THE H-BUG EPIDEMIC:

The Impact of Antibiotic-Resistant Staphylococcal Infection on New Zealand Society and Health 1955-1963

Deborah Mary Jowitt

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ATTESTATION OF AUTHORSHIP

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the qualification of any other degree or diploma of a university or other institution of higher learning, except where due acknowledgement is made in the acknowledgements."

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ABSTRACT

An epidemic of staphylococcal infections occurred in New Zealand hospitals and communities from 1955-1963. The ‘H’, or ‘Hospital Bug’, a strain of *Staphylococcus aureus* characteristic of the epidemic, was resistant to the most commonly used antibiotics. Post-operative patients, the frail elderly and mothers and babies were particularly vulnerable to staphylococcal colonization and infection.

This thesis places the H-Bug epidemic in its historical context, discussing the ways in which the government and health professionals responded to the rising incidence of staphylococcal infection, and the major effects of the epidemic on medical and hospital practice. It also examines the impact of persistent staphylococcal infection on women and families in the community.

Primary sources provided the basis for this thesis. The H-Bug epidemic has gone largely unrecorded except in contemporary documents. Health Department files and Auckland Hospital Board records as well as newspaper clippings were important sources.

The New Zealand epidemic was clearly linked to the global pandemic of antibiotic resistant staphylococcal infection, 1946-1966, through medical literature and archival documents. International medical journals, including the *New Zealand Medical Journal*, published numerous articles on the epidemiology of antibiotic-resistant staphylococcal infection, providing an excellent record of research, case studies, current opinion, and recommended practice.

The most valuable contribution to an understanding of the impact and experience of the H-Bug epidemic was, however, provided by the nineteen people who agreed to be interviewed for the study. Interviewees included a wide variety of health professionals and women and their children, all of whom had personal experience or association with the epidemic.

In this thesis it is argued that the main focus of the medical response was the prevention and control of hospital cross-infection, both to protect patients and to preserve the public perception of the hospital as a safe venue for care. Although the emergence of resistant strains of staphylococci was widely attributed to the misuse of antibiotics, this thesis contends that the Health Department was reluctant to impose restrictions on medical prescribing and that Health Department officials and senior clinicians chose instead to modify hospital environments and clinical practice.

Rooming-in was widely introduced to counter the epidemic despite the fact that a trial in 1959, at National Women's Hospital, did not demonstrate a reduction in infection rates among neonates. The concept endured, however, as it held strong appeal for hospital administrators hard pressed to keep wards adequately staffed with trained personnel. It was also supported by women and health professionals who were convinced of the benefits of a close mother-baby relationship from birth.

The H-Bug epidemic was eventually resolved by the introduction of the methicillin antibiotics in the early 1960s. As a consequence, confidence in a pharmaceutical solution to infectious disease remained intact until the emergence of multiple antibiotic-resistant organisms in the 1980s. The lessons of the H-Bug epidemic had been largely forgotten in the intervening years, ignored until New Zealand clinicians were reminded once again that antimicrobial resistance would inevitably accompany the indiscriminate use of antibiotics and inadequate attention to infection prevention and control.

ACKNOWLEDGEMENTS

This thesis has been written over two years and would not have been completed without the interest, willing assistance and support of many people. My supervisors, Dr Lynne Giddings and Dr Linda Bryder, encouraged me to pursue the topic I had chosen, recognizing that I had a strong personal and professional interest in researching this particular aspect of New Zealand history. I would like to thank them both for their confidence in my choice of topic and their unstinting encouragement and support.

The staff of the Philson Library and Off Campus Storage, University of Auckland gave me friendly, helpful service, going out of their way to assist me with my research. The staff of Archives New Zealand in Wellington and Auckland was also very helpful. I am particularly grateful to those people who agreed to be interviewed for this study. Although I found much important material in the archives and in journals and books, the personal recollections of people affected by the H-Bug epidemic have provided essential material about the challenges they faced in their personal and professional lives during this time.

Thanks to my colleagues at Auckland Hospital, to Dr Sally Roberts in particular, for her thorough review of the chapter on the effects of the epidemic on medicine and medical practitioners in New Zealand, and to Camilla McGuiness, who encouraged me to take time to research and write during my first year of study.

My family have given me constant encouragement and support. My children have always respected my desire to complete a post-graduate qualification. My mother, Dr Anne McKinnon, was able to assist me both from a medical and personal perspective. It was our experience as a family in 1955 that sparked my initial interest in the H-Bug epidemic. The distress caused by the prolonged illness of my brother and the death of my baby cousin, Sally, from staphylococcal pneumonia made a lasting impression on us all. I am grateful to my mother for her encouragement and words of advice.

My husband, Allen Jowitt, has provided uncomplaining companionship, support and confidence in my ability to see this project through to completion. I will always be grateful for his love and steadfast faith.

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INTRODUCTION

In 1941, when penicillin was first used to treat infection, *Staphylococcus aureus* (*S.aureus*) appeared to be fully sensitive to the effects of this miraculous antibiotic. In the years that followed, however, it rapidly demonstrated greater capacity than any other susceptible bacteria for developing antibiotic resistance. A pandemic of resistant staphylococcal infections, dubbed the 'H-Bug' epidemic in New Zealand, occurred from 1946-1966.[1] When new, more potent antibiotics were introduced in the 1960s, the problem of resistance appeared to be overcome, but since the 1980s antimicrobial resistance has re-emerged as a major global problem.

During the past two decades methicillin-resistant *S.aureus* (MRSA), vancomycin-resistant enterococci (VRE) and a variety of other antimicrobial disease-producing bacteria have become endemic in hospitals around the world. The appearance of vancomycin-resistant *S.aureus* in 2002 is of particular concern.[2] In this context, the impact of the H-Bug epidemic on New Zealand society and health is of undoubted interest to medical historians and to healthcare workers currently engaged in controlling the spread of multi-resistant pathogens in our hospitals and communities.

The First Signs of Penicillin-Resistance

Antibiotics proved so effective that they quickly instilled general confidence in 'a once-and-for-all solution' for infectious disease. In the triumphant aftermath of the discovery of penicillin, few people anticipated that a new problem would accompany the antibiotic 'fix' for infection.[3] Until 1944, few cases of infection were attributed to penicillin-resistant staphylococcal strains.[4] In the mid-1940s the use of penicillin increased, particularly in hospitals, where penicillin-resistant staphylococci came to outnumber

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[1] Robert I. Wise, Elizabeth A. Ossman, and Dwight R. Littlefield, Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance, *Reviews of Infectious Diseases*, 2, 6, 1989, pp.1005-1019.

[2] William R. Jarvis, 'Controlling Antimicrobial-Resistant Pathogens', *Infection Control and Hospital Epidemiology*, 25, 5, 2004, pp.369-372. Vancomycin has long been considered a valuable drug of choice for treating multi-resistant staphylococcal infections; 'Vancomycin is given intravenously to treat Gram-positive infections, particularly those due to methicillin-resistant staphylococci...it remains the 'gold standard' glycopeptide'. Selwyn Lang, ed, *Guide to Pathogens and Antibiotic Treatment* 6th edn, Auckland, 2001, p.40.

[3] 'Disease Fights Back', *Economist*, 20 May 1995, p.13.

[4] Mary Barber and Mary Rozwadowska-Dowzenko, 'Infection by Penicillin-Resistant Staphylococci', *Lancet*, 23 October 1948, pp.641-644.

penicillin-sensitive strains by a simple process of selection.[5] By 1945, more than 10% of all hospital strains tested in the United Kingdom (UK) were resistant to penicillin. Within two years, these rates had increased to 40%.[6]

Antibiotic-resistant staphylococcal infections in UK and USA hospitals were a serious concern throughout the late 1940s and early 1950s, but it was not until 1955 that the New Zealand medical community became aware that resistant staphylococcal infections were a growing problem throughout the country. The epidemic 'H-Bug' strain, 80/81, was resistant to the most commonly prescribed antibiotics: penicillin, streptomycin and the tetracyclines. The emergence of persistent, often severe staphylococcal infections affecting hospital patients was the first clear signal to the New Zealand medical community that antibiotics might not be the final solution to infectious disease, but that they might simply represent, '…a tactical victory that needed following through…in a race with no foreseeable end'.[7]

Historiography

The history of epidemic infectious disease in New Zealand has until relatively recently followed the celebratory model of medicine that emphasized the 'great men' of medicine, medical discovery and esteemed medical bodies and institutions. Works such as Francis Maclean's *Challenge for Health: A History of Public Health in New Zealand* aimed to document the official government response to serious communicable diseases and the achievements of individual doctors and Department of Health administrators to prevent and control their occurrence.[8] Inquiry into the wider social impacts of epidemic disease is a relatively recent phenomenon.

Histories of communicable disease in New Zealand focus heavily on the vaccine-preventable diseases – measles, mumps, diphtheria, influenza and polio – and major pathogens such as tuberculosis that were responsible for high rates of morbidity and

[5] ibid., p.643. Long hospital admissions for surgery were routine during the 1940s and 50s.All maternity patients were entitled to a fortnight's postpartum stay. The use of penicillin prophylaxis in surgery and maternity care was common practice.
[6] ibid., p.641.
[7] 'Disease Fights Back', *Economist*, 20 May 1995, pp.13-14.
[8] Francis S. Maclean, *Challenge for Health: A History of Public Health in New Zealand*, Wellington, 1964.

mortality throughout the population. This is understandable given the severe impact of these diseases on both Pakeha and Maori communities over time and the preoccupation with controlling disease through active public health and sanitation measures in the early 20th century. It is also consistent with an age-old preoccupation with the dramatic effects of plague and pestilence on human populations.[9]

The H-Bug epidemic was unlike previous scourges in that it occurred as a result of human invention and intervention. The success of antibiotic therapy was marred by the unanticipated emergence of so-called 'super-bugs' – staphylococci naturally resistant to the effects of penicillin were 'assisted' to dominate where previously they had been minority pathogenic strains. This paradoxical process, initiated by medical therapy, resulted in an epidemic of staphylococcal infection among vulnerable patients in hospitals and people in New Zealand communities from 1955-1963. It has gone largely unrecorded except in contemporary documents, although there is no doubt that specific epidemic strains were identified and an increased incidence of antibiotic-resistant staphylococcal infection was notified during this period.[10]

As a result, this history has relied heavily on personal interviews with individuals affected by the H-Bug epidemic, Health Department archives and contemporary medical texts and journals. Only one article located, 'Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance', dealt directly with the personal experience of healthcare workers during this period.[11] The American co-authors, Drs Wise, Ossman and Littlefield, were deeply involved in initiating local and nationwide infection surveillance in the USA during the 1950s; they reported a lasting connection with infection control that was rooted in the staphylococcal pandemic, 1946-1966. American infectious diseases physicians and microbiologists established a strong identity as infection prevention and control professionals at this time whereas public health and the medical profession in New

[9] 'The term *epidemic* derives from the Greek 'upon the people' while *pandemic* is applied to disease extending across the globe within a limited span of time'. Mary Dobson, Epidemics and the Geography of Disease, in *Western Medicine*, Loudon Irvine, ed, Oxford, 1997, p.179.

[10] 'Epidemic nosocomial infections are defined as hospital-acquired infections that represent an increase in incidence over expected rates', Consuelo Beck-Sague, William R. Jarvis and William J. Martone, Nosocomial Infections, in Loreen A. Herwaldt and Michael D. Decker, eds, *A Practical Handbook for Hospital Epidemiologists*, Thorofare, 1998, p.135.

[11] Wise et al, 1989, pp.1005-1019.

Zealand did not begin to investigate the value of such an approach until the mid-1970s.[12]

The approach taken by Wise et al towards their colleagues is completely devoid of the romanticism often associated with records of medical endeavour. 'The senior author, as a bacteriologist in a venereal disease clinic…assisted physicians in the collection of specimens for the diagnosis of gonorrhoea and observed one of the most prominent physicians in the community perform vaginal examinations without gloves; he then contaminated the door knob of the examination room as he was the first to leave the room…the physician reclaimed his cigar, held on a toothpick, and washed his hands'. They viewed the practice of their colleagues with a critical eye: 'Physicians and nurses were observed to change dressings of infected surgical wounds without wearing gloves, discard the staphylococcus-laden dressings into an unlined waste basket near the bed, draw back the bedside curtains in open wards, and rub their noses before washing their hands'. [13]

Instead of ignoring unacceptable practice among their colleagues Wise et al were compelled to record it and to act upon it. Their shift in perspective is noteworthy. The medical and nursing profession are not seen in the traditional light as enlightened, selfless beings, but as a potential threat to their patients. This article was also an important validation of the existence and impact of the worldwide pandemic of staphylococcal infection. Although infection control literature consistently makes reference to the pandemic as the event that instigated intensive epidemiological surveillance of infection rates by a new medical and nursing specialty, there is little attention paid to the impact of local epidemics on health professionals or individuals in affected communities.[14]

The shocking nature of severe resistant staphylococcal infection among medical colleagues very occasionally found its way into contemporary academic papers; '…anyone professionally connected with a large hospital can recount tragic instances of fulminating infection…A simple appendectomy in a healthy young physician resulted in

[12] Berenice Bird, 'A Historical Perspective on Infection Control Nursing in New Zealand', paper presented at the 9th Annual Infection Control Conference, July 1990.
[13] Wise et al, 1989, p.1017.

septic thrombosis, osteomyelitis of vertebrae, extradural abscess and paraplegia; while paronychia in a healthy young woman (also a physician) ended within a week in fatal staphylococcal meningitis. These things should not be; yet such examples…could be matched and multiplied elsewhere in North America and in the British Isles, Scandinavia and Australasia'.[15] This was an isolated piece of personal discourse in what was otherwise a review of seven decades of research into *Staphylococcus pyogenes*, a rare touch of the vernacular amongst the science.

The first account of the New Zealand Department of Health, Francis Maclean's *Challenge for Health: A History of Public Health in New Zealand*, published in 1964, is an interesting and informative record of notable figures and achievements of this remarkable government service. The efforts made to control communicable diseases, such as diphtheria and polio, are documented as well as the fledgling activities of the first vaccine laboratory in 1905, and the prescient actions to vaccinate Maori against smallpox in the mid-1850s.[16] Although Maclean acknowledges competing agendas within the medical profession towards such contentious issues as maternity care, his work lacks the broader social and political context to lift it beyond the purposes of a departmental record.

The establishment of the National Health Institute (NHI) in 1954 is briefly referred to by Mclean, but no mention is made of the H-Bug epidemic or of the Health Department's role in managing outbreaks and promoting epidemiological research during the period. It is a curious omission given that this activity was undeniably on the public record. An article on the NHI in the June 1959 edition of *Health* notes that as well as identifying Salmonella and Shigella organisms and isolating influenza viruses, the institute performed staphylococcal phage typing on thousands of specimens; 'the work on staphylococcal organisms is of great importance in helping to control the so-called "H-Bug" which has figured in newspaper reports recently'.[17]

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[14] Richard P. Wenzel, *Prevention and Control of Nosocomial Infection*, 4th edn, Philadelphia, 2003.
[15] C.E.Dolman, 'The Staphylococcus: Seven Decades of Research', *Canadian Journal of Microbiology*, 2, 1956, p.197.
[16] Maclean, 1964, p.245.

In his 1995 history of the New Zealand Department of Health, *Safeguarding the Public Health: A History of the New Zealand Department of Health*, Derek Dow explores just over a decade of departmental activity in each chapter, bringing together the social, economic, political and professional influences on the organization and delivery of public health services during defined segments of time.[18] Dow's comprehensive approach was extremely valuable when exploring the background to the emergence of the H-Bug in New Zealand, without providing direct reference to the staphylococcal epidemic.

The extensive detail on the work of Dr John Cairney, Director-General of Health 1950-1959, was an excellent adjunct to my research on the most intense years of the epidemic, 1955-1959.[19] Cairney was an active supporter of the introduction of rooming-in to maternity hospitals who advised 'discriminating' use of antibiotics. Dow also noted the close interest in and communication with both British and American medical colleagues and professional organizations in the 1940s and following decades, as well as the friction between established voluntary organizations such as Plunket and the new Parents Centre movement.

Linda Bryder's recent history of the Plunket Society, *'A Voice for Women: The Plunket Society and Infant Welfare 1907-2000'*, provides in-depth discussion of the conflict emerging in the 1950s between progressive consumer organizations and professional groups.[20] This was very useful when contemplating the control that medicine exerted over childbearing women in the 1950s and the context within which the decision to instigate rooming-in in maternity hospitals was made. For the medical profession, the decision was a grave one; 'Just how practicable or effective segregation of the nurse from the baby is, remains to be seen. Unless babies… are to be left entirely to the untrained care of the mother, there will still be much for the nurse to do', but the stakes were potentially high.[21] This radical step was taken not only to prevent cross-infection, but more importantly to stave off a potential exodus from the maternity services.

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[17] The National Health Institute, *Health*, June 1959, pp. 8-9.
[18] Derek A. Dow, *Safeguarding the Public Health: A History of the New Zealand Department of Health, Wellington*, 1995.
[19] Dow, 1995, pp.172-177.
[20] Linda Bryder, *A Voice for Mothers: The Plunket Society and Infant Welfare 1907-2000*, Auckland, 2003.
[21] Editorial, 'Maternity Service in New Zealand', *New Zealand Medical Journal (NZMJ)*, 56, 1957, pp.491-493.

Mothers were re-designated as the main caregivers of their babies as part of a concerted campaign to restore the reputation of the maternity hospital as a safe venue for care.

In New Zealand during the 1950s, rooming-in was discussed in the context of changes introduced to American maternity hospitals in the 1940s and 50s.[22] The staphylococcal pandemic occurred at the same time that short staffing in maternity hospitals, rising birth rates and concerns over the 'considerable problem of mental health' intersected in the post-war period.[23] In her history of the Parents Centre movement in New Zealand, *The Trouble with Women*, Mary Dobbie described the 'intimidating regimentation' of maternity hospitals in the early 1950s and the introduction of rooming-in as 'the ideal arrangement' to prevent staphylococcal cross-infection while encouraging mothers to get up soon after the birth and establish a more 'natural' relationship with their baby.[24] Parents Centre members saw these changes 'as psychologically beneficial to mother and child'.[25]

Contemporary historians, such as Elizabeth Temkin, offer an alternative interpretation for the impetus to introduce rooming-in in American hospitals in the 1940s and 50s.[26] When postpartum stays were shortened as a necessity during World War II, there was considerable pressure on women to mobilise soon after birth. The obvious benefits of early ambulation convinced doctors that some of the rituals and practices designed to protect women and babies from infection, could be safely discarded. Many hospitals, however, instituted rooming-in out of simple necessity. Nursing shortages post-war made it impossible to staff the nurseries adequately with trained personnel.

New Zealand maternity administrators faced similar challenges to their American counterparts. Following the introduction of the Social Security Act in 1938, New Zealand women were entitled to a free fortnight's rest in hospital after giving birth. Acute nursing shortages affecting the maternity sector undoubtedly contributed to the decision to introduce rooming-in. Caring for babies at the mother's bedside was

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[22] Garth Holdaway, 'A Year's Experience of Rooming-in in a Maternity Home', *NZMJ*, 58.1959, pp.163-169.
[23] *Parents Centre Bulletin*, 13, 1959, p.5.
[24] Mary Dobbie, *The Trouble with Women*, Christchurch, 1991, p.42.
[25] *Parents Centre Bulletin*, 13, 1959, p.5.
[26] Elizabeth Temkin, *Unlimited Mothering: Rooming-in in Post War America*, a paper presented at the Social Science Research Seminar, Wake Forest University, 23 March 2000, available at : http://www.wfu.edu/~caron/ssrs/roomin.doc

perceived as safer during outbreaks of staphylococcal infection. It was also seen to support breastfeeding and the emotional wellbeing of the mother and baby – while requiring fewer skilled staff.

Contemporary observers such as Dr Doris Gordon, and recent historians such as Adelheid Wassner, described overcrowding as another feature of maternity hospitals in New Zealand during the 1940s and 50s.[27] It was officially recorded as the probable cause of the Calvary Hospital outbreak in November 1955, when eight babies delivered in the maternity department died of antibiotic resistant staphylococcal pneumonia.[28] In her history of the Catholic order that established the Calvary Hospitals, *Mary Potter's Little Company of Mary: The New Zealand Experience 1914-2000,* Ann Trotter noted that the hospital was 'exceptionally busy in the years after 1945…ironically the very popularity of the maternity department and the nursing care provided there contributed to the disaster'. [29] Calvary Hospital maternity department received much adverse publicity on account of the tragic deaths, although it had regained its excellent reputation by the early 1960s.

Stigma of association with the epidemic was a definite incentive to omit any mention of events that adversely affected the public image of a maternity institution. Potter redressed the balance by emphasising the successes of the department. 'In 1963, it was reported that a prenatal blood transfusion, the second of its kind in the world, had been performed on a baby at Calvary…This technique saved this baby and would save others…Such achievements were a justifiable source of pride'.[30]

In the official Auckland Hospital Board record of the planning for the new National Women's Hospital, *For the Women of New Zealand: The Story of National Women's Hospital,* Gerald Wakeley noted the decision to redesign patient accommodation; 'following another meeting in 1957 it was agreed that the ward layout would be revised to allow for 'rooming-in' instead of central nurseries', but made no suggestion of the

[27] Doris Gordon, *Doctor Down Under*, London, 1957; Adelheid Wassner, *A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972*, Dunedin, 1999.
[28] A. Douglas and H.T. Knights, 'Some Public Health Aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55, 1956, pp. 378-387.
[29] Ann Trotter, *Mary Potter's Little Company of Mary: the New Zealand Experience 1914-2000*, Wellington, 2003, pp.64-65.
[30] ibid., p.65.

context within which this decision was taken.[31] The staphylococcal epidemic was not part of the proud, linear progress of this institution and indeed it was the stated goal of the Medical Superintendent, Dr Algar Warren, that the new National Women's Hospital should be a 'show piece'; association with the word isolation was to be avoided as 'it seemed to conjure up…something unpleasant or taboo, especially when applied to maternity matters'.[32]

The Discovery of Penicillin

Accounts of the history of the discovery of penicillin adhere closely to the heroic model of medical achievement. While penicillin resistance is noted, it is peripheral to the main events. Simplistic versions of Fleming's discovery of the famous mould on a petri dish abound; Ronald Hare, who worked with Alexander Fleming at St Mary's Hospital laboratories, presented a more analytical version of events surrounding this sentinel event.[33] Hare's recollections of childhood and his career in bacteriology, *The Birth of Penicillin*, provided valuable contextual material for understanding the impact of the discovery of penicillin and the later development of its therapeutic potential.

Antibiotics were readily appreciated as miracle drugs for a reason – there had been no effective cure for most infectious diseases up to that time. Apart from preventive measures such as vaccines and chemotherapeutic agents such as Salvarsan and the sulphonamides, there was precious little to offer patients in the way of a cure. Hare described his father's general practice at the turn of the century: '…my father was forced to treat patients with infections by the same methods he used for the treatment of other diseases… All he could do was enquire about the patient's progress, suggest something about his diet, say a few words of encouragement, and instruct the family to collect a bottle of medicine (one of four available medicaments) at his house that evening.[34]

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[31] Gerald Wakeley, *For the Women of New Zealand: The Story of National Women's Hospital*, Auckland, 1963.

[32] Auckland Hospitals Committee minutes, 12 April 1965, Proposal of National Women's Hospital Medical Committee to vary the intended use of the beds in the first floor Isolation Block, HI 56/7/14/1 closed no 31071, Archives New Zealand, Auckland.

[33] 'Sir Alexander Fleming – an important role in the discovery of penicillin', *Health Gazette*, 337, 11 August 2003, p. 3. The public perception that the 'laurel wreath' for the discovery of penicillin should go to Fleming is widely attributed to a letter published in the *Times* on 31 August 1942, by his colleague and mentor, Sir Almroth Wright; David Wilson, *Penicillin in Perspective*, London, 1976. p.60.

[34] Ronald Hare, *The Birth of Penicillin*, London, 1970, pp. 19-20. Ronald Hare, who worked with Alexander Fleming at St Mary's Hospital, was the son of a general practitioner who had practiced in rural England in the early twentieth century.

The discovery of the sulphonamides in 1936 was seen as a 'breakthrough', especially in the treatment of puerperal sepsis. In *The Tragedy of Childbirth Fever*, medical historian Irvine Loudon discussed the positive impact of the sulphonamides on maternity practice and practitioners:

> Jimmie, as he was always known …was very much of the old school, brought up in an age when there were few active pharmaceuticals…In his cottage hospital, he had a maternity unit, of course, and the patients were confined for several days post-partum in case they developed puerperal fever. He told me that those of us working in the 1960s with modern antibiotics aplenty could not begin to understand the feeling of horror of watching the swingeing fever take grip of a fit young women, who had just given birth to her child, and realize you could do precious little but pray. [35]

In this context, the impact of penicillin, with its low toxicity and wide therapeutic effect, cannot be underestimated.[36] Hare described the changes that occurred in the treatment of infectious disease and the organization of medical research in the post-war in his chapter aptly named *The Metamorphosis of Medicine*. 'Medical research had become respectable and was no longer a spare time hobby…or something to occupy the time of men endowed with private means...a great many diseases were becoming preventable, curable or amenable to study. Almost every facet of medicine was affected in this way'. Of all the advances, 'the most spectacular were made in combating diseases caused by microbes'. [37]

Penicillin-Resistance

Hare described the discovery of antibiotic after antibiotic, and even made brief reference to; '…another series of antibiotics too numerous to mention individually, [that] also made their appearance when strains of staphylococci resistant to penicillin became rampant in our hospitals'.[38] This succinct reference to resistance is interesting in the context of Hare's perspective on Alexander Fleming's failure to extract a therapeutic form of penicillin in 1929. Clutterbuck, Lovell and Raistrick, junior research colleagues working under Fleming's direction at St Mary's during this time, successfully grew

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[35] Irvine Loudon, *The Tragedy of Childbirth Fever*, Oxford, 2000, p.183.

[36] The Second World War gave New Zealand doctors serving in the Allied forces early exposure to the effects of penicillin in vivo. Dr Fred McConnell, graduated at Otago University in 1942 then was transferred to Italy in the medical corps in 1943. He recalled his first impressions of penicillin therapy as 'remarkable… quite wonderful…it turned the infection period around completely'.

[37] Hare, 1970, pp.217-220.

[38] ibid., p.220.

penicillin on a synthetic culture medium but were unable to solve the difficult problems of purification and concentration of the therapeutic substance.

Hare suggested that there were four probable reasons for the decision to discontinue the research in spite of Fleming's early optimism. One of these, although it was, 'pure conjecture on my part…was the fact that Craddock had found that staphylococci could become resistant to penicillin after only short exposure to it'. Although this work was never published, the experiment was described to Hare in a conversation with Craddock:

> …the classical method was employed in which the organisms were 'trained' by growing them in broth containing penicillin in too small amounts to kill them. As a result of only three such passages, the Hall strain of staphylococci became able to multiply in broth containing mould juice at a dilution of only 1/100 (but not in 1/10) whereas before treatment in this way, it had been inhibited in all dilutions up to and including 1/400. This form of resistance is due to mutation and it is now known that staphylococci seldom acquire it while causing infections of patients under treatment. Fleming could not have known this. What he did know was the standard doctrine of the time; that resistance can be acquired under treatment, that once resistance has been acquired it is a permanent characteristic and that if such an organism produces an infection, treatment by the chemotherapeutic agent is valueless.[39]

In 1938 Howard Florey, Professor of Pathology at the University of Oxford, and Ernst Chain, a biochemist, began a systematic investigation into the chemical and biological properties of antibacterial substances produced by micro-organisms. 'By great good fortune one of the first to be investigated was penicillin, which …showed interesting biochemical and biological characteristics. That this substance prevented the growth of staphylococci appeared particularly important, as no substance was known that effectively controlled staphylococcal infection'.[40] The first preparations, made by extracting penicillin from culture medium into ether and back into water, contained only about 1 per cent of pure penicillin, but 'even these very crude preparations inhibited the growth of staphylococci and other bacteria at a dilution of 1 part in 500,000'.[41] While

[39] ibid., p.110.
[40] Ernst Chain and Howard W. Florey, 'Penicillin', *Endeavour*, January 1944, p.4.
[41] ibid., p.5.

this was encouraging, further work produced purer preparations that 'inhibited the growth of staphylococci at the astonishing dilution of 1 part in 50 millions…'[42]

As early as 1940, however, Chain, Florey and colleagues were questioning whether bacteria such as *Staphylococcus aureus* could 'acclimatise themselves to inhibitory concentrations of penicillin…by producing the penicillin-destroying enzyme penicillinase'. To provide an answer, 'a strain of *Staph.aureus* was cultivated for some months in broth in the presence of increasing quantities of comparatively crude penicillin. Even after a few daily subcultures there was evidence of increased resistance, the coccus showing growth in at least twice the previously inhibitory concentration'.[43] In 1944, Sir Howard Florey (later Lord Florey) and Chain stated that American researchers had confirmed that a certain number of strains of *S.aureus* were naturally resistant to penicillin. 'Scott Thomson (1943) has recently shown that these constitute about 4 per cent. of the staphylococci occurring in war wounds'.[44]

Staphylococcus aureus has always presented clinical challenges to medical practitioners. While it is often a harmless passenger in the body and staphylococcal boils and minor skin infections can be relatively benign, in the pre-antibiotic era the lack of specific therapy for severe illness was reflected in the high mortality of patients with septicaemia and the suppurative or disabling disease among those who recovered. A series of 122 cases of staphylococcaemia at Boston City Hospital reported in 1941 by Skinner and Keefer had a mortality rate of 82% in adults over 30 years of age, and although the mortality for children was lower, there was a high incidence of chronic osteomyelitis occurring as a complication.[45] Surgical drainage of suppurative lesions, especially in osteomyelitis, remained an important aid to recovery.[46] Empirical therapy, including stannous oxide pills, X-rays or ultra-violet light, was used for persistent staphylococcal skin infections in general practice but it was not until penicillin was made available that this common pathogen appeared to be overcome. [47]

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[42] ibid., p.7.

[43] E.P. Abraham, E. Chain, C.M. Fletcher, H.W. Florey, A.D. Gardner, N.G. Heatley and M.A. Jennings, 'Further Observations on Penicillin'. *Lancet*, ii, 177, 1941, pp.177-188.

[44] Chain and. Florey, 1944, p.12.

[45] David Skinner and Chester S. Keefer, 'Significance of Bacteremia Caused by Staphylococcus Aureus', *Archives of Internal Medicine*, 68, 5, 1941, pp.851-875.

[46] Wise et al, 1989, p.1006.

[47] Dr Fred McConnell, interviewed by Deborah Jowitt, 10 January 2003; G.N. Gillum and L.W. Gillum, *The Modern Physician and Home Medical Guide*, Chicago, 1943.

The relative severity of the staphylococcal epidemic in New Zealand (1955-1963) is difficult to assess because of the lack of published data on the incidence of serious staphylococcal infection during previous decades. A search through the *New Zealand Medical Journal* since 1900 revealed that with two exceptions no comment was made regarding staphylococcal infection until 1954, when attention was drawn to the increased incidence of staphylococcal infections in maternity hospitals.[48] Lynch (1924) discussed 20 cases of staphylococcal pneumonia complicating influenza and Ludbrook (1943) reported a case of staphylococcal septicaemia successfully treated with sulphathiazol. 'It would seem that in earlier years staphylococcal infection had been accepted as a part of man's fate and as such, stimulated little comment'.[49]

Sources

The *New Zealand Medical Journal* proved to be an excellent source of contemporary medical opinion, case reports and research. In contrast to previous decades, an average of two articles concerned with staphylococcal resistance, outbreak, management and research were published each year from 1955 –1964. As the 'voice' of the medical profession in New Zealand, the journal recorded the measures taken to prevent and control cross-infections as well as the emerging discussion over the source of infection – hospital or community? Researchers presented arguments to support both sides of the debate; a debate that lost impetus in the early 1960s when epidemic strains of staphylococcus began to recede in the face of new, more potent antibiotics.

Archival material stored in both Auckland and Wellington provided relatively large amounts of material from the Department of Health files to complement local and international journals, newspaper clippings and medical texts. The correspondence between medical officers of health, hospital boards and the department was particularly helpful, especially the copious reports written by Dr H.T. Knights after his hospital visits as investigating NHI epidemiologist. Knights left a unique record of the *actual* state of the hospitals and small maternity units he visited; he documented the shortcomings of each institution in light of his recommended improvements to their

[48] E.F. Battersby and Hugh Stringer, Pathogenic Staphylococci in a Maternity Hospital, *NZMJ*, 53, 1954, pp. 420-422.
[49] N.P. Markham and H.C.W. Shott, Staphylococcal Infection in General and Hospital Practice, *NZMJ*, 57, 1958, pp.55-62.

facilities. Contemporary opinion and class differences were aired openly along with his views on hospital hygiene;

> The type of young woman employed, judging by the general appearance, was not one to whom over-fastidiousness in personal hygiene or observance of reasonable hours and general rules of healthy living would be acceptable, yet the laundry manager, Mr. Cunningham, insists that absenteeism due to boils, abscesses and sore fingers is unknown. This, it will be realised, is in a type of employee to whom the provisions of the Worker's Compensation Act are not unknown and who…would be among the first to take advantage of its provisions.[50]

The archives also provided access to the extensive correspondence between members of women's organizations and the senior administrators of National Women's Hospital over the planning of isolation facilities and the separation of obstetric and gynaecological services within the new hospital. This was extremely valuable, as was the access to Auckland Hospital Board records, held at both the Archives New Zealand Wellington and Auckland branches. These documents provided details of debates on control of cross-infection, research on staphylococcal carrier rates among staff and patients, rooming-in and the introduction of pHisoHex (hexachlorophene) emulsion for 'dry-bathing' babies, as well as Department of Health recommendations on measures to prevent infection and retain nurses and midwives during extreme staff shortages.

The most important contribution to my understanding of the impact and experience of the H-Bug epidemic, however, was provided by the nineteen people who agreed to be interviewed for the study. Two paediatricians, two infectious diseases physicians, three general practitioners, two midwives, three nurses, one laboratory technician, three women and three of their relatives participated in the interviews. Anne McKinnon was able to bring both the perspective of a mother and a GP to her recollections of the epidemic; this was particularly useful as her combined professional and personal recollections provided a unique record of events.

The interviewees were recruited by snowball sampling. Professional contacts were especially helpful in identifying elderly colleagues who had worked during the 1950s

[50] H.T.Knights, Investigations of Staphylococcal Cross Infection in Christchurch Hospitals, 2 March – 20 March, report to John Cairney, Director-General of Health, 17 April 1958, HI 131/175, Archives New Zealand, Wellington.

and 60s. All of the interviewees had either worked as health professionals from 1955-1963 or had experienced H-Bug infections first-hand in hospital or in the community. Their recollections, particularly the intense experiences shared by the women, midwives and nurses, provided a record of human emotion and hardship that complemented and enriched formal documents such as committee minutes and correspondence.

Structure of the Thesis

Chapter Two outlines the emergence and management of antibiotic-resistant staphylococcal infection in New Zealand. It backgrounds the increasing incidence of resistant infections internationally and the measures taken by the Department of Health to contain and control infection in New Zealand hospitals.

Chapter Three discusses the impact of the epidemic on doctors in hospitals and in the community. While senior hospital administrators bore the brunt of public criticism and scrutiny, clinical staff sought solutions to the problem of cross-infection and general practitioners cared for their patients suffering from persistent boils, abscesses and impetigo. None of the doctors interviewed recalled this time as more challenging than any other in their careers.

Chapter Four examines the effect of the introduction of the 1941 Pharmaceutical Benefits Scheme and the discovery of the therapeutic potential of penicillin on doctor's prescribing practices. Doctors were subject to competing pressures – patients requesting the latest medication, persistent marketing by pharmaceutical companies and the association between progressive practice and drug treatment. All these factors mitigated a move from within the profession to restrict prescribing and thereby minimise the further development of antimicrobial resistance.

Chapter Five reflects on the history of infectious disease among postpartum women and the management of childbirth when the epidemic began. The maternity services were already under strain - short staffing and overcrowded conditions contributed to staphylococcal outbreaks and an increasing incidence of severe infection in babies and breast abscesses in their mothers. This chapter reviews the changes made during the 1950s and 60s to the delivery of maternity services in response to the threat of

staphylococcal cross-infection and growing societal demands for a ‘more natural’ way for mothers to care for their babies in the hospital setting.

Chapter Six discusses the experience of individuals in the community, particularly the mothers and families of infected babies or children, and the advice given to the public by general practitioners and the Health Department. It also follows the correspondence between women’s organizations and the Auckland Hospital Board over isolation facilities within the new National Women’s Hospital.

This thesis explores the impact of the H-Bug epidemic (1955-1963) on health professionals, mothers and babies, other patients and the general public. It examines factors that contributed to the development of antimicrobial resistance in the 1940s and 50s, as well as the measures that were introduced to overcome infections caused by the prevailing epidemic staphylococcal strains. It concludes that the medical community underestimated the significance of the antimicrobial resistance during this period. Since the mid-1980s, endemic and emerging antimicrobial resistant pathogens have been among the most controversial and difficult challenges facing medicine and healthcare institutions, with no final solution in sight.

CHAPTER TWO

There are no potent therapeutic roses without their thorns[51]

Introduction

By the early 1950s, concerns about anti-microbial resistance were being voiced within the New Zealand medical community. The experience overseas was of a rapidly increasing incidence of resistant staphylococcal infection in hospital settings where the extensive use of antibiotics had encouraged resistant strains to flourish and cross-infect post-operative patients, the frail elderly and mothers and babies in maternity units.[52] In November 1955, the country was shocked to learn that eight babies, born in a private maternity hospital in Christchurch, had died from antibiotic resistant staphylococcal pneumonia.

A creative Auckland news reporter dubbed the epidemic strain of *Staphylococcus aureus*, 'The H (Hospital) Bug', but the infections were not confined to institutions.[53] Sporadic outbreaks, particularly among newborn babies and their mothers, occurred throughout the country in both hospitals and in the community for the next eight years, when the introduction of new, more potent antibiotics coincided with the apparent waning of the 'virulent' epidemic strain of staphylococci.

Cautionary Advice

The first locally published paper cautioning doctors about microbial resistance appeared in the *New Zealand Medical Journal* in 1953.[54] John Hiddlestone, later Director-General of Health (1973), wryly described the sense of disillusionment experienced by practitioners for whom 'the advent of sulphonamides and antibiotics [had] seemed to herald a formerly undreamed of therapeutic El Dorado'.[55] The practice of medicine had undoubtedly been changed significantly by the advent of antibiotics. Whereas in the

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[51] H.J.H. Hiddlestone, 'The Action of Antibiotics', *NZMJ*, 52, 1953, pp.207-209.

[52] Mary Barber and Mary Rozwadowska-Dowzenko, 'Infection by Penicillin-Resistant Staphylococci', *Lancet*, 23 October 1948, pp.641-644; C.E. Dolman, 'The Staphylococcus: Seven Decades of Research (1885-1955)', *Canadian Journal of Microbiology*, 2, 1956, pp.189-200.

[53] *The Standard*, 21 November 1956.

[54] Hiddlestone, 1953, pp.207-209.

[55] ibid., p.207.

past, patients nursed in the home had required daily visits and rigorous nursing care, 'in the antibiotic era you gave them their four or five days and said I'll come back in two days when the antibiotic was really working …'[56] Where healing had often been slow and protracted, the 'miraculous' properties of antibiotics promoted such rapid improvement many infections seemed to 'vanish and heal up in no time at all'.[57] Dr Jack Dilworth Matthews, a leading paediatrician of the time, drew a simple housekeeping analogy between the widespread use of penicillin and 'stains on your carpet. If you've got something that takes them out every time, you're going to use it, aren't you?'[58]

Hiddlestone predicted that the widespread use of broad-spectrum antibiotics for prophylaxis and treatment would accelerate the selection process for resistant organisms. Dr Henry Treffers, a Professor of Microbiology from Yale University of Medicine on tenure as a Fulbright Research Scholar, concurred in his lecture to the Otago Medical School in October 1954, Drug Resistance – To-day's Research and To-morrow's Medicine.[59] Published in the *New Zealand Medical Journal*, Treffers' paper gives some insight into contemporary attitudes to antibiotic prescribing. He identified a 'cycle of optimism' during which a new chemotherapeutic agent is introduced, accompanied by an 'initial enthusiasm' and denial of clinical resistance, followed by increasing frequency of resistance to therapy in infections due to certain species of micro-organisms, and the inevitable abandonment of the first drug in favour of a newly discovered one.[60]

Treffers made particular reference to the ability of *S.aureus* to develop resistance to new antibiotics; 'some micro-organisms can become resistant to not only one drug, but after successive selections by various agents may acquire an impressive list of additional resistances ... staphylococci resistant to five or more therapeutic agents have now been reported by a number of clinics'.[61] He concluded that medical confidence in and dependence on antibiotics was bolstered by the strong belief that the pharmaceutical

[56] Dr Fred McConnell, interviewed by Deborah Jowitt, 1 January 2003.
[57] Dr Fred McConnell, interviewed by Deborah Jowitt, 1 January 2003.
[58] Dr Jack Dilworth Matthews, interviewed by Deborah Jowitt, 10 January 2003.
[59] H.P. Treffers. 'Drug Resistance – To-day's Research and To-morrow's Medicine', *NZMJ*, 53, 1954, pp.561-568.
[60] ibid, p.561.
[61] ibid., p.561.

industry would continue to produce new chemotherapeutic agents but cautioned that, 'the mere existence of resistant organisms…is a sufficient basis for [the clinician's] concern'.[62]

Antimicrobial resistance emerged alongside other perplexing problems, including antibiotic-associated enterocolitis and severe anaphylaxis.[63] Dr J.A.K. Cuningham reported increasing numbers of fatal cases of antibiotic-related anaphylaxis in the USA that he related to the profligate use of antibiotics. 'In 1951 in the United States… the amount of penicillin used was sufficient to treat every member of the population for one attack of pneumonia. The amount of streptomycin used was sufficient for a year's treatment of a million cases of tuberculosis. In addition 250 tons of broad-spectrum antibiotics were ingested'.[64] Cuningham advised that the 'fact must be squarely faced that if an antibiotic is not required it should not be given', calling on his colleagues to remember the old dictum, 'All that is febrile is not infective'.[65] While New Zealanders were somewhat scornful of the 'therapeutic fervour' of American physicians, they were also prescribing large amounts of antibiotics. By 1955, 'widespread and indiscriminate use of antibiotics had given rise to conditions favourable for the emergence of new antibiotic resistant strains of staphylococcus aureus' throughout New Zealand.[66]

The Emergence of the 'H-Bug' in New Zealand

In a presentation to fellow pathologists at their conference in May 1956, Dr G.C.T. Burns commented on the sudden emergence of antibiotic resistant staphylococci in Christchurch in April 1955. '3 cases of staphylococcal pneumonitis with one death occurred in the chest surgery unit at Cashmere Sanitorium, resistant to Penicillin, Aureomycin & Terramycin, but sensitive to Chloromycetin and Erythromycin, practically the first occasion that we had isolated staphylococci with such a degree of resistance …the infecting organism being insensitive to Penicillin, Streptomycin, in common with other hospitals … all over the civilized world'. Burns linked the 'absolute

[62] ibid., p.564.
[63] J.A.K Cuningham, 'Penicillin Reactions', *NZMJ*, 54, 1955, pp.261-266.
[64] ibid., p.261.
[65] ibid., p.265.
[66] Auckland Hospital Board, Hospitals Committee, 12 December 1955, HI 131/175-26673, Staphylococcal infections 1955-57, Archives New Zealand, Wellington.

increase in the number of Staphylococcal infections in Christchurch' with the pandemic that was affecting other western nations at the time. New Zealand's geographical isolation and scattered population appears to have kept clinically significant cases of penicillin-resistance at bay until nearly ten years after they were reported to be causing serious concern in the UK and USA.[67]

Senior clinicians in other districts were also aware of escalating levels of antibiotic resistant staphylococcal infection within their institutions. Throughout 1955, patients nursed in hospitals in Auckland were increasingly affected by serious *Staphylococcus aureus* infections;

> Within recent months clinical evidence has been accumulating to indicate that a new mutant form of this organism with increased virulence has emerged and, not only has it given rise to more severe local and systemic infections, but many of the strains are resistant to the commonly used antibiotics…Greenlane has reported a 7% incidence of wound infection with this same organism following clean operations and at post-mortems this organism has been implicated as the cause of death on more than one occasion.…Middlemore is concerned with the reappearance of osteomyelitis, similar to that encountered prior to the introduction of antibiotics, as a consequence of infection with strains of the organism which are antibiotic resistant. Grafts in the plastic unit have broken down due to contamination by this organism.[68]

While sporadic morbidity and mortality due to resistant organisms was concerning, it was the tragic outbreak of antibiotic resistant infection at a private maternity hospital in Christchurch that finally brought the H-Bug to national attention. In early November 1955, a baby born at Calvary Maternity Hospital died from staphylococcal pneumonia. Later the same month thirteen babies born at the hospital developed staphylococcal pneumonia and all were transferred for treatment at Christchurch Hospital. Seven of these babies died. From the six cases coming to autopsy, 'staphylococcus aureus was isolated, sensitive to the antibiotics Chloromycetin and Erythromycin, but resistant to Penicillin, Streptomycin and the tetracyclines'.[69] On post-mortem examination all eight

[67] Barber and Rozwadowska-Dowzenko, 1948, pp.641-644.
[68] Auckland Hospital Board, Hospitals Committee, 12 December 1955, HI 131/175-26673, Staphylococcal infections 1955-57, Archives New Zealand, Wellington.
[69] G.C.T.Burns, Some Observations of Hospital Staphylococcal Infection, paper presented to Pathologist's Conference, Napier, May 1956, pp.1-5, HI 131/175 – 26673, Staphylococcal infections 1955-57, Archives New Zealand, Wellington.

cases showed similar pathological findings; 'staphylococcal pneumonia, atelectasis, lung abscess and empyema, in various combinations.'[70]

The deaths took place between 2 November and 26 November; on 22 November after the deaths of five babies the hospital authorities simultaneously informed the Health Department and closed the maternity unit to admissions.[71] Information collected by the Plunket Society revealed that for at least six months before the outbreak, there had been a high incidence of skin and upper respiratory infections after discharge home from Calvary. This showed 'a general rising tendency until the month of October, when 40 per cent of the babies born in the institution sooner or later developed such infections'.[72]

Inspection of the nursery, ward, laundry, milk preparation facilities and nursing techniques was undertaken by Dr A. Douglas, Medical Officer of Health for Christchurch, and Dr H.T. Knights, his deputy. In the absence of an obvious source of infection among staff or an attributable environmental cause they could only suggest that 'the fact that this was the most overcrowded maternity unit in the city may well have contributed to this outbreak', where 'a highly susceptible group of new-born infants [were nursed]…in an environment conducive to the spread of infection [and] some of these infants developed serious lung infections and died.' Douglas and Knights were clear that 'the whole tragic episode requires a thorough re-examination of all administrative, medical and nursing procedures'[73]

Health Department recommendations included: an amendment to the Health Act to ensure immediate notification of neonatal deaths of babies born in maternity hospitals and pemphigus infections developing in babies in or discharged from maternity institutions; the bacteriological investigation of serious outbreaks by a team from the National Health Institute, Wellington; and research into the eradication of penicillin-resistant organisms from maternity units. Specific areas for attention were better

[70] A. Douglas and H.T. Knights, 'Some Public Health Aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55,1956, pp.378-387; the maternity department remained closed until February 1956, Ann Trotter, *Mary Potter's Little Company of Mary*, Wellington, 2003, p.65.
[71] AJHR, 1956, H. 31, pp.123-125
[72] ibid., p.124.
[73] ibid., p.124.

methods of ventilation, dust control, laundering practices, records of neonatal health and the 'necessity or not of bathing the newborn'.[74] In 1957, Knights relinquished his post as Deputy Medical Officer of Health to take up a position with the National Health Institute. For the next eight years he worked on the problem of staphylococcal infection in maternity units, visiting public hospitals throughout the country to test for levels of bacterial contamination and to advise management on the deficiencies of their premises and practices.

The Impact on the Maternity Services

Although all specialties were affected, it was the maternity services that carried the main burden of the H-Bug epidemic. The outbreak at Calvary Hospital brought other maternity units under intense public scrutiny. The Auckland Hospital Board, responsible for National Women's Cornwall Hospital, had already taken action to determine the level of infection within this institution. At a meeting of the Hospitals Committee 12 December 1955, a report on the 'Epidemic of *Staphylococcus Aureus* Infection' was tabled. 'The Medical staff for some time has viewed with concern the increasing incidence of staphylococcal infections within the hospitals here, as well as in other parts of New Zealand…the matter was discussed at a Medical Advisory Committee meeting on 3rd October, 1955, when it was agreed that a representative committee be set up to collect and correlate information on the subject with a view to improving the local situation…making recommendations… to the Health Department … and possibly to the Medical Research Council'.[75]

Dr Harvey Carey, Professor of Obstetrics and Gynaecology and Medical Superintendent of Cornwall Hospital, was appointed to chair and convene the 'Special Committee'. The cost of infection control was high on the agenda. Among the first items for discussion was the financial burden of replacing ordinary toilet soap with an antibacterial soap containing hexachlorophene. The cost of the committee's recommendation that hexachlorophene soap be used in all wards and operating theatres was 'impossible to determine'. Wholesale swabbing of staff and patients 'who have been in the ward for

[74] ibid., p.124.
[75] The Auckland Hospital Board, Hospitals Committee, 12 December 1955, Archives New Zealand, HI 131/175-26673, Staphylococcal infections 1955-57, pp.262-265.

more than two weeks' and the treatment of positive persons with Polyfax cream or Bacitracin ointment also involved uncertain expenditure –'it is possible that the total cost could be considerable'.[76]

Scrutiny of practice and surveillance of infection was heightened. 'Masks should be changed after each operation in the same way as gloves and gowns…neither medical nor nursing staff should be allowed to wear masks around their necks at morning tea…', and any staff member suffering from boils was to be excluded from wards and theatres. All infected wounds were to be swabbed and details of antibiotic sensitivity recorded by each hospital laboratory. Monthly reports that classified the strains of staphylococci were to be exchanged among the laboratories and copied to the Medical Superintendents and Superintendent-in-Chief. [77]

The high staphylococcal colonisation and infection rates among the babies at National Women's Hospital were attributed to their frequent handling by nursing staff. Routine practices such as the care of neonates in communal nurseries, established to prevent streptococcal disease, were neither appropriate nor effective in preventing the spread of staphylococcal infection. Change was inevitable; 'the methods of spread of the two types of infection are quite different and this has accentuated the need for revision of many of the medical and nursing techniques'.[78] Tensions emerged in the maternity sector as not all staff appreciated the need to modify accepted methods – 'unfortunately some who are not conversant…are very conservative and opposed to the changes which are needed'.[79]

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[76] ibid., p.263.

[77] ibid., p.263. His research was designed to throw light on the uncertain nature of transmission of the organism from staff to patients, a central concern in the ongoing epidemic.

[78] During the mid-1950s, Ronald Hare carried out research designed to throw light on the uncertain nature of transmission of the organism from staff to patients, a central concern in the ongoing epidemic. Hare confirmed that a high rate of nasal colonization with penicillin-resistant *Staphylococcus aureus* among staff was an international phenomenon, and that carriage was frequently acquired soon after entering an institution. Ronald Hare, 'The Transmission of Staphylococcus Aureus', *British Medical Journal (BMJ)*, 13 October 1956, pp.840-844. Hare confirmed that a high rate of nasal colonization with penicillin-resistant *Staphylococcus aureus* among staff was an international phenomenon, and that carriage was frequently acquired soon after entering an institution.

[79] National Women's Hospital Medical Committee minutes 12 February, 1957, BAGC A638/38a, Archives New Zealand, Auckland.

Reactions in the Press

The Calvary deaths awakened public concerns about hospital-acquired staphylococcal infection. In response, the popular press actively challenged official reports, research and recommendations in a series of hostile newspaper articles claiming that there was government secrecy and a policy of telling the public 'no more than is good for them'.[80] Dr Stanley Kendrick, Superintendent-in-Chief of the Auckland Hospital Board (AHB), responded somewhat defensively in an interview with the 'Special Reporter' from the *Standard*, asserting that, 'there is no secrecy regarding this particular infection, but the daily papers have done incalculable damage by publishing sensational reports about the H-Bug'. [81]

The *Standard* reporter was not fobbed off easily and a small but detailed footnote to the article challenged the Superintendent's views; 'Of great significance is an official memorandum from the treasurer of the Auckland Hospital Board regarding district nursing costs for the year ended 31 March 1956. The memorandum noted the cost of dressings used by district nurses on the North Shore as £66, staphylococcal cases requiring frequent dressings were the major cause'. [82] Columnists voiced their suspicion of official accounts, with mothers-to-be advised to consider a 'home birth' or at the very least go to 'an exclusively maternity hospital' where there was less risk of cross-infection.[83]

The Official Response

In December 1956 the Director-General of Health, Dr John Cairney, stated in his annual report that the profligate use of antibiotics had contributed to the inevitable development of anti-microbial resistance. 'When antibiotics were first used the possibility of resistant organisms was seen and pleas were made to limit their use to susceptible organisms in major disorders. When their usefulness was fully established there followed an orgy of indiscriminate use. Antibiotic was rubbed on skin, incorporated in throat lozenges and even chewed in chewing gum. There is little doubt that such widespread use has

[80] *The Standard (TS)*, 26 September 1956.
[81] *TS*, 21 November 1956
[82] ibid.
[83] *TS*, Women's News and Views, 26 September 1956.

hastened the emergence of the present staphylococcus which is resistant to most antibiotics in current use'.[84] Cairney reminded readers of the *New Zealand Medical Journal* that 'pemphigus neonatorum' and 'staphylococcal skin lesion' had been added to the list of notifiable infectious diseases in early 1956.[85]

Other measures to confront a problem that 'has been difficult and prolonged' were not so clearly articulated. Cairney gave few details except to say that 'the use of the few remaining antibiotics effective against the resistant organism should be carefully controlled'.[86] Erythromycin, still effective against most *S.aureus* infections at this time, was removed from general use by the Health Department in 1956 to maintain an alternative option for treatment. Later, antibiotics from the same group such as carbomycin and spiromycin were also reserved, with the emphasis being on retaining antibiotics effective against resistant staphylococcal strains. Restrictions on prescribing to *prevent* the emergence of resistance do not appear to have been seriously contemplated until the 1980s.[87]

With the introduction of the Pharmaceutical Benefits Scheme in 1941, doctors became the 'gate-keepers' of prescription medicines.[88] They could decide which drugs to prescribe from the 'free list' for their patients, without regard for the price of the drug itself or any official restraints on the number of scripts per patient per annum. The fee-for-service scheme, adopted as a way out of the long dispute between the first Labour government and the New Zealand Branch of the British Medical Association over the provisions of the 1938 Social Security Act, 'entrenched those forms of professional autonomy and control that doctors had already secured'. General practitioners in particular, 'continued to enjoy the right to practice where they chose, as they chose, for the prices they chose, while being able to draw on an extensive state subsidy of their fees and the resources, especially pharmaceuticals, that they used in the practice of

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[84] Annual Report of the Director-General of Health, 1955-1956, *NZMJ*, 55, 1956, p.440.

[85] Pemphigus neonatorum was a recognised infection during the first six weeks of a baby's life. It resulted from staphylococcal infection and could vary from 'simple' bullous impetigo to more serious infection causing generalised sepsis. T.F. Corkill, *Lectures on Midwifery and Infant Care: A New Zealand Course*, Wellington, 1932. Pemphigus neonatorum is not listed as a condition in modern paediatric texts.

[86] Annual Report of the Director-General of Health, 1955-1956, *NZMJ*, 55, 1956, p.440.

[87] Dr Rod Ellis-Pegler, interviewed by Deborah Jowitt, 1 April 2003.

[88] Astrid Baker, 'Paying the Price: Pharmaceutical Benefits and Government Policy-Making, 1938-1986', in Linda Bryder and Derek A. Dow, eds, *New Countries and Old Medicine*, Auckland, 1995, pp.118-124.

medicine'[89]. In response, patients expected the latest drugs available, so 'it was a help to the doctor to be able to prescribe what he believed best for the patient, without considering whether the patient could afford it or not'.[90]

Health Department and hospital strategies focused instead on barrier nursing techniques, the promotion of rooming-in for mother and baby in maternity units to reduce staff contact with vulnerable newborns, screening of nursing and midwifery staff, and improved methods of ventilation and cleaning. In September 1957, Cairney called a conference 'widely representative of bodies interested in the maternity field, to review technical procedures in maternity hospitals. The ability to translate with speed expert advice into practical operation on a national basis is a great asset in the preventive field in this country. The facility with which the Department of Health now avails itself of authoritative outside opinion in all spheres of medical work does not go unremarked and it has paid handsome dividends'.[91] Dr Knights of the Health Research Institute travelled the length and breadth of the country with his Casella Dust Slit bacterial air sampler, looking for the elusive cause of the persistent cross-infections. He was welcomed by staff in maternity units in every centre, where he offered well-received advice and encouragement in the 'hospital war against staph'. [92]

Staffing Shortages

Shortage of nursing staff was exacerbated by the high incidence of infection, especially among nursing trainees. The 1957 Health Department report in the *Appendices to the Journals of the House of Representatives* (*AJHR*) made it quite clear to senior administrators that 'research must be undertaken by all hospitals to find the underlying causes … for the considerable increase in the incidence of boils and septic fingers … in all training schools (of nursing)… the loss of duty time by those contracting these conditions means a reduction in the number available for nursing care and is a serious

[89] Geoff Fougere, 'Struggling for control: the state and the medical profession in New Zealand', in Frederic W. Hafferty and John B. McKinlay, eds, *The Changing Medical Profession: An International Perspective*, New York and Oxford, 1993, p.117.
[90] J.B.Lovell-Smith, *The New Zealand Doctor and the Welfare State*, Auckland, 1966, p.184.
[91] Editorial, 'Maternity Services in New Zealand', *NZMJ*, 56, 1957, pp.491-494.
[92] pHisoHex 'Advertiser's Announcements', *NZMJ*, 60, 1961, p.39; Dr Knights is described as ' an absolute enthusiast – he'd swab your hands before and after hand washing and use his little machine to trace the soiled linen from the cot to the (dirty) linen bag'. Ann Nightingale, interviewed by Deborah Jowitt, February 21 2003.

matter when viewed in conjunction with general shortage of staff'.[93] Sue Paviour, a laboratory technician who managed the National Women's laboratory during the mid-1950s, recalled testing maternity staff repeatedly for staphylococcal carriage; ' it was really quite tragic for staff because they just spent half their lives being positive, staying off work for x number of weeks, getting clear, coming back and getting re-colonized'.[94]

The 1957 Asian influenza epidemic stressed hospital services further with multiple admissions of patients who had contracted secondary resistant staphylococcal respiratory infections. Sue Paviour, 'vividly remember(ed) doing evening shifts in the Auckland Hospital laboratory getting 60 or 70 bloods (specimens) a night from patients who got really nasty staph infections following the flu… you didn't just have the babies with morbidity and mortality, there were adults post-influenza getting staph pneumonias also'.[95]

Bed and staffing shortages were exacerbated by the confusion arising from conflicting advice given to public hospitals by different divisions within the Health Department. This is well illustrated by correspondence from Dr L.S. Davis, Director, Division of Public Hygiene, to Dr C.A. Taylor, Director, Division of Hospitals in July 1957;

> I am very concerned to learn from you that you have given instructions that cases of Asian influenza are not to be admitted to hospitals. Many statements have been given by the Minister, the Director-General, and myself, all indicating the method of prevention of the introduction of influenza into New Zealand will be by the isolation of any cases arriving in hospital … the first cases arriving in any district should be isolated in hospital and secondary cases until it is obvious that the disease is out of control, under which circumstances I envisage that cases will then be treated in their own homes. … It has been pointed out to me by Dr Manning and Dr Knights that probably the greatest danger we face in connection with Asian influenza is the complication that may arise from resistant staphylococcal infections … It has been suggested to me that it might be wise to warn hospitals of this danger and to point out to them that cases of influenza should not be isolated in any part of the hospital where there is a danger of resistant staphylococcal infection.[96]

[93] AJHR, 1957, H. 31, p.60.
[94] Sue Paviour, interviewed by Deborah Jowitt, 21 November 2002.
[95] Sue Paviour, interviewed by Deborah Jowitt, 21 November 2002.
[96] Davis to Taylor, 22 July 1957, H1 131/175, Staphylococcal Infections 1957-61, Archives New Zealand, Wellington.

'Rooming-in'

The practicalities of finding a way through the on-going crisis were delegated to senior hospital management who struggled to maintain adequate staffing levels, to protect patients from cross-infection, and to implement new methods of neonatal care in outdated maternity wards built for a previous era. The concept of 'rooming-in' seemed tailor made for the problems facing the maternity sector. Initially introduced in the USA in the post-war period, the idea was promoted by supporters of 'natural motherhood' in New Zealand to encourage closer bonds between mother and baby within the constraints of the hospital setting.[97]

Figure 1: Babies on the baby trolley

Babies on the baby trolley that transported them between the nursery and the ward. This picture was posed as the babies were usually placed across the bed with heads and feet alternating. Otago Hospital Board Photographic Department, Adelheid Wassner, A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972, Dunedin, 1999.

This radical change in institutional baby care also appealed to doctors and medical administrators as a way of reducing staphylococcal cross-infection between nurse and neonates while providing constant supervision and care.[98] Instead of large communal nurseries where the staff provided all necessary cares, bringing the babies out to the

[97] Grantly Dick Read, *Introduction to Motherhood*, London, 1951, p.1; *Parents Centre Bulletin*, 13, 1959, p.5.

[98] Thaddeus L. Montgomery, Robert E. Steward and Pauline Shenk, 'Observations of the Rooming-In Program of Baby with Mother in Ward and Private Service', *American Journal of Obstetrics and Gynaecology*, 57,1, 1949, pp.176-186.

mothers in 'three shelf trolleys with babies slotted into them' to feed at three or four hourly intervals, the baby was placed in a cot at the mother's bedside where she would be taught and supported in the art of mother craft.[99] The theoretical benefits were seen as both bacteriological and psychological; a simultaneous reduction in the level of contact between 'infectious' nurses and babies and increased opportunities for women to learn how to care for an infant among trained nurses before being discharged home.

In early 1957, the plans for the postnatal wards in the proposed new National Women's Hospital, Auckland, were amended to incorporate the 'rooming-in' principle on the basis of international evidence that the main route of spread of infection was from nurse to baby to mother. The high rate of breast abscesses in nursing mothers, usually after discharge from hospital, was another manifestation of the epidemic. Figures collated by the Health Department at the request of the Auckland Women's Branch of the Labour Party, showed that in 1955, 338 women with a breast abscess associated with lactation were treated in public hospitals around the country. By 1956 this number had risen to 633, peaking in 1957 at 708 cases.[100]

Most maternity units entered into the spirit of change reluctantly; Knights recorded a variable level of enthusiasm in his detailed reports and others commented on the 'considerable passive resistance on the part of trained nursing staff in some hospitals to the introduction of a rooming-in programme'.[101] Even though subsequent research, at National Women's Cornwall Hospital in 1959, showed that rooming-in had little effect on the rates of staphylococcal colonization of babies, the model was already well established as a sound basis for infant care.[102] A visible transformation of the maternity services was initiated during this period. Rooming-in is one of the few measures still evident today, but a raft of less obvious changes was prompted by the H-Bug epidemic.

[99] Sue Paviour, interviewed by Deborah Jowitt, 21 November 2002.
[100] Derek Taylor to Evelyn Johnston, 31 March 1960, HI 56/7/14:26929, Archives New Zealand, Wellington. These figures do not account for cases treated in the home, in doctor's surgeries or in private hospitals.
[101] Garth Holdaway, 'A Year's Experience of Rooming-in in a Maternity Home', *NZMJ*, 58, 1959, pp.163-169.
[102] H.M.I. Liley, Umbilical and Nasal Staphylococci in Babies and their Relation to Rooming-In, unpublished, September 1959, BAGC A638/38b, Archives New Zealand, Auckland.

The high incidence of neonatal sepsis and breast abscess noted during 1956 and 1957 was already on the decline by the time that changes got well underway, but by then public concern and administrative disquiet had united in a common goal – safe hospital environments for birthing mothers and their babies.[103] The focus was on the inadequacies of small maternity homes and the need for centralized scientific obstetric care, epitomized by the opening of the new National Women's Hospital on February 14, 1964.[104]

The End of the Epidemic

There were occasional outbreaks of infection in maternity hospitals in 1963. Most notably in Kaponga, where three babies died within three days in the six-bed local maternity hospital from phage type 80/81 staphylococcal pneumonia and in New Plymouth in 1964. These incidents were, however, isolated cases representing the last instances of an eight-year long nation-wide epidemic.[105] The introduction in 1959 of new, more potent penicillin compounds, in particular sodium 6 penillanate mononhydrate (Methicillin), and the routine use of hexachlorophene emulsion to bathe newborns in the early 1960s, both contributed to the gradual disappearance of the 80/81 type staphylococcal infection from New Zealand hospitals.[106]

In 1964, Dennis Bonham, Professor of Obstetrics and Gynaecology at National Women's Hospital, lent his own interpretation to the epidemiology of the H-Bug epidemic: 'In the early 1950s we had a troublesome stand by the staphylococcus brought into the hospital by the obstetric patients themselves and spread by the staff. The better understanding of the life story of the staphylococcus and the addition of hand washing, to droplet control by mask …has, with improved techniques of antibiotic therapy, controlled the spread of staphylococcal sepsis'.[107]

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[103] P.B. Maling, Trends in Staphylococcal Infection in Christchurch, *NZMJ*, 63, 1964, pp.596-597.
[104] 'The New National Women's Hospital, Auckland', *NZMJ*, 63, 1964, pp.241-242.
[105] H.T. Knights, 'Neonatal Staphylococcal Sepsis in a Small Maternity Unit Involving the Death of Three Babies', *NZMJ*, 63, 1964, pp.13-17.
[106] K.C. Kathsarma, 'A Study of Certain *in vitro* Properties of Staphylococci', *NZMJ*, 62, 1963, pp.97-100.
[107] Dennis G. Bonham, The Evolution of Obstetrics and Gynaecology, *NZMJ*, 63, 1964, pp.709-714.

The past advice by cautious practitioners to control medical prescribing was forgotten; the troubles of the past decade conveniently ascribed to the ‘patients themselves’. Treffers’ ‘cycle of optimism’ began again, as doctors prescribed the latest antibiotics with renewed assurance that pharmaceuticals would combat disease, confident that this time they had found the final solution to infectious disease.

CHAPTER THREE

Not as lethal as the H-Bomb, but the H-Bug kills too[108]

> Among the more chastening chapters in the annals of microbiological research is the story of our apparently dismal failure to control the depredations of the staphylococcus... three quarters of a century after Koch first noted their presence in pus, the staphylococci…'keep their ancient places', no less ubiquitous but still elusive, and shockingly endowed with apparently new, malign propensities.[109]

Introduction

In New Zealand, as in other Western developed nations, hospital treatment and antibiotic therapy were established components of patient management by the mid-1950s. The hospital was seen by the medical profession and most Pakeha New Zealanders at least, as the most salient location to deliver the benefits of centralized medical technology and professional expertise.[110] The staphylococcal pandemic of the 1950s initiated a strong response from the medical community in New Zealand and overseas because it threatened the perception of the hospital as a safe venue for care.

The most vulnerable patients were the ones most affected by antibiotic-resistant staphylococcal infections. The epidemic affected doctors differently depending on where they practised; general practitioners shouldered the increased burden of boils and carbuncles in the community with apparent forbearance while hospital clinicians were forced to reassess medical and nursing practice, and to place renewed emphasis on aseptic technique and barrier precautions for infectious patients.

The nineteen fifties and sixties has been described as a 'golden age' for medicine.[111] The remarkable success of the biomedical paradigm had created great prestige for medical researchers, public adulation for the medical profession, and heightened expectations of further achievement. New Zealand doctors, like their counterparts in

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[108] Editorial, *Auckland Star (AS)*, 29 November 1955.

[109] Dolman, 1956, pp.189-200.

[110] In the mid-1930s 78% of Pakeha women were having their babies in hospital compared with only 17% of Maori women. The 1940s and 50s saw a gradual change in Maori attitudes and expectations so that by the mid-1960s over 90% of all New Zealand women gave birth in hospitals. Helen Mountain Harte, 'Maori Childbirth in the 1930s', in Linda Bryder and Derek A. Dow, eds, *New Countries and Old Medicine*, Auckland, 1995, pp.361-365.

[111] Allan M. Brandt and Martha Gardner, 'The Golden Age of Medicine', in Roger Cooter, and John Pickstone, eds, *Medicine in the 20th Century*, Amsterdam, 2000, pp.21-37.

other western countries, enjoyed high social status and considerable autonomy in their practice. Medical education had become increasingly standardized, with students rotating through both laboratories and wards in university based programs.[112] New Zealanders kept current with clinical developments and international medical research through regular deliveries of the *British Medical Journal* and *Lancet*, so that even isolated rural practitioners were 'up to date with the latest advances'.[113] Doctors seeking post-graduate qualifications in the UK before returning to practice in New Zealand, helped sustain on-going educational and professional links that influenced local practice and training.

First Civilian Supplies of Penicillin

In early 1944, as a result of the small supply of penicillin (at or near its expiry date) made available when American forces vacated their military hospital in Cornwall Park, New Zealand doctors may have been among the first to use antibiotics on a civilian population.[114] Penicillin became available for non-military use under strict regulations in New Zealand in mid-1944. A circular from the Director-General of Health, Dr Michael Watt, on 31 July 1944, to medical superintendents of all public hospitals and pathologists in the four main centres, stated that 'some 60 million units of American Penicillin which cost £6 per ampoule of 100,000 units, became available to New Zealand from 13th March onward and was distributed on a population basis…no request was refused for its use in life-saving circumstances…this would appear to indicate that 5 million units per week is sufficient for those "life-saving" conditions'.[115]

American supplies were made available in small quantities for 'civilian use throughout the non-Axis world', on the proviso 'that some central agency must take undertake to control distribution and use of Penicillin' for approved conditions only.[116] These included all serious staphylococcal infections, all cases of clostridia infections, all

[112] Brandt & Gardner, 2000, p. 29. 'While considerable differences in medical education persisted across western nations, more impressive still was the 'universalization' of medical knowledge and practices'.
[113] Personal communication with Dr Anne McKinnon, 16 August 2003. The *British Medical Journal* and *Lancet* were read widely by medical practitioners in New Zealand in the 1950s.
[114] Sullivan to Nordmeyer, Minister of Health, 22 June 1944, H1 15/183, Archives New Zealand, Wellington.
[115] Circular Letter to Medical Superintendents of all Public Hospitals from Dr M.H. Watt, Director-General of Health, *Penicillin Supply Position*, 31 July 1944, HI 15/183 Archives New Zealand, Wellington.
[116] Draft cable received by the Ministry of Health from the Washington Penicillin Board, 26 July 1944, *Medical supplies – Penicillin for Civilian Use*, 15/183, Archives New Zealand, Wellington.

serious streptococcal infections with bacteraemia, all pneumococcal infections, and all gonococcal infections complicated by secondary infection or sulphonamide resistance.

The education of doctors in the use of antibiotics was a primary concern to the American distributors. The Health Department was advised that the severe restrictions would mean, 'at this stage, [they would only be sent sufficient] for clinical trials and education of medical personnel. We believe it is time for you to consider civilian distribution at least for medical education purposes since the Washington Penicillin Board are convinced that appreciably larger quantities may be available for civilian use in the near future [depending on] the course of the war and the magnitude of military demands'.[117]

In October 1944, the requirement for two doctors to sign a penicillin order for civilian use was lifted as supplies began to arrive regularly from the Commonwealth Laboratories in Victoria, Australia. The indications for penicillin therapy were broadened to include 'burns, preparation for skin graft, sycosis barbae and other skin conditions, severe pneumonia as an alternative to Sulphonamide treatment which is unpleasant and occasionally dangerous, also numerous other conditions which will readily occur to you'.[118]

There were perceived benefits of penicillin therapy both 'to patients and in a decreased stay in Hospital'.[119] This was an important issue in New Zealand as 'while the rate of hospital expansion slowed in the post-war years, costs rose dramatically through the 1950s...Adjusted for population growth, occupied bed rates actually decreased, from 6.6 per 1,000 in 1945-6 to 5.8 per 1,000 in 1949-50. The annual average cost per bed, however, had leapt from less than £415 to just over £674 in the same period'.[120] The impetus for practitioners to treat patients with penicillin on clinical grounds was equally strong - an extensive series of clinical trials reported by Sir Howard Florey and other reputable clinicians demonstrated outstanding results in the treatment of medical and

[117] ibid.
[118] Circular Letter to Medical Superintendents of all Public Hospitals from Dr M.H. Watt, Director-General of Health, 31 July 1944, HI 15/183, Archives New Zealand, Wellington.
[119] ibid.
[120] Derek A. Dow, *Safeguarding the Public Health: A History of the New Zealand Health Department*, Wellington, 1996, p.175.

Figure 1.2. *When penicillin was first introduced it was not a prescription drug. It was not until the mid-1950s that prescriptions were required. Many companies advertised penicillin to the general public as soon as enough became available. This advertisement appeared in the August 14, 1944, issue of* Life *magazine.*

Figure 2: Thanks to Penicillin…He Will Come Home
Stuart Levy, The Antibiotic Paradox, New York, 2001.

In New Zealand, unlike the USA, penicillin could only be obtained on a doctor's prescription. Civilian supplies were available in small quantities from mid-1944.

surgical cases, plastics, ophthalmology and infantile gastro-enteritis.[121] Florey's enthusiasm is still palpable fifty years on; 'the most striking addition to knowledge is…that penicillin is apparently effective in treating syphilis. Another excellent development… is that penicillin can now be given as a preventive instead of as a last resort. In battle casualties especially, the effort is being made to prevent serious sepsis from developing by giving penicillin at a very early stage'.[122]

In November 1944, Florey visited Auckland, Wellington, Christchurch, Dunedin and Nelson as a Nuffield Travelling Professor to 'discuss with medical men the clinical uses of penicillin'.[123] The issue of uncertainty as regards therapeutic doses had already been raised earlier in the year by the Australian Department of Health, 'as no definite standard has yet been evolved in any country for the dosage in any set of conditions'.[124] In the presence of extreme shortage and close regulation of the drug, the likelihood of over prescribing or indiscriminate use of antibiotics must, however, have seemed remote. Penicillin shortages continued for several years causing concern over hospital stocks. By 1947 dentists were demanding supplies from the Division of Dental Hygiene, followed a year later by farmers lobbying the Minister of Health for veterinary provisions as the remarkable potential of penicillin for treating and preventing human and animal disease became increasingly apparent.[125]

First Signs of Anti-microbial Resistance

International medical publications began describing the association between antibiotic prescribing and anti-microbial resistance as early as the mid-1940s. Howard Florey and his colleagues had clearly flagged the potential for staphylococcal resistance to antibiotics as early as 1941; 'there is reason to believe that not every infection, even by such an organism as the staphylococcus, may be controllable. It has been found that it is possible to habituate organisms to grow in penicillin'. [126] American researcher Charles Rammelkamp confirmed these findings in 1942 and in 1943, Scott Thomson reported

[121] Howard Florey, 'Penicillin: A Survey', *BMJ*, 5 August 1944, pp.169-180.
[122] ìbid., p.171.
[123] Memorandum for the Minister of External Affairs from the High Commissioner for New Zealand in Australia, Penicillin, 20 September 1944, 15/183, Archives New Zealand, Wellington.
[124] Memorandum from the Australian Department of Health, Canberra, 18 May 1944, 15/183, Archives New Zealand, Wellington.
[125] 'Meeting of AHB re shortage of penicillin', *New Zealand Herald (NZH)*, 22 September 1947; New Zealand Dental Association, South Auckland Branch to Division of Dental Hygiene, Wellington, 26 November 1947; A.O'Shea, General Secretary of the Federated Farmers of New Zealand to the Minister of Health, Mabel Howard, 20 February 1948.
[126] Howard Florey and Ernst Chain, 'Penicillin', *Endeavour*, January 1944, p.12.

that 4 per cent of staphylococcal infection in war wounds was attributable to strains of *S.aureus* naturally resistant to penicillin.[127]

The incidence of staphylococci resistant to penicillin increased in North American and English hospitals in the mid-1940s.[128] In 1948, Mary Barber and Mary Rozwadowska-Dowzenko, bacteriologists at the Postgraduate Medical School of London, traced the rapid rise in the incidence of penicillin-resistant strains of '*Staph. pyogenes*' from 1945 ; 'until 1944 few such strains were encountered…Since then, however, the incidence has been increasing rapidly, particularly in hospitals'. [129] Barber and Rozwadowska-Dowzenko postulated that 'a process of selection' was the major contributing factor for the increasing incidence of penicillin-resistant organisms in hospitals; '…it is possible that the number of strains of staphylococci in infections in a particular hospital at any one time might be quite small, and once a penicillin-resistant strain appears it will survive while penicillin-resistant strains are rapidly eliminated by penicillin. Thus by a simple process of selection penicillin-resistant staphylococci may come to outnumber penicillin-sensitive strains'.[130] They did not believe that the community at large was likely to be affected in the same way, pointing to research confirming the high carriage rate of staphylococci among hospital staff, and their own experience of surgeons and nurses colonized with penicillin-resistant staphylococci of a phage type identical to the infections of surgical patients in their hospital. They had no doubt that 'the rapid increase of penicillin-resistant strains is primarily caused by the widespread use of penicillin', but that this was associated with susceptible patients in the hospital setting.

In New Zealand there was no comparable concern while local circumstances did not warrant alarm. In 1953, however, the reports of microbial resistance overseas were discussed in the *New Zealand Medical Journal* by Dr H. Hiddlestone. 'At Hammersmith Hospital, London…over a short period of time the proportions of resistant forms (of staphylococci) rose from 5 per cent to 70 percent. Similarly in the Royal Infirmary Edinburgh, over 90 per cent of the staphylococci are resistant'.[131]

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[127] ibid., p.12.

[128] Robert I. Wise, Elizabeth A. Ossman, and Dwight R. Littlefield, 'Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance', *Reviews of Infectious Diseases*, 2, 6, 1989, pp.1005-1019.

[129] Mary Barber and Mary Rozwadowska-Dowzenko, 'Infection by Penicillin-Resistant Staphylococci', *Lancet*, 23 October, 1948, pp.641-644.

[130] ibid., p.643.

[131] H.J.H. Hiddlestone, 'The Action of Antibiotics: Intelligent Antimicrobial Therapy', *NZMJ*, 52, 1953, pp.207-209.

Dr Henry Treffers, Professor of Microbiology, Yale School of Medicine, signaled the possibility that drug resistance might soon have some direct relevance to everyday medical practice in his paper, 'Drug Resistance – To-day's Research and Tomorrow's Medicine'.[132] 'Staphylococci resistant to five or more chemotherapeutic agents have now been reported by a number of clinics…[however] many species have continued to remain susceptible up to the present under widespread chemotherapy and [all antibiotics] are still highly regarded for particular applications'.[133] New Zealand practitioners did not appear to be aware that their antibiotic prescribing might be contributing to an emerging problem. The medical enthusiasm for antibiotic therapy was fuelled by the expectations of their patients who were frequently exposed to reports in the popular press of yet another infectious disease proving 'highly vulnerable to …the new antibiotic "wonder drugs"'.[134]

The Use and Abuse of Antibiotics

With the introduction of the Pharmaceutical Benefits Scheme in 1941, doctors had became the 'gate-keepers' of prescription medicines.[135] They could decide which drugs to prescribe from the 'free list' for their patients, without regard for the price of the drug itself or any official restraints on the number of scripts per patient per annum. As a consequence of the ballooning pharmaceutical costs, when new antibiotics such as chloretetracycline, chloramphenicol and oxytetracycline (under the brand names Aureomycin, Chloromycetin and Terramycin respectively) became available in New Zealand in 1953, the Department of Health restricted their use to Hospital Boards in an attempt to contain costs. Following repeated requests from medical practitioners, the Department made these drugs available on the Drug Tariff in 1955. Predictably, prescribing rose with a dramatic increase in the costs of pharmaceutical benefits.[136]

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[132] Henry P. Treffers, 'Drug Resistance – To-day's Research and Tomorrow's Medicine', *NZMJ*, 53, 1954, pp.561-568. Treffers was a Fulbright Research Scholar at the University of Otago in 1954.
[133] ibid., p.561.
[134] Here's the News about Medicine, *New Zealand Woman's Weekly*, 2 September 1954.
[135] Astrid Baker, 'Paying the Price: Pharmaceutical Benefits and Government Policy-Making, 1938-1986', in Linda Bryder and Derek A. Dow, eds, *New Countries and Old Medicine*, Auckland, 1995, pp.118-124.
[136] Astrid Baker, 'Private Interests and Public Money: The State Provision of Medicines in New Zealand 1938-1986', PhD thesis, Massey University, 1996, p.96 and Table, p.101.

During 1955, it gradually became more obvious to the New Zealand medical community that serious complications were occurring locally as a result of a complex interaction between broad-spectrum antibiotics and resistant staphylococci. In the *NZMJ*, Drs J.A.K. Cunningham and D.W. Beaven from Christchurch Hospital reported on three cases of fatal enterocolitis, including those of a thirty-nine year old admitted for brucellosis and a three year old girl admitted following treatment for complications of measles.[137] They remonstrated with their colleagues, cautioning that unless one or two antibiotics were reserved for severe cases, 'indiscriminate use' would lead to increasing resistance to all available therapy. 'The promiscuous use of antibiotics has led to the emergence of strains of staphylococci resistant to most antibiotics…The use of penicillin and streptomycin in combination or one of the broad-spectrum antibiotics alone results in a profound disturbance of the bowel flora with a marked decrease in the bacterial population. If the patient harbours a resistant staphylococci…this organism will multiply and fill the "bacteriological vacuum"…[this]… gives rise to vomiting, diarrhoea and collapse'.[138]

Cuningham and Beaven painted a bleak picture of the prescribing patterns that had evolved over the previous ten years of therapeutic advance and made a strong plea for 'the reservation of erythromycin for resistant infections':

> Unless certain facts are faced, the incidence of antibiotic enterocolitis will increase. The broad spectrum antibiotics can be administered orally and have a wide range of activity. These considerations, plus the erroneously held belief that they are effective against viruses, has led to their indiscriminate use, but the least of these abuses is their irresponsible employment in upper respiratory tract infections and other minor febrile conditions. Both in this country and overseas, the increasing dangers of this practice have now become manifest after several years grace…There is ample proof that the development of resistant strains is solely dependent on the widespread use of and abuse of antibiotics.[139]

Cunningham and Beaven were convinced that even if other excesses of prescribing could not be controlled, the use of erythromycin should be restricted. 'The ready availability of erythromycin and its apparent freedom from side effects are popularizing this antibiotic. Unfortunately, staphylococci all too readily develop resistance to

[137] J.A.K. Cunningham and D.W. Beaven, 'Fatal Enterocolitis due to Antibiotics', *NZMJ*, 54, 1955, pp. 644-647.
[138] ibid., p. 645.
[139] ibid., p. 646.

erythromycin. For this reason it should not be used as a primary treatment but might well be reserved for cases of…staphylococcal infections due to resistant strains. If it is employed indiscriminately, we may lose one of our most effective weapons in the treatment of resistant staphylococcal infections'.[140] Within the year the Health Department had taken the step of restricting the use of erythromycin to consultant-approved cases of resistant infection. A recognised increase in the incidence of staphylococcal infections in hospitals and the community prompted the need for action.

Hospital clinicians throughout the country became aware of a change in the epidemiology of staphylococcal infections during the first few months of 1955. In Auckland 'the Medical Staff for some time has viewed with concern the increasing incidence of staphylococcal infections within the hospitals here, as well as in other parts of New Zealand, and is aware that these infections are becoming resistant to the common antibiotic drugs'.[141] Senior staff of the Auckland Hospital Board were so concerned that on 3rd October they nominated a Staphylococcal Committee consisting of Professor Harvey Carey, Medical Superintendent of National Women's Hospital, as Chairman and Convenor, and six other senior clinicians.[142]

This 'Special Committee' presented their report at a meeting of the Medical Advisory Committee on 14 November, 1955. Increasing morbidity and mortality in the Board's hospitals had clearly initiated action:

> The death from staphylococcal septicaemia of a baby from one of the outlying maternity units precipitated a temporary closure of this unit…Green Lane has reported an increased incidence of mammary gland infection in lactating women from the same cause. Bedsores due to this virulent strain have occurred and from such foci systemic infection has developed with death from bronchopneumonia. A number of nurses, both at Green Lane and Auckland have been infected with this organism and their continued employment in the hospitals due to the shortage of staff, has created a further reservoir of infection. The decease of some of the elderly patients in medical wards in Auckland Hospital has been accelerated by this same organism.[143]

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[140] ibid., p.646.
[141] Report of the Superintendent-in-Chief (16/11/55), Hospitals Committee, Auckland Hospital Board, HI 131/175 – 26673, Archives New Zealand, Wellington, pp.260-265.
[142] The other members of the committee were Dr E.G. Sayers, Dr Selwyn Hills, Dr S.E. Williams, Mr. A.F. Hunter, Mr. F.J. Hall, Mr. W. M. Manchester.
[143] ibid., p.262.

The Committee's recommendations were broad-based. They were intended to improve aseptic and isolation techniques, to detect and treat carriers of penicillin-resistant strains of *Staphylococcus aureus*, to collate and disseminate information about phage patterns emerging from laboratory specimens and to advise medical and nursing staff of 'the importance of infection by this new virulent strain of *Staphylococcus aureus'*:

> Their attention should be drawn to the risks of indiscriminate use of antibiotics, particularly in minor infections with a good natural prognosis. Similar information should be disseminated, with the help of the British Medical Association, to general practitioners and a statement suitable for publication in the lay press should be prepared drawing the attention of the public to this danger and the importance of avoiding the use of antibiotics, except for serious infections. This will relieve pressure by the public on general practitioners for the use of antibiotics for minor infections, or under inappropriate circumstances in inadequate dosages.[144]

The Chief Pharmacist was called upon to present a separate report on the cost of 2% hexachlorophene soap and Bacitracin ointment for the treatment of carriers. Proposals to introduce Hibitane cream (1% chlorhexidine in a water miscible base) as an additional measure were scotched; 'if the claims made in the literature and also by the makers of hexachlorophene soap are anywhere near the truth, it is felt that the use of a chlorhexidine cream in addition is not warranted'.[145] Patient's blankets had also been singled out for special treatment, as they 'are known to be an important source of hospital cross-infection…if a simple workable method of treating blankets is available the Committee considered it should be utilised'.[146]

A survey of 'carrier rates for staphylococci resistant to penicillin' among hospital staff and patients at National Women's Hospital on 1 November 1955, completed the committee's report. Doctors had the highest carriage rate (50%), nurses the lowest (27%), household staff, 32%, and laboratory staff, 33%.[147] The patients with the highest

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[144] ibid., p.263.
[145] ibid., p.261.
[146] ibid., p.264.
[147] Full-time medical staff was employed at the hospital in very low numbers compared with nursing staff. The National Women's Hospital monthly report for July 1954 showed 9 full-time medical staff and 184 nursing staff including 59 maternity trainees. A survey of personnel and patients at the Massachusetts Memorial Hospital in 1953 showed that of the *S.aureus* carriers, 78.5% were colonized with a penicillin-resistant strain. 'The highest incidence of heavy growth occurred in personnel having most intimate contact with patients – namely, nurses, aides and attendants. Doctors were next in frequency …anaesthetists yielded uniformly heavy growth'. Chester W. Howe, 'Postoperative Wound Infections Due to *Staphylococcus Aureus', New England Journal of Medicine,* 251, 11, pp.411-417.

carrier rate were the infants four days and older (40%). Adult female patients had a 14% carrier rate while their 0-3 day old infants had the lowest rate (11%). The high carrier rate of the older babies was significant. British research had already demonstrated that babies were colonized with penicillin-resistant *S.aureus* through close contact with hospital staff and that they in turn infected their mothers, most often after discharge home.[148]

The swabbing of staff and patients in the wards and theatres, the introduction of hexachlorophene soap for staff, the isolation of infected patients and the exclusion from clinical areas of medical, nursing and domestic staff suffering from boils, posed logistical and financial challenges to the Board. Staff shortages, especially in nursing and midwifery, were already acute.[149] The committee's advice was accepted even though 'it is apparent from perusal of these reports that adoption of these recommendations will involve both additional work and additional expense. However if these measures should be the means of preventing even a proportion of this type of infection and of thus saving life and preventing suffering, they are well justified'.[150]

The Calvary Outbreak

The actions of the Auckland Hospital Board proved very timely. Just ten days later, on November 22, 1955, the Christchurch District Office of the Health Department was notified by the matron of a large private maternity hospital, the Calvary, that 'five babies born in the maternity unit …had died of a ([staphylococcal] infection affecting their respiratory tract'.[151] By the time the investigation got underway 'three more babies had died, bringing the death roll to a total of eight'. The H-Bug hit the national news and pressure was suddenly placed on senior medical staff to assure a nervous public, already worried by the untimely reappearance of poliomyelitis in August 1955, that the outbreak was controlled.[152]

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[148] Mary Barber and John Burston, 'Antibiotic-Resistant Staphylococcal Infection', *Lancet*, September 1955, p.579.
[149] Nurses should only do nursing: Real answer to shortage, *NZH*, 1 September 1955.
[150] Report of the Superintendent-in-Chief (16/11/55), Hospitals Committee, Auckland Hospital Board, HI 131/175 – 26673, Archives New Zealand, Wellington, pp.260-265.
[151] A. Douglas and H.T. Knights, 'Some Public Health Aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55, 1956, pp. 378-387.
[152] George. C. Kohn, *The Wordsworth Encyclopaedia of Plague and Pestilence*, New York, 1995, p.224.

Interviews for the lay press were conducted by hospital administrators, anxious to put public fears to rest as polio cases continued to be notified.[153] Dr Kendrick (Superintendent-in-Chief of Auckland Hospital Board) had no compunction about emphasizing the preparations already in place at National Women's Hospital in an interview entitled 'Care Taken Here Against H-Bug'.[154] The *Auckland Star* featured a photograph of Mr D. Williams, the principal bacteriologist at Auckland Hospital, eyeballing bacteria on a culture plate – 'Taking a Peep at the H-Bug'.[155] The editorial in the *Auckland Star* on November 29, 'The H-Bug kills, too', stated that 'resistant strains spread easily particularly in hospitals, where they have become so numerous that doctors call them "hospital" or "H-Bugs". The H-Bug is not as lethal as the H-Bomb. But it can kill too'.[156]

One year later, Kendrick gave an 'exclusive interview' to *The Standard* in which he expressed his frustration at the alarmist tendencies of the press. 'Dr Kendrick said there was no secrecy regarding this particular infection, but that the daily papers had done incalculable harm by publishing sensational reports about the H-Bug. There was no such thing as an H-Bug…It was the invention of an Auckland reporter and such reports scared people to such an extent that they did not want to go into hospital'. [157]

The Health Department immediately closed Calvary Hospital to further admissions, pending investigation of the outbreak. The Medical Officer of Health and a Nurse Inspector visited the hospital to enquire into the health of the mothers and babies remaining in the maternity unit, and the incidence and clinical course of the infections occurring among babies born at the hospital up to a month prior to the fatalities. On questioning the matron, it appeared that 'during the month of September, 1955, there had been widespread upper respiratory infection in the general population outside the hospital; this infection was often accompanied by infection of the accessory nasal sinuses and there had also been a prevalence of cutaneous staphylococcal lesions'.[158] The experience of the Tutor Sister of the local branch of the Plunket Society

[153] *NZH*, 29 November 1955.
[154] *AS*, 28 November 1955. In the same edition an article about testing of the H-Bomb ('Timing of Soviet H-Bomb is Puzzling') emphasizes the topical use of the term 'H-Bug'.
[155] *AS*, 30 November 1955.
[156] *AS*, 29 November 1955.
[157] *TS*, 21 November 1956.
[158] Douglas and Knights, 1956, p.379.

corroborated the matron's version of events; 'in April, 1955, (she) had told the Health Department that her nurses examining babies at home or at Plunket Clinics reported there was a higher incidence of skin infection in babies born in the maternity unit where the outbreak occurred than in other hospitals'.[159]

A review of 98 families, visited by the Public Health Nurses over the previous eight months, revealed 13 cases of breast abscess in the mothers, 61 babies with skin lesions, 39 with upper respiratory symptoms and 2 with eye lesions involving discharge. A culture from one of the fatal cases was available for phage typing. The phage type identified, 80/81, was the world-wide antibiotic-resistant strain of *S.aureus* in the 1950s.[160] Of mothers and babies swabbed during the investigation, a number grew resistant staphylococcus and several grew the 80/81 strain. New Zealand had officially joined the international pandemic.

Recognizing the delays presented by the Calvary outbreak where it had been 'extremely hard to get immediate notice that babies taken ill at home have been born in a particular maternity hospital', the Government rapidly empowered the Health Department by adding a new regulation to the Health Act 'requiring notification of impetigo and pemphigus of the newborn in or discharged from maternity institutions [to] aid materially in checking another outbreak at an earlier stage'.[161]

Drs Douglas and Knights published their report of the Calvary outbreak in the *NZMJ* the following year.[162] They started their paper by referring to the 'recent medical literature…[showing] how rapid has been the increase in antibiotic resistant staphylococcal infection'. 'This present trend in institutional epidemiology' had in fact been reported in the international literature for at least 6 years without raising material concern in public health in New Zealand. The Health Department response closed the gate after the horse had bolted. But with notification in place, the Department determined to thoroughly pursue the matter of staphylococcal cross-infection in maternity homes, hospitals and units throughout the country.

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[159] ibid., p.380.
[160] Wise et al, 1989, p.1008.
[161] AJHR, 1956, H.31, Appendix 1, Outbreak of Penicillin-Resistant Staphylococcal Infection in a Private Hospital Maternity Unit, Christchurch October-November 1955, pp.123-125.
[162] Douglas and Knights, 1956, pp.378-387.

The tragic neonatal deaths had highlighted an issue that had plagued maternity care since the mid-1940s – excessive overcrowding of maternity wards and nurseries. A summary of the outbreak in the *AJHR*, 1956, concluded that 'overcrowding in the institution did contribute to the outbreak. Whereas the remainder of the maternity units in the city did not exceed booking 2 patients per bed per month, [this] institution had as many as 3 patients per bed per month…while babies cots were placed in much closer proximity than the 2ft. advocated…'[163]

Although 'the nurse's hands were the suspected source of infection…the lack of history of staff illness and the failure of bacteriological confirmation made it impossible to prove this chain of events'.[164] As in previous maternity outbreaks, for example, the Kelvin Home puerperal sepsis in 1926, midwives and maternity nurses were singled out for criticism and closer regulation of practice; 'It would appear certain that in the light of this tragedy reliance is not to be placed on mechanical aids to nursing and modern drugs, to the exclusion of the careful observance of maternity techniques built up over the years'.[165] This barely concealed reference to the H.Mt. 20, a Departmental handbook first published in 1926 to ensure aseptic midwifery techniques for childbirth, signalled that nursing and midwifery practice would be closely examined and controlled.

While Douglas and Knights acknowledged that 'antibiotics are freely available under pharmaceutical benefits …[and]…the dramatic and often time-saving effects of these therapeutic agents have led to the use of antibiotics without a clear diagnosis or the use of sensitivity tests. In some hospitals the giving of large doses of antibiotics without charting the prescription is a frequent practice…', challenging doctor's prescribing practices was only briefly considered, as 'medico-political and ethical arguments can be found for and against restriction in prescribing'.[166]

Dr John Cairney, Director-General of Health, advocated restraint; 'the indiscriminate use of antibiotics in general for trivial infections or as prophylaxis following surgery should cease and the use of the few remaining antibiotics effective against the resistant

[163] AJHR, 1956, H.31, p.124.
[164] Douglas and Knights, 1956, p.384.
[165] 1956, H.31, p.124.

organism should be carefully controlled…' but he too stopped short of suggesting measures to control prescribing, apart from removing erythromycin from the general schedule.[167] He was well aware that any political move to threaten doctor's financial or professional independence would meet with strong resistance. Government attempts to provide free universal general practitioner, hospital, pharmaceutical and maternity care in 1938 had 'caused considerable and lasting friction between the government and the medical profession', still evident in the 1950s.[168]

Along with notification, the Health Department offered the services of the National Research Institute (NHI), established in Lower Hutt in 1954, to conduct bacteriological investigation of serious outbreaks as well as on-going research into the eradication of penicillin-resistant organisms. [169] Strongly recommended as an important component of an effective public health department by the Director-General of Health, Dr Michael Watt, in 1938, it was equipped with a bacteriological laboratory for research and teaching purposes. The avenues that research would take were outlined in the 1956 *AJHR* report; 'Better methods of ventilation and dust control, of laundering, of records of neonatal health, and research into the necessity or not for bathing the new-born, are all matters for careful study …'[170] Dr H.T. Knights, recently Deputy Medical-Officer of Health in Christchurch and the co-author of the Calvary report, joined the staff of the NHI in 1956. For the next eight years, he devoted his professional life to the problem of nosocomial staphylococcal cross-infection, visiting numerous maternity hospitals around the country with his air sampler and bacterial plates.

The first visit, conducted as a result of a 'seeming high incidence of notifications of puerperal pyrexia…for the months of October and November', was to National Women's Hospital, on 28 and 29 November 1956. Drs. Taylor and Davis and the Director of Nursing, Miss Flora Cameron, carried out the inspection together. 'The hospital staff admits that 20% of the babies are infected with some manifestation of Staphylococcus infection. This…is unduly high. Professor Carey explained it as due to

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[166] Douglas and Knights, 1956, p.386.
[167] Editorial, Annual Report of the Director-General of Health, *NZMJ*, 55, 1956, pp.439-440.
[168] Dow, 1996, p.122. 'The doctor's refusal to accept the proposed capitation system of payment forced the New Zealand government to adopt a fee-for-service scheme in 1941'.
[169] Maclean, 1964, p.33.
[170] AJHR, 1956, H. 31, p.124.

meticulous investigation and reporting…'[171] Overcrowding combined with poor facilities and conditions were considered to be the cause for the incidence of infection; 'We think that it is safe to say that this is one of the worst maternity hospitals in New Zealand'.[172]

The conditions found in the hospital were far from satisfactory; in the labour ward 'the sterilizing room is combined with a soiled linen room. Mackintoshes are actually scrubbed on the same linoleum-covered bench where the drums for sterilizing are also prepared…Patients are placed at 5' 6" bed centers. Nurseries are also overcrowded'.[173] The medical staff were reluctant to agree that there was a problem; 'An interview with the medical staff prior to us making the inspection of the Hospital disclosed that they were not unduly disturbed over the incidence of notifications, and Mr Kendrick (Superintendent-in –Chief) even claimed that it was lower than that in the Campbell Johnson Ward at Waikato Hospital'.[174] The tension evident in this report is not reflected in the later hospital reports by Knights, who emphasized the warm welcome and helpful attitude of medical staff throughout the country when he conducted his inspections and research.[175]

'Indiscriminate Prescribing'

Increasing evidence of antibiotic-resistant staphylococcal infection in the community was reported in 1956. Drs Stewart and Cunningham submitted another report of fatal enterocolitis from Christchurch in which an eight-year old girl died after extraction of a tooth for alveolar abscess followed by treatment with tetracycline (a broad-spectrum antibiotic), over a four day period.[176] The child's mother had been a patient in a private hospital (three months earlier during an outbreak of resistant staphylococcal pneumonia in the nursery).[177] Concern over the impact of 'indiscriminate use of antibiotics' by colleagues is evident in letters and articles printed in the *NZMJ* during 1957, for

[171] Report to the Director-General of Health, Inspection of National Women's Hospital: 28 and 29 November 1956 by Drs. Taylor & Davis and Miss Cameron, pp.1-13, HI 131/175/1, Archives New Zealand, Wellington.
[172] ibid., p.4.
[173] ibid., p.5.
[174] ibid., p.8.
[175] In a letter to the Director-General of Health, re Proposed Visit of Medical Officer, National Health Institute, to maternity units of the Auckland Hospital Board, 20 September 1957, Dr Knights notes that 'Professor Carey has welcomed my visit and stated that it will be possible for me to live in'. Archives New Zealand, Wellington, HI 131/175-27839, Staphylococcal Infections 1957-61.
[176] D.T. Stewart and J.A.K. Cunningham, 'Fatal Antibiotic-Resistant Staphylococcal Enteritis Arising in General Practice', *NZMJ*, 55, 1956, pp.376--377.
[177] The maternity hospital was almost certainly Calvary Hospital.

example, this brief communication from the New Zealand Otological Society that wished to advise the profession that 'the Society views with alarm the prolonged and indiscriminate use of local antibiotics in ear disease without correct diagnosis. Increasing bacterial resistance is becoming more widespread with considerable danger to the patient'.[178]

Dr J.A.K Cunningham presented a paper on 'The Use and Abuse of Antibiotics' to his colleagues at the Biennial Conference of the New Zealand Branch of the British Medical Association in February, 1957.[179] He reminded them that pyrexia may have a non-infective cause, that antibiotics are ineffective against viruses, and that the prophylactic administration of prophylactic antibiotics should be confined to specific situations until research proved the benefits of wider prescribing:

> If we examine our own consciences we must admit that we have been too prodigal with antibiotics. We have used them promiscuously and indiscriminately. We have turned our hospitals into plague spots of resistant staphylococcal infection. The patient who leaves hospital with boils or an infected operation wound may consider himself fortunate. Those less fortunate may develop staphylococcal pneumonia, pyelonephritis, osteomyelitis, septicaemia or endocarditis. The newborn infant may fall victim to staphylococcal pneumonia. At the other extreme of life, if a patient is too long in dying, his last days may be made miserable by boils. If an antibiotic is required we should not hesitate to give it, but we must be discriminating for as Hardy (*American Practitioner*, 1955, 6, p.87) has remarked, it is a sad commentary on our professional integrity and honesty when antibiotics are prescribed for undefined illnesses in order to placate our patients and allay our own feelings of insecurity.[180]

While practitioners were urged to examine their practice, work continued on controlling staff colonization and reducing staff contact with vulnerable patients. Dr Knights advised the Director-General of Health and Directors of the Divisions of Public Hygiene, Clinical Services, Nursing and Hospitals that Bacitracin ointment, prescribed to treat colonized staff in 1955, showed no 'inhibition of the Oxford staphylococcus or the 80/81 staphylococcus …Two samples of Neobacrin, on the other hand, showed marked growth inhibition power against all the organisms tested'.[181]

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[178] R. B. Duncan, 'Indiscriminate Use of Antibiotics', (To the Editor), *NZMJ*, 56, 1957, p.468.
[179] J.A.K. Cunningham, 'The Use and Abuse of Antibiotics', *NZMJ*, 56, 1957, pp.175-178.
[180] ibid., p.178.
[181] Knights to the Director-General of Health, 17 April 1957, H 131/175, Archives New Zealand, Wellington.

The annual report of the Director General of Health in 1957 emphasized that the importance of treating staff and preventing cross infection. Nursing shortages were being exacerbated by the 'considerable increase in the incidence of boils, septic fingers …in all training schools. Measures to prevent the incidence of such wastage of nursing staff must be strictly enforced and research undertaken by all hospitals to find the underlying causes. It is not sufficient to find and treat these conditions. Research into techniques [should be undertaken] particularly those to do with hand washing, cleaning and disposal of used equipment, soiled dressing disposal…' [182]

Reducing maternity staff contact with babies was seen as an achievable and urgent priority. In June 1957, a meeting was called by the Auckland Hospital Board 'primarily to consider the effect of the "rooming-in" proposals on the design of the ward block for the new National Women's Hospital' that had reached the planning stage after years of political lobbying and fund-raising.[183] A statement, distributed by Professor Carey in May 1957, claiming that the design of the new hospital would not meet Health Department recommendations for 'rooming-in' mother and baby, was refuted by the Director General of Health, Dr John Cairney. Cairney had attended the Board meeting to emphasize 'particularly the importance of proceeding with the new Hospital at the earliest possible date, so that the present unsuitable buildings could be vacated as soon as possible'.[184]

The Epidemiology of Staphylococcal Infection

The epidemiology of staphylococcal infection was of increasing interest and importance to clinicians and researchers alike. Clinicians did their best to unravel the mechanisms of cross-infection using the resources at their disposal in the National Health Institute. In 1958, the NHI reported 'a very large increase in the number of specimens examined. The majority are cultures of staphylococcus for typing'. Almost half the cultures typed were from one maternity hospital; 'A total of 5,704 cultures has been typed for hospitals. The largest number from any single hospital has been 2,237 cultures from the

[182] AJHR, 1957, H.31, p.60.
[183] Auckland Hospital Board Meeting re: Planning New National Women's Hospital, 10 June 1957, HI 131/175, Archives New Zealand, Wellington.
[184] ibid.

National Women's Hospital, Auckland. Type 80/81 remains the commonest cause of hospital staphylococcal infections'.[185]

Drs Markham and Shott, from the Department of Microbiology, University of Otago, saw that their laboratory provided them with a unique opportunity to study both hospital and community patients. 'Because of the importance of learning as much as possible concerning staphylococcal infection as it exists at the present day it seemed appropriate to review the situation in a limited geographical area'.[186] They found that 'there was a significantly higher infection rate in children under one year of age, in females in the 20-30 age group and in males over 70 years of age…'[187]

Identification of staphylococcal strains by phage typing was carried out by the NRI; 'staphylococci of phage type 80/81 was found significantly more frequently in lesions acquired in general and maternity hospitals and in lesions of nurses than it was in private practice'.[188] The researchers concluded that:

> Firstly, many patients whose lesions are caused by "resistant" staphylococci fail to respond to outside treatment requiring subsequent hospital treatment. Secondly there is a constant feeding into the hospital environment of drug resistant strains a process which must surely be important in maintaining a high proportion of staphylococcus in the hospital environment. A drug resistant organism when once introduced into hospitals will have a greater chance of survival there than a drug sensitive organism because of the widespread use of antibiotics in the hospital environment…When the selective introduction into and selective maintenance of drug resistant staphylococci in a hospital is duly considered it does not seem surprising that most staphylococcal infections acquired in a hospital by patients and nurses are caused by drug resistant organisms.[189]

While this theory appeared sound, it still did not explain 'why it is that maternity hospitals harbour "drug resistant" staphylococci to such a high degree, since patients entering such institutions do not carry a high proportion of drug resistant organisms in their noses at the time of admission neither could it be expected that antibiotic drugs are

[185] AJHR, 1958, H.31, pp.117-118.
[186] N.P. Markham and H.C.W. Shott, 'Staphylococcal Infection in General and Hospital Practice', *NZMJ*, 57, 1958, pp. 55-62.
[187] ibid., p.56.
[188] ibid., p.61.
[189] ibid., p.60.

widely used in these….It is obvious that much is still to be learnt about the epidemiology of staphylococcal infection in maternity hospitals'.[190]

A higher than usual notification of puerperal pyrexia among postnatal women nursed in National Women's Hospital, as well as the apparently high incidence of neonatal staphylococcal infection, prompted both clinician and Health Department concern. Research on colonisation rates among nursing staff and patients in September 1956 had revealed that of the 93 nurses carrying *S.aureus* in the nose, 55 (59%) were colonized by penicillin-resistant staphylococci. Of the 584 babies nasally swabbed on discharge (after an average two weeks stay in the nurseries), 353 (60%) were positive for *S.aureus* and all except 26 were colonized by penicillin-resistant strains.[191] These results were a spur to challenge 'matters governed by the H.Mt.20', in particular the choice of antiseptic solutions for vulval preparation of women in the labour ward and 'rooming-in' of mother and baby throughout the hospital. The introduction of rooming-in was seen as a matter of particular urgency as although rigid isolation precautions had reduced the incidence of staphylococcal infections among the gynaecological patients, 'almost to extinction point', the improvement in obstetric cases and babies was not so satisfactory.

From October 1955 to March 1956, 207 (22%) of the total babies delivered at National Women's Hospital had clinical staphylococcal infections of which 80% were penicillin-resistant, 50% were streptomycin resistant and 25% were also resistant to the tetracyclines. The mothers were found likely to be the source of infection in less than 1% of the babies swabbed.[192] The clear evidence that babies were being infected by the staff and/or the hospital environment emphasized the need to improve the postnatal wards so that they could function on the rooming-in principle and to construct adequate cleaning and sterilizing facilities for the labour ward.

The Health Department made a series of recommendations for changes in practice, equipment and accommodation based on British research into the control of staphylococcal cross-infection. The need to maintain consumer safety and confidence in

[190] ibid., p.61.
[191] Minutes of the National Women's Hospital Medical Committee, 12 February 1957, BAGC A638/38a, Archives New Zealand, Auckland.

the hospital system were seen to be equally important; 'Judged by objective criteria the rate of cross infection at National Women's Hospital is comparable to that found in other large maternity units. However, in hospitals of this type the carrier rate among babies is seven times greater than that for babies delivered at home. This underlines the fact that there is much room for improvement'.[193]

Interest in the epidemiology of staphylococcal infection increasingly focused on two issues: the mode of transmission of staphylococcal infection, and the link between hospitalization and the acquisition of antibiotic resistant strains in the community. Knights continued to investigate small and large maternity units throughout the country during 1958 and 1959. He left a unique record of the state of local hospitals in his wake. In the children's ward in Kaitaia: 'a profuse growth of moulds, probably in themselves evidence of the dampness of the wards (an overcrowded coalescence of cottages) prevented the isolation of the epidemic phage type of staphylococci…It is the worst ward seen so far in any hospital'.[194] In Oamaru Hospital that had 'figured previously in connection with neonatal staphylococcal sepsis…It is evident that the air of all the wards examined…is heavily charged with 80/81 staphylococci and little will avail except to thoroughly spring clean each ward, sterilize all bed linen and possibly employ a (Savlon) aerosol'.[195]

Calvary Hospital, the site of the staphylococcal outbreak in 1955, had adopted oiling rather than baby bathing 'until the day of departure' on the strength of Dr Knights' demonstration by serial air sampling that bacterial contamination rose steeply during nursery bath time. From being the most popular and overcrowded maternity unit in Christchurch, it appears at the time of Knights' visit in March 1958, to be experiencing either a seasonal lull in occupancy or the persistent effects of negative publicity.[196] The number of babies in the nursery was low, only twelve, and mothers were excluded from

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[192] ibid.

[193] ibid.

[194] Cross Infection Investigations: Kaitaia Hospital, 17 February 1958, H1 131/175/1-29956, Disease – *Staphylococcus Aureus*, 1957-64, Archives New Zealand, Wellington.

[195] Investigations of Staphylococcal Cross Infection in Christchurch Hospitals, 17 April 1958, H1 131/175/1-29956, Disease – *Staphylococcus Aureus*, 1957-64, Archives New Zealand, Wellington.

[196] J.J. Brownlee, Letter to the Editor, Hospital Infection, *Christchurch Press*, 30 May 1958, Archives New Zealand, Wellington, H1 131/175/1-29956, Disease – *Staphyloccocus aureus*, 1957-64. 'In 1955 Calvary Hospital received discriminatory and unenviable publicity. ..Now the lay public should know that this institution is not only recognized as one of the "cleanest" hospitals in the Dominion, but also, as a result of recent stringent tests, its authorities have been officially congratulated on its being completely free of the virulent staphylococcus'.

the room so that only a 'few correctly garbed personnel' were present. Knights, ever the enthusiast, reports the results of nursery air sampling as most satisfactory; 'The low level of bacterial contamination was remarkable…It does seem to show that oiling as opposed to bathing has something to recommend it…The complete absence of epidemic phage type Staphylococci from this hospital is very gratifying'.[197]

Concern over the spread of phage type 80/81 *S.aureus* from hospital patients to individuals in the community, prompted Dr Paterson, from the Department of Health, and Dr Burns, a pathologist from Christchurch Hospital, to survey general practitioner wound swabs positive for *S.aureus*, from mid-April to July 1958. One hundred and seventy-nine swabs from ten G.P. practices in Christchurch were cultured, the antibiotic sensitivity pattern and phage type being determined for each strain isolated. Their findings confirmed that; 'connection with the hospital [either as an in-patient or as a relative of an in-patient] is significantly associated with the occurrence of infections due to phage type 80/81… 54% of staphylococcal strains obtained from infections in the community at large were resistant in vitro to penicillin…Forty-two per cent of the strains were of the penicillin epidemic phage type 80/81…Hospitalization was a significant factor in the spread of phage type 80/81 into the community'.[198]

Staff Swabbing

Demand for phage typing of staphylococcal cultures by the NHI, reached 'a probable ten thousand' by late 1958. This prompted Dr C.A. Taylor, the Director, Division of Hospitals, to approach the Medical Superintendent of the Otago Hospital Board with a proposal that 'the main base laboratories at Auckland, Wellington, Christchurch and Dunedin should undertake 'the phage typing of their own cultures' from in-patients and staff as well as 'specimens sent by or at the request of the Medical Officer of Health and derived from their own Board district'.[199] The swabbing of healthcare staff to detect nasal carriage, particularly nurse trainees who were required to complete screening before they started on the wards and maternity units, was completely overwhelming the capacity of the NHI while dramatically reducing the number of available staff.

[197] Investigations of Staphylococcal Cross Infection in Christchurch Hospitals, 17 April 1958, H1 131/175/1-29956, Disease – *Staphylococcus Aureus*, 1957-64, Archives New Zealand, Wellington.
[198] W.I. Paterson and G.C.T. Burns, 'Staphylococcal Infection in Christchurch in 1958', *NZMJ*, 58, 1959, pp.787-791.
[199] Taylor to the Medical Superintendent, Otago Hospital Board, 6 February 1959, H1 131/175, Archives New Zealand, Wellington.

In order to clarify the situation, Knights summed up his experience over the previous three years. It indicated that 'Of 10 outbreaks in N.Z. all were due to either medical or nursing staff with actual lesions or those who had suffered from such lesions within the past six months and were still nasal carriers. Experience of two years of nurse trainees shows that in one hospital from one third to one half of all trainees at one time or another during the first year are carriers of epidemic phage type staphylococci and become either permanent carriers, show the organism from time to time or lose it within a week or two and do not show it thereafter'.[200]

Knights attempted to confront the practical issues facing hospital and laboratory administrators by recommending that the focus of attention be staff with active staphylococcal lesions. These staff should 'be excluded from nursing until such time as the lesion is healed or proved not be of the epidemic phage type staphylococcus …[however]… Should an outbreak of staphylococcal cross infection occur in an institution then steps must be taken to determine the persons responsible'.[201] The transient nature of *S.aureus* carriage in the anterior nares of 60% of the population, meant that a large number of apparently positive staff was being excluded from duty during their subsequent treatment, and a certain number of staff was re-colonized during the following months.

The resulting confusion among Public Health staff, led to communications to the Director-General of Health. 'Although Dr H.T. Knights thinks there is little risk, on the last occasion when I spoke to the Director, Division of Nursing, she was quite adamant that no nurse [who is a staphylococcal carrier] should be allowed to work in the hospital [St Helens, Christchurch], nor should she be allowed in contact with other nurses who are working there. In practice this means that a nurse is put on special leave and not allowed to remain in the Nurses Home'.[202] This followed the death of a baby born at St Helens in early November from staphylococcal septicaemia, and the subsequent discovery that five members of the staff had positive nasal swabs for phage type 80/81.

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[200] H.T. Knights, Treatment of Carriers of Epidemic Phage Type Staphylococci, 3 December 1958, H1 131/175, Archives New Zealand, Wellington.
[201] ibid.
[202] Douglas to Taylor, 9 December 1958, H1 131/175, Archives New Zealand, Wellington.

'As this is an extremely busy month for St Helens, the situation that arises as the result of excluding (staff) is rather serious. St Helens has already had 56 babies born this month; today there are 58 patients in the wards'.[203]

Contradictory advice from the Department of Health clearly vexed hospital administrators. A memorandum circulated throughout the country in January 1959 reiterating Knights views on staff screening and treatment, led at least one medical superintendent to respond; 'I find it difficult to see how your recommendation No.9 can be implemented if one, at the same time, follows recommendation No.7. How will one detect all the carriers to which you refer in recommendation No.9 unless one carries out periodic swabbing of the whole staff? As our minor sepsis rate is still of the order of 12% I think that we need to be more conscientious in carrying out periodic swabbing of all staff and following your recommendations N0.9, 11 and 12'. Professor Carey referred to British research showing that Staphylococci 80/81 from symptomless carriers were 'just as virulent as those isolated from lesions'. [204] National Women's Hospital management had invested considerable funding into improving their maternity facilities and was undoubtedly keen to see a reduction in the infection rates among neonates as a result.

Improvements at National Women's Hospital

The *New Zealand Herald* reported on the additions and alterations at National Women's Hospital in October 1958 – 'Mothers and Babies Happier in New £10,000 Ward'. Changes 'include ward 30, a 19-bed rooming-in ward, a nine-bed isolation ward, a centralized sterilisation service and a centralized "production line" milk bottle washing, filling and sterilising service… The isolation ward…takes not only infectious cases from the National Women's Hospital, but also infected babies and mothers from private hospitals…This ward has its own delivery room and ambulance bay'. The main advantages to the new ward, built specifically for rooming-in, were cited as encouragement of breast-feeding and early ambulation; 'By getting out of bed fairly soon after her confinement, it is believed that she is less weakened than by a long and

[203] Paterson to Taylor, 12 November 1958, H1 131/175, Archives New Zealand, Wellington.
[204] Carey to Taylor, 3 February 1959, H1 131/175, Archives New Zealand, Wellington.

uninterrupted stay in bed'. Finally, 'another big advantage claimed for the rooming-in ward is that the system cuts down staphylococcal cross-infection'. [205]

To substantiate these claims two of the hospital's registrars, Dr William Liley (later Sir William) and his wife Dr Margaret Liley, completed research on the subject of staphylococcal infection and carriage. Margaret Liley investigated the relationship between rooming-in and umbilical and nasal staphylococci in babies.[206] In September 1959 she reported that the rooming-in Ward 30 had not reduced the rate of staphylococcal carriage in babies, but had in fact increased the relative rate of positive umbilical to nasal swabs. She suggested that nursing staff on the ward might be the possible source; 'either because cross infection from baby to baby is occurring there with a vengeance on morning cord round, or nurses are not seeing that mothers keep babies clean'.[207]

William Liley pursued the more elusive subject of staphylococcal epidemiology and its impact on hospital staff; 'little is known of the natural history of nasal colonisation with staphylococci…The rate at which nasal-positive staff spontaneously become negative is obviously important as a background against which purported nasal antiseptics must be assessed. Similarly the rate at which nasal negative staff become positive should be measured in view of the present requirement in several hospital localities that nursing staff must have a nasal swab negative for staphylococci before commencing duty or training'.[208] His results mirror those of other researchers in the field; 'The distribution of positive swabs is continuous between 'transient' and 'permanent' carriers. Rather than a hard core of permanent carriers there appears a hard core of staff who refuse to become colonized with any of the strains available in this hospital'.[209]

Liley concluded that 'the rule that nursing staff commencing work or training in certain hospital departments should have a nasal swab negative for staphylococci would seem to confer little, if any, benefit on patients. Of staff found to be negative, some 15% may

[205] *NZH*, 6 October 1958, H1 131/175, Archives New Zealand, Wellington.
[206] H.M.I.,Liley, Umbilical and Nasal Staphylococci in Babies and Their Relation to Rooming-in, September 1959. BAGC A638/38b, Archives New Zealand, Auckland.
[207] Ibid.
[208] A. William Liley, The Natural History of Nasal Colonisation with Staphylococcus aureus, pp.548-557. Minutes of the Senior Medical Staff Committee, National Women's Hospital, BAGC A638/38b, Archives New Zealand, Auckland.
[209] Ibid.

be expected to be positive the following week. Of staff positive but becoming negative fortuitously or otherwise, on nasal antiseptics, some 36% will revert to a positive swab the following week. This turnover would seem to defeat the entire purpose of the rule'.[210]

Records for 1959 cited in the Report of the Director, NHI, indicate there had been no let up in swabbing around the country. '9,575 specimens were examined (in the NHI Phage Typing Laboratory)…In all, 7275 strains were typed. …80/81 is still the commonest infecting type'.[211] Type 80/81 was identified in 81% of staphylococcal infections in hospital staff, 61% of baby infections and 53% of adult infections. The numbers of women and infants affected by staphylococcal infection still appeared to be on the rise; infants under 3 months who died from any disease where the underlying infection was identified as staphylococcal had increased from 12 in 1955 to 25 in 1958. Also numbers of cases where breast abscesses associated with lactation were treated in public hospitals had risen from 338 in 1955 to 675 in 1958.[212]. The measures in place still did not appear to be having a significant effect in the maternity setting.

Hexachlorophene for Bathing Baby

In October 1959, an article was published in the *Medical Journal of Australia* providing evidence of a significant drop in staphylococcal infection in neonates in a large maternity hospital. Like New Zealand, Australia had experienced the 'growing problem of staphylococcal infection in the newly born'. Melbourne's Royal Women's Hospital had responded to the increase in infection in a similar way to National Women's Hospital; 'the honorary medical staff set up an Infection Control Subcommittee to investigate the problem and recommend means of control' – setting up of a phage-typing laboratory in the hospital, swabbing of staff, treatment of nasal carriers and increased focus on tighter 'nursing disciplines, particularly in regard to "rooming-in" techniques'.[213]

[210] ibid., p.548.
[211] AJHR, 1959, H.31, pp.122-126.
[212] Taylor to Johnstone, 30 November 1959, H1 131/175, Archives New Zealand, Wellington.
[213] Arthur M. Hill, Hildred M. Butler, and J.C. Laver, 'Reduction of Staphylococcal Infection in the Newly Born', *Medical Journal of Australia*, 31 October, 1959, pp.633-634.

Despite these measures, the staphylococcal infection rate among neonates had risen from 1.9% in 1957 to 17% by October 1958. The Infection Control Subcommittee then began a case controlled study of the use of hexachlorophene emulsion for washing newborn babies in one of the hospital's two labour wards. 'The effect of the introduction of hexachlorophene emulsion was both immediate and sustained. ..This continued efficacy of a simple procedure is the reason for the publication of this report'. During the trial there was also a fall in the percentage of babies that became nasal carriers of pathogenic staphylococci. Among premature babies the rate dropped from 90% to 30%, and for term babies from 70% to 38%. This article was attached to the minutes of the Auckland Hospital Board Senior Medical Committee Minutes and had clearly been copied for distribution to members.

In May 1960, Knights wrote to Dr Derek Taylor, Director of the Division of Maternal Welfare, reporting on the recent visit of Dr S.C. Peddie to Royal Melbourne Women's Hospital.[214] In his letter, Knights confirmed the measures in place to prevent and control staphylococcal infection. These included;

> …pHisohex preparation of all patients for delivery and pHisohex of all babies immediately on delivery, shaving of pubic hair delayed until the last possible minute in long labour and then shaving is done only with pHisohex in all cases, an antibiotic committee decides which broad spectrum antibiotic may be used for one particular month; by changing this antibiotic, they desensitize the organism; sulphonamides, penicillin and streptomycin are permitted for emergency treatment by residents but no broad spectrum antibiotic may be used by anybody without the consent and knowledge of the control committee; are of proved value.[215]

The effectiveness of pHisoHex, a liquid detergent containing 3% hexachlorophene, for reducing skin flora, was confirmed by the work of Dr Audrey Jarvis at Palmerston North Hospital. In August 1960, this product and the 'Melbourne method', were adopted for bathing babies born at Palmerston North Public Hospital after previous methods of infection prevention had failed.[216] Swabbing of the babies with pHisoHex was followed by drying and a second application of pHisoHex that was allowed to remain on the baby's skin. 'A statistically significant reduction in staphylococcal

[214] Knights to Taylor, 27 May 1960, H1 131/175, Archives New Zealand, Wellington.
[215] Knights to Taylor, 27 May 1960, H1 131/175, Archives New Zealand, Wellington.
[216] Audrey W. Jarvis, 'Reduction of Staphylococcal Infection of Babies in the Maternity Unit of a New Zealand Hospital', *NZMJ*, 60, 1961, pp.570-573.

Figure 3: Decisive measure against STAPH.
'Advertisers' Announcement', New Zealand Medical Journal, 62, 1963, p.196.

The manufacturer suggested that doctors recommend to mothers that they continue the use of pHisoHex for a 'healthier "first" year… to provide continuity of antisepsis' in the home.

infections in babies followed the use of phisohex for bathing babies. That the reduction is one of skin infections as compared with eye and other infections suggests that the protective layer of phisohex left on the baby's skin is the significant factor'.[217]

New Antibiotics

At the same time as hexachlorophene was being trialled as a measure to reduce staphylococcal colonization of the skin, important chemotherapeutic advances were being reported in the medical literature. The emergence of penicillin resistant staphylococci in the early 1950s, and the tremendous profits accruing from the sale of antibiotics, had stimulated an intensive search by pharmaceutical companies for anti-microbial compounds with activity against staphylococci. In 1956, the discovery of a soil sample from the interior of Borneo that contained a newly isolated bacteria, *Streptomyces orientalis,* led to the development and distribution of the glycopeptide antibiotic, Vancomycin, in 1958.[218]

Even more significant at the time, was the development of synthetic penicillin following the fermentative isolation of the penicillin nucleus in 1959.[219] Celbenin, methecillin and staphcillinin, were unaffected by the action of the staphylococcal enzyme penicillinase, the major mechanism by which staphylococcal resistance to penicillin was achieved. In March 1961, Dr Keitha Corlett from Auckland Hospital, reported the successful treatment with celbenin of a four year old child with acute osteomyelitis and penicillin-resistant septicaemia.[220] In July of the same year, Dr W. B. Jackson of Masterton Hospital discussed the case report of an infant successfully treated with celbenin, after ten months of recurring staphylococcal septicaemia that was unresponsive to penicillin, erythromycin, chlorormyecetin and furadaltone.[221]

Jackson expressed his concern that some form of prescribing constraint was necessary to prevent bacterial resistance to the new antibiotic; 'The need for frequent injection limits the use of celbenin to hospital practice, but the recent discovery of the oral

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[217] ibid., p.573.

[218] Glenn L. Cooper & Douglass B. Glass, *Vancomycin, A Comprehensive Review of 30 Years of Clinical Experience*, New York, 1986.

[219] Nicholas Wells, *Medicines: 50 Years of Progress 1930-1980*, Office of Health Economics, London, 1981.

[220] Keitha Corlett, 'Staphylococcal Septicaemia with Ulcerative Endocarditis, Successfully Treated with Celbenin', *NZMJ*, 60, 1961, pp.112-113.

compound P.A.248…at once raises the question of the deliberate limitation of its use in New Zealand as a matter of great and practical importance'.[222] While it is clear that erythromycin was still restricted in some hospitals at this time – Audrey Jarvis states that in 1961 'erythromycin is only used in (Palmerston North Public Hospital) with the permission of the medical superintendent, and both cathomycin and chloromycetin are used to only a limited extent' – it is difficult to assess how widespread restrictions were and how firmly they were enforced.[223]

While Dr Knights continued to emphasize the importance of reducing environmental sources of infection - the appropriate floor polishers and vacuum cleaners to help prevent airborne transmission in hospitals, and the potential for the cuffs of doctors white coats to harbour pathogenic bacteria, a pharmaceutical solution to nosocomial staphylococcal cross-infection was gradually being adopted throughout the country.[224] In December 1961, the National Women's Hospital Medical Committee agreed to introduce pHisoHex for 'cleaning neonates...in the whole hospital in the near future…the bathing technique is no longer required and should be replaced by the pHisoHex technique for the cleaning of new born babies'.[225] A year after the introduction of methicillin, ampicillin entered the market followed by another synthetic, amoxycillin, that has the same broad spectrum of activity as ampicillin but achieves higher levels in the blood and is more rapid in its anti-bacterial effect.

A change in the epidemiology of nosocomial staphylococcal infection was reflected in the findings of a ninety-week survey in Dunedin from August 1 1960 to April 30 1962.[226] Drs Markham and Shoot from the Department of Microbiology, University of Otago, sought to compare the results of their previous survey of sepsis in hospital patients, published in the *New Zealand Medical Journal* in 1961, with a larger group of patients over a longer timeframe.[227] Their observations concurred with:

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[221] W.B. Jackson, 'Recurrent Staphylococcal Septicaemia Treated by Celbenin: Report of a Case', *NZMJ*, 60, 1961, pp. 337- 338.
[222] ibid., p.338.
[223] Jarvis, 1961, p.573.
[224] Knights to the Director, Division of Hospitals, Director, Division of Maternal Welfare, Director, Division of Nursing, Long Sleeves & Hospital Cross Infection, 2 October 1961, H1 131/175, Archives New Zealand, Wellington; H.T. Knights, 'Hospital Coats and Cross Infection', *NZMJ*, 61, 1962, p.287.
[225] Medical Superintendent to Superintendent-in-Chief, 21 December 1961, BAGC A638/399, Archives New Zealand, Auckland.
[226] N.P. Markham and H.C.W. Shott, 'Sepsis in Hospital Patients: Trends in the Epidemiology of Staphylococcal Sepsis', *NZMJ*, 62, 1963, pp.521-527.
[227] N.P. Markham and H.C.W. Shott, 'A Survey of Sepsis in Hospital Patients', *NZMJ*, 60, 1961, pp.474-480.

> …the stated impressions of persons associated with other hospitals in New Zealand…There has been a progressive decline in the number of hospital acquired staphylococcal infections especially following operations which had a high sepsis risk. The incidence of gram negative bacillary infections after these operations has increased…The amount of infection in nurses showed a significant fall in the last of the 30 week periods. The changes observed in the characteristics of hospital acquired sepsis in patients has been reflected in infections among nursing staff in whom there has been a reduction in the frequency of staphylococcal infections and in the incidence of the more drug resistant staphylococci.[228]

A survey by Drs Paterson and Burns comparing 'Trends in Staphylococcal Infection in Christchurch' over a similar period (October 1961 to April 1963) with a survey completed in 1958, confirmed the findings of Markham and Shott in Dunedin.[229] While the 1958 survey showed that association with a hospital was 'significantly associated' with the spread of 80/81 type infection in the Christchurch community, the more recent survey showed that this was no longer the case. Resistance to penicillin in staphylococcal isolates had declined, and although the rate was not statistically significant the author comments that ' at least the resistance to penicillin has not increased – encouraging in view of the grim forebodings of several years ago…It would appear that the efforts of our hospital administrators to rid the hospitals of staphylococcal infection are being rewarded'.[230]

'Closing the Book on Infectious Disease'

While isolated outbreaks of 80/81 strain staphylococcal sepsis still occurred, most notably causing the deaths of three babies in a small maternity unit in Kaponga in July 1963, a mood of optimism is detectable among those seasoned in the field. In July 1964, Knights wrote to the Director General of Health; 'Staphylococcal cross infection is now of lesser importance and other organisms are now more responsible'.[231] By April 1965, the National Women's Hospital Medical Committee put forward a proposal to the Hospitals Committee 'to vary the use of the Obstetrical Beds (29) on the First Floor, Isolation Block'.[232] The original plan provided for 50 isolation beds for infectious

[228] Markham and Shott, 1963, p.526.

[229] W.I. Paterson and G.C.T. Burns, 'Staphylococcal Infection in Christchurch', *NZMJ*, 58, 1959,pp.787-791.

[230] P.B. Maling, 'Trends in Staphylococcal Infection in Christchurch', *NZMJ*, 63, 1964, pp.596-597.

[231] Knights to Director General of Health, 17 July 1964, H1 131/175/1-29956, Disease – *Staphylococcus aureus*, 1957-64, Archives New Zealand, Wellington.

[232] Auckland Hospital Board, Hospitals Committee 12 April 1965, HI 56/7/14/1 closed no 31071, Archives New Zealand, Wellington.

obstetric, neonatal and gynaecology patients in a separate isolation block for the new hospital. By 1965, however, it was clear that this estimate had been made 'at a time when serious hazards to patients were being experienced due to the prevalence of "H" bug infections. These hazards have now, largely, disappeared'.[233]

The success of anti-microbial therapy against staphylococcal sepsis and endemic staphylococcal infection, was cause for burgeoning confidence in the ability of pharmaceuticals and doctors to abolish disease. The impact was felt worldwide. In 1967, the U.S. Surgeon General, William Stewart, declared, 'The time has come to close the book on infectious diseases. We have basically wiped out infection in the United States'.[234] In 1969, a group of Danish researchers published a ten-year retrospective study of 'Changing Staphylococci and Staphylococcal Infections'.[235] 'Clinical and bacteriologic findings in about 2000 cases of bacteremia illustrate the changes within the staphylococcal flora in Danish hospitals during the years 1957-66. The phage type complex 52, 52A, 80, 81, usually resistant to penicillin and streptomycin only, regressed with the increasing use of new antibiotics…a simple rule that seems to hold true is that strains sensitive to an antibiotic can hardly maintain or gain a dominating epidemic position in environments in which this antibiotic is extensively used…This may be the reason why the 52, 52A, 80, 81 complex lost its dominating role'.[236]

The Danes had already noted the emergence of some methicillin-resistant *S.aureus* isolates from patients in their hospitals, but in the complacent era that followed the staphylococcal pandemic, Henry Treffers' cautionary advice about the 'antibiotic cycle of optimism' was once again disregarded as New Zealand. Doctors forged ahead with the promise of total victory over microbes. The understanding of staphylococcal epidemiology had broadened significantly over the preceding decade, but the enduring potential for staphylococci to develop 'new, malign propensities' was conveniently ignored while the new antibiotics appeared to have vanquished 'the depredations of the

[233] ibid.
[234] The Financial Page, 'No Profit, No Cure', *The New Yorker*, November 5 2001, p.46.
[235] Ove Jessen, Kirsten Rosenthal, Per bulow, Viggo Faber & Knud Riewerts Eriksen, 'Changing Staphylococci and Staphylococcal Infections', *New England Journal of Medicine*, September 18 1969, 12, 281, pp.627-635.
[236] ibid., p.634.

staphylococcus'.[237] The hospital was once again sanctioned as a safe venue for care, in spite of the lingering doubts that remained for women who had been the most affected during their maternity experience.

The Experience of Individual Medical Practitioners:

Two factors seem to account for the relatively low importance given to the epidemic by doctors interviewed fifty years on; virulent staphylococcal infections were only one of a series of challenges encountered in lengthy careers spanning decades, and unlike nurses and midwives who managed the arduous isolation procedures for staphylococcal illness hour after hour, doctors tended to have relatively brief contact with their patients, minimizing the enduring impact that prolonged contact with these patients appears to have had.[238] Doctors previously in general practice, obstetrics, paediatrics, and infectious diseases, were interviewed for the purposes of this research. All but one of the doctors interviewed completed their medical training from the late 1930s to the early 1950s, two decades of extraordinary change in anti-microbial therapy.

Dr Fred McConnell, an Auckland GP, working in a residential suburb for over forty years, saw the increase in staphylococcal infections during the fifties as an example of the change that continually affected his community. 'You go through a thing like that but populations move and change…over a period of time the demographics change so the type of infections change in the neighbourhood as well as the ages of people that are affected'.[239] He used antibiotics widely during this period, but at the same time stressed the important role played by general practitioners, who adopted a practical approach to preventing infection at the grass roots level.

Dr Charles Howden, who graduated in 1940, had a large general practice in the Waikato region during the post-war years. During his training in the pre-antibiotic era, he was exposed to the effects of the sulphonamides, and was consequently able to offer insights into the remarkable healing properties of penicillin in the early 1940s. 'I suppose you could say that we did see the natural history of staphylococcal infections…we did see them evolve. I don't remember sulphonamides being very effective for staph. Prontosil

[237] Dolman, 1956, pp.198-199.
[238] Refer to Chapter 5, The Impact on Maternity.
[239] Dr Fred McConnell, interviewed by Deborah Jowitt, 10 January 2003.

was the recommended treatment for mild staph infections like boils…and I used manganese buterate in general practice'. With childhood osteomyelitis, 'they would probably not rush the child on to some sort of IV (intravenous) preparation of sulphonamides, they were always rushed to hospital to have the bones attacked [surgically]'.

Antibiotics changed the nature and efficacy of hospital and community treatment, leading to a deep-seated confidence in a continued and untroubled future for anti-microbial therapy, even though individual dosages were continually increased to retain their effectiveness. Initially 'dosages were lower …[because]…the bugs were very sensitive…a woman with cellulitis of the breast [was successfully treated in the community] with 50,000 units whereas a few years later we would have had to have given a million units at least'. With a large maternity component to his practice, as was common in the New Zealand in the 1940s and 50s, this GP was very conscious of the threat of infection to mothers and babies. 'Maternity was regarded as the heart of general practice. You gave total care to the family. The birth rate was very high. I delivered over 3000 babies during this time'. His sensitivity to infection control was honed by this experience. In 1960 he entered practice as an infectious diseases specialist in Auckland Hospital where he was exposed to the problem of penicillin resistance, but, 'We then had celbenin, the first off-shoot from penicillin'.

His approach characterizes the impressive 'universalization' that characterizes western medical practice. 'We gleaned from others' experiences, often overseas experience…When you are treating sick people, our ethos was to use anything that would help in treating very ill patients; was to use any good information'. Within the hospital itself at this time, there was probably considerable variation in antibiotic prescribing. No formal constraints were placed on individual clinicians to control prescribing patterns. The infectious diseases team were not consulted for advice; 'In those days the haematologists had to deal with a lot of infection and they didn't refer to us. In those days clinicians using antibiotics were pretty much autonomous'.[240]

[240] Dr Charles Howden, interviewed by Deborah Jowitt, 1 April 2003.

Dr Anne McKinnon, a woman GP working in a rural Northland town during the mid-1950s, recalled that she and her husband, 'used to put down the readiness to infect to the climate…because it is sub-tropical. Of course we were aware of the deaths of the babies in Christchurch…we knew that this staphylococcus was penicillin-resistant and that it was widespread …but…we weren't really aware we were going through this historic phase and how important it was'. When her infant son developed a severe recurrent staphylococcal infection after being hospitalized with her during treatment for a serious infection, the other members of the family of six were swabbed and all found to be colonized with penicillin resistant *S.aureus*. The older children had chronic boils and her husband had a busy GP maternity practice, but she has no memory of the family being treated for their carrier status. Once diagnosed, their baby responded rapidly to treatment with erythromycin from the hospital pharmacy, but the other children's boils continued 'until we went to a colder climate in England the following year where they very rapidly cleared up'.

She and her husband were deeply affected by the chronic illness of their son, 'we really despaired of him', and the death of an infant niece from staphylococcal pneumonia in 1958. However, they did not anticipate the potential long term impact of anti-microbial resistance: 'We really weren't aware of the fundamental importance of this era in the recognition of what happens with resistance'. The couple had graduated from Otago University in 1951 at a time when the medical model went largely unchallenged. Penicillin epitomized the success of science in overcoming infectious disease; 'it was regarded as so infallible that I think that possibly some other forms of treatment weren't emphasized enough because you could just rely on penicillin – magic!' During the 1950s and 60, resistance appeared to be a temporary issue that would be beaten by the discovery of new antibiotics. "Each time a new antibiotic came on to the market, we thought, Ah! This is it'. [241]

Dr Keitha Farmer, a paediatric infectious diseases physician who graduated from Otago University in 1950, remembers being given no information about the potential for antibiotic resistance during her training. 'None whatsoever from what I can remember. In our surgical lectures, Gordon Bell talked about penicillin…it was THE thing'. Her

[241] Dr Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.

experience reveals how rapidly new antibiotics were released on to the market during the 1950s. 'When I was a 4th year student we heard about antibiotics, then when I was qualified I was using penicillin, Streptomycin and the tetracyclines. It was a little later that we realized the effect of tetracycline on the teeth. I remember looking after a child with cystic fibrosis whose teeth literally crumbled away due to all the tetracycline she had'. The life-saving aspects of antibiotics had to be balanced continually against lesser side-effects; 'there's a down side to most things but as far as the broad-spectrum antibiotics you have to weigh up the risks to the patient compared with the long term effects'.

Although Keitha went to England in early 1954 and did not return to New Zealand until 1960 to take a position as tutor specialist at Princess Mary's Children Hospital in Auckland for 16 months, there were still a 'large number of cases of staphylococcal pneumonia, most of them under the age of two or three years' at this time. 'There was the pneumonia and the development of the cystic form and the multiple cysts which are so typical and a large number of empyemas'. Equipment for treating the children was inadequate; 'There were only five or six (chest) suctions – not enough for those who needed intercostals drainage due to their empyemas'.

At the time, '*Staphylococcus aureus* was the most common cause of childhood pneumonia…Penicillin was the drug of choice. A child with penicillin-resistant ulcerative endocarditis was treated with celbenin. It was important to recognize and treat penicillin-resistant organisms with what was then a very specific drug'. After more experience overseas Keitha returned to New Zealand in 1964 to start work as a general paediatrician at the new National Women's Hospital. The H-Bug epidemic was over. 'Staph was not a major problem. We had the minor infections – sticky umbilicus, paronychia, but nothing major that I can recall'. [242]

Dr Jack Dilworth Matthews, an up and coming paediatrician during the H-Bug epidemic, practised as a part-time visiting specialist for National Women's Hospital from 1950 until the 1980s. He qualified in 1940 when sulphonamides were in use, and has his first clinical experience with penicillin in post-war Britain. 'It was a magic drug

[242] Dr Keitha Farmer, interviewed by Deborah Jowitt, 6 December 2002.

for those bugs which it could treat…it was used terribly widely for all ages of children of course because they got so many ear infections, nose and throat infections. It was magical for haemolytic streptococcus. (Strep) was ubiquitous and so staph became. All the time seemed to be spent deciding what percentage of various communities, hospital and otherwise, were carriers of penicillin-resistant staph'.

His perspective on the introduction of rooming-in, reflects his appreciation of the broader issues involved. '[Preventing cross-infection] was a very good justification for 'rooming-in' but it wasn't the only reason for it. It was regarded as a more natural way of treating newborns. You see in the old days we shoved babies into the nursery – they were [just regarded] as things and mothers, who were people, were kept in the wards... a lot of people, grabbed 'rooming-in' with great joy as a good reason for having the babies with the mothers'.

He saw the negative impact of breast abscesses on breastfeeding women. 'A lot of them would never breastfeed again. [Although] they made the incision on the line of the (breast) duct so that very few ducts would be destroyed… The main thing was, once bitten, twice shy'. He and his registrar of the time, Dr Mont Liggins (later Sir Mont Liggins) developed a bedside trolley with a fiberglass cot to facilitate rooming-in. 'The whole idea was to remove all the inhibitions you could safely remove. Less restrictions; a more normal situation [for mother and baby]'.[243]

Dr Rod Ellis-Pegler, an infectious diseases physician still practising in 2004, had the experience of entering his specialty at a time when it appeared to the local and international medical community that the battle against microbes had already been won. 'When I said that I was going to specialize in infectious diseases there were people who said that I was foolish. In 1967, 68 they said why don't you do endocrinology? There aren't going to be any infections. I knew enough evolution to know that I didn't agree with them. These people were my advisers…[This attitude] persisted throughout my training. We had superb microbiology teaching at the University of Otago but no clinical follow through at all. There was no infectious diseases specialist down there'.

[243] Dr Jack Dilworth Matthews, interviewed by Deborah Jowitt, 10 January 2003.

In 1975, Dr Ellis-Pegler was appointed to Auckland Hospital, on the budget set aside for an infection control medical officer. He had no idea, however, when or why this position had been established and was not expected to fulfill this function as part of his infectious diseases role. He had been imbued with a deep interest in infection prevention and control during his training, so did go on to establish an infection control committee in the late 1970s. His career has spanned decades of change during which medical attitudes to anti-microbial resistance have radically altered. The collective medical memory of nosocomial staphylococcal infection in the 1950s had to all intents and purposes completely disappeared by the time he was appointed.

'The very notion that there was a need for an infectious diseases physician [was outlandish]…I had to convince [my colleagues] by being a very good clinician so that they realized that people with my sort of training was useful to them….Then antibiotic resistance started to appear again [in the 80s] and [my skills and advice] began to be accepted'. In essence it seemed that if the consequences were not immediately obvious to clinicians they tended to ignored the relationship between prescribing and resistance. 'Antibiotics were the solution. Just find new antibiotics and of course that is what happened all through the 1960s, 70s and 80s. They simply found new antibiotics and the resistances would go up the social scale of the new antibiotic…. Finally people started listening to what people like me have been saying for decades but what others hadn't wanted to hear.[244]

[244] Dr Rod Ellis-Pegler, interviewed by Deborah Jowitt, 1 April 2003.

CHAPTER FOUR

A Pill for Every Ill

> It is true that twenty years ago doctors had to be careful not to write expensive prescriptions…The public knew little about drugs and had only limited faith in their power to do good. Today they have been educated…to think there is a specific remedy for every ill…[245]

Penicillin and subsequent antibiotics were prescribed frequently once adequate supplies became available. The high price of the new drugs was borne by the Pharmaceutical Benefits Scheme, introduced in 1941 under the 1938 Social Security Act. Under the scheme, patients received their medicines free while doctors were able to prescribe 'as they saw fit' without consideration for the cost of the drugs.[246] Both the miraculous therapeutic effects of antibiotics and the total funding of the drugs contributed to the rapid rise in their use. Large numbers of doctors entered or re-entered practice during the post-war years, and none of those already qualified by 1945 had received formal training in the appropriate use of antibiotics.[247] Extensive and at times 'indiscriminate' prescribing of antibiotics was implicated in the increasing incidence of infections caused by antibiotic-resistant strains of that 'versatile and ubiquitous pathogen', *Staphylococcus aureus*.[248]

By the mid-1950s, Health Department officials had already experienced the difficulties involved in applying effective restrictions on antimicrobial prescribing in an effort to control costs. The Department was wary of challenging the medical profession on sensitive issues involving clinical practice and appealed instead to the professional integrity of individual doctors to control the incidence of 'extravagant' prescribing. Doctors, however, were subject to competing pressures – patient demands for medicines, the association between new drugs, progressive practice and higher financial status and the persistent marketing of 'branded' antibiotics by the pharmaceutical manufacturers.

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[245] AJHR, 1960, H.31, p.67.

[246] J.B. Lovell-Smith, *The New Zealand Doctor and The Welfare State*, Auckland, 1966, p.183. Lovell-Smith claims that, 'there is no evidence that the medical profession was ever advised which drugs were free, or how much each cost'.

[247] 'The number of doctors entering or re-entering practice (post-war) was comparatively large, and by the end of 1947 the number of men in practice had increased by over 50 per cent from 1942', ibid., p.183.

[248] C.E. Dolman, 'The Staphylococcus: Seven Decades of Research (1955-1955)', *Canadian Journal of Microbiology*, 2, 1956, pp.189–200.

As the 'gatekeepers' of medicines and other health benefits, doctors were of particular interest to the burgeoning drug industry.[249] In an increasingly competitive pharmaceuticals market they were the focus of expensive advertising campaigns to promote antibiotic use and ensure loyalty to brand name products. The Department of Health restricted a single antibiotic, erythromycin, for use against penicillin-resistant infections in 1956, but no substantial policies to restrict the use of antimicrobials emerged until the 1980s.[250] Methicillin-resistant strains of *Staphylococcus aureus* appeared during this time, signaling the end of the twenty-year respite afforded by the penicillinase-resistant beta-lactams and other new antibiotics.

Penicillin

The discovery of the therapeutic effects of penicillin in 1941 was a key factor in the development of the modern pharmaceutical industry. The success of the sulphonamides, discovered in 1935, had already stimulated investment and a progressive change in production methods. Sulphonamides were produced widely under patent from 1936 by large-scale precision manufacturing techniques after the isolation of the active principle, aminobenzene sulphanilamide.[251] Penicillin had broader therapeutic application and far greater commercial potential once the difficulties of mass production were overcome.[252] Profound changes to the New Zealand health system, initiated by the 1938 Social Security Act, occurred at the same time as 'dramatic advances in organic chemistry and the subsequent development of synthetic drugs in Europe and the United States. These events transformed the pharmaceutical industry from a commodity business to a sophisticated international industry producing mainly synthetic, mass-produced medicines, well protected by patents'.[253] The way in which people were introduced to these new medicines also changed. It was not by the traditional routes – pharmacists,

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[249] Astrid Baker, Private Interests and Public Money: The State Provision of Medicines in New Zealand 1938-1986, PhD thesis, Massey University, 1996. In her thesis, Astrid Baker frequently refers to the 1938 Social Security Act establishing the medical profession as the 'gatekeepers' of health services in New Zealand.

[250] In 1966, 'the necessity for any set policy aimed at controlling the activities of staphylococci has been much diminished by the introduction of penicillinase-resistant antibiotics (methicillin and cloxacillin) and other new antibiotics (fucidin, lincomycin and cephaloridine). R.E.O. Williams, R.Blowers, L.P. Garrod & R.A. Shooter, *Hospital Infections*, Aylesbury, 1966, p.279.

[251] 'The introduction of the sulphonamides summons up such hackneyed phrases as 'a miracle durg', a 'breakthrough', or 'the dawn of a new era in medicine'. Hackneyed they may be, but they are not an exaggeration'. Irvine Loudon, *The Tragedy of Childbirth Fever*, Oxford, 2000, p.183.

[252] Although the British team lead by Florey and Chain was the first to demonstrate the therapeutic effects of penicillin, the Americans, who were yet to enter hostilities, developed improved culture methods for mass production. The first of the semi-synthetic penicillins did not appear on British and American markets until November 1959, 17 years later. Nicholas Wells, *Medicines: 50 Years of Progress 1930 – 1980*, London, 1980, pp.11-20.

advertisements, word-of-mouth – but rather through a consultation with the physician and the delivery of a prescription.[254]

1938 Social Security Act

The 1938 Social Security Act laid the framework for the first Labour Government's plan to provide a free medical service including a free public hospital service and free medicines. Sustained opposition from the local branch of the British Medical Association to the proposed general contract for doctors delayed the introduction of the pharmaceutical benefits scheme until 1941.[255] Under the scheme, the Minister of Health paid from the Social Security fund for medicines listed on the schedule or Drug Tariff.[256] Doctors could prescribe from the fund as they saw appropriate without considering the cost of the medicine, either to the patient or the state.

The medical right to prescribe was accompanied by the stipulation that pharmacists could not substitute a cheaper product for the brand name prescribed by the doctor. The scheme appeared to be economically feasible and indeed projected spending could only have included the limited drugs then available. There was no precedent for the chemotherapeutic revolution that was about to unfold. In the years leading up to the passage of the Social Security Act, chemotherapy was still largely concerned with providing symptomatic relief in the form of tinctures, nostrums, syrups and remedies; modern formulations of drugs, such as tablets, were virtually unknown.[257] As Astrid Baker comments in her 1996 PhD thesis; no government could have anticipated the Pandora's Box they were about to open.[258]

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[253] Astrid Baker, Paying the Price: Pharmaceutical benefits and Government Policy-Making, 1938-1986, in Linda Bryder and Derek Dow, eds, *New Countries and Old Medicine*, Auckland, 1995, p.120.

[254] Jordan Goodman, Pharmaceutical Industry, in Roger Cooter and John Pickstone, eds, *Medicine in the 20th Century*, Amsterdam, 2000, p.149.

[255] See J.B. Lovell-Smith, *The New Zealand Doctor and the Welfare State*, Auckland, 1966, for a detailed record of the prolonged negotiations between the British Medical association and the first Labour Government from 1936-1941.

[256] 'The Drug Tariff set out only in general terms the medicines that could be charged to the Social Security Fund. The scope was liberal: in effect, any doctor's prescription for a drug for which a formula was published in the an official pharmaceutical publication, namely the current editions of the British Pharmacopoeia and the British Pharmaceutical Codex, could be presented to a contracting pharmacist and become a charge on the Fund'. Astrid Baker, 1996, p.47.

[257] Pauline Norris, From Craft to Profession: A Brief History of Retail Pharmacy in New Zealand, 1938-1986, in Linda Bryder and Derek A. Dow, eds, *New Countries and Old Medicine*, Auckland, 1995, p. 126; 'According to the British Pharmacopoeia of 1932, for instance, there were just 36 synthetic drugs, including aspirin, phenaticin and barbitone, all of which had been developed in Germany before 1900'. Nicholas Wells, *Medicines: 50 Years of Progress 1930 – 1980*, London, 1980, p.9.

[258] Baker, 1995, p.119.

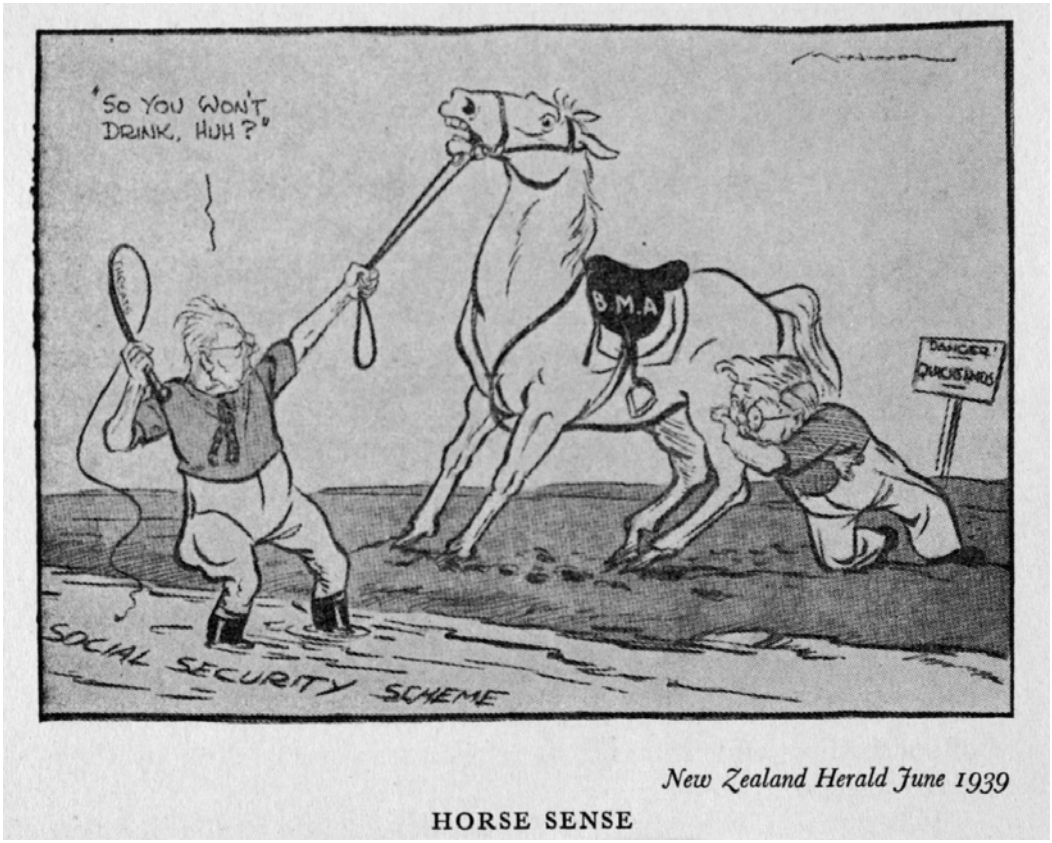

Figure 4: Horse Sense

New Zealand Herald, June 1939, cited in J.B. Lovell-Smith, The New Zealand Doctor and the Welfare State, Auckland, 1966.

Doctors – the 'Gatekeepers'

Doctors, in particular general practitioners, were seen as central to the success of the new social security scheme. Their unconditional right to prescribe appears to have gone largely undisputed in key political forums. As part of preparation for the introduction of the Act, the Minister of Health, Peter Fraser, appointed a National Health Insurance Committee, later known as the McMillan Committee after its chairman Dr D. G. McMillan, a general practitioner representing the electorate of Dunedin West. In 1937, the McMillan Committee recommended the establishment of a universal national health service including the provision of free medicines, but McMillan privately warned Fraser that under the recommended scheme prescribing would rise, 'probably 300-400 per cent'. He proposed an alternative scheme for pharmaceuticals that would ensure that the increase in expenditure would benefit the state, while still nurturing local enterprise. According to Baker, his advice was ignored, as 'free medicines were not seen as a

controversial issue but simply part of the scheme as proposed'.[259] Sidney Holland, the Leader of the Opposition, expressed the prevailing opinion in 1941: 'A doctor should be free to choose what would do the most good without the thought at the back of his mind that the person might be called upon to meet the expense himself if instructed to use something not on the Social Security list'.[260]

Assistance to Pharmacies

The Social Security Act utilized pre-existing arrangements – doctors prescribed while pharmacists dispensed. Although the Act was primarily devised to provide universal care for the ill and disadvantaged, its provisions also benefited and promoted industrial and professional interests. Unrestricted prescribing and the rapid increase in the range of chemotherapy available from the early 1940s, contributed to a dramatic rise in the number of prescriptions that were dispensed annually.[261] Retail pharmacies in New Zealand were substantially assisted by government policies intended to provide full employment and implement a broad social security system. In 1936 the Labour Government passed the Industrial Efficiency Act 'to promote the economic welfare of New Zealand by providing for the promotion of new industries in the most economic form'.[262] The government aimed to strengthen and encourage local industry to create sustainable jobs and conserve precious foreign exchange. Pharmacies were among the locally based businesses regulated under the Act by a system of licensing. Pharmacists received payment based on the wholesale cost of the drug; a profit margin based on that price, prescribing fees, container fees and breakage fees.[263] 'While the Department of Health was committed to provide a full range of medicines at no or low cost to the patient, the Department of Trade and Industry aimed 'to establish and maintain good returns on investment for…pharmaceutical manufacturers and importers'.[264] Pharmacists as well as doctors and patients were well pleased by the new system. 'Doubling of turnover since we commenced (the Scheme) is not uncommon' wrote the Director of Pharmacy, E.R. Myers, in May 1942. 'Quite a number of pharmacists have

[259] Baker, 1996, p.30.
[260] *New Zealand Parliamentary Debates*, (*NZPD*), 1941, 260, p.656.
[261] 'In 1939, the average number of prescriptions dispensed per pharmacy was 3,000. Between 5 May and 12 August 1941, 2,000 new scripts were dispensed in one small pharmacy. During 1942, 3,500,000 scripts were dispensed as pharmaceutical benefits'. Baker, 1995, p.119.
[262] *The Statutes of the Dominion of New Zealand*, 1936, p.407.
[263] Baker, 1996, p.50.
[264] Baker, 1995, p.118.

been overwhelmed by the work that is coming to them and believe themselves to be on the high road to prosperity…'[265]

Paying the Price

The number of prescriptions charged to the Fund climbed steeply from the introduction of the scheme. They 'rose from 3.5 million in1942-3 to 4.75 million in 1944 and 5.5 million in the following year', while the 'average number of scripts per pharmacy increased from 3000 per annum in 1939 to almost 10,000 in 1946'.[266] Politicians and Health Department officials were frustrated by the lack of public interest in the rising cost of medical care; 'Many expensive new drugs have been introduced during recent years, and in the absence of health-benefits legislation the majority of them would not have been available to most patients on account of their cost'.[267] The public demand no doubt seemed insatiable because many were 'receiving services which they were unable to afford in the past' and because the new drugs could provide an effective cure for previously untreatable illnesses.[268]

With no direct control over doctor's prescribing, apart from limits to the length of treatment or supply per prescription, the Department of Health was unable to halt rising trends in drug consumption. Department officials could appeal to doctors to avoid 'excessive prescribing', but the government was loathe to confront the medical profession on an issue central to their professional and economic status. Francis Mclean, acting Director General-of-Health, summed up the status quo in a memorandum to Arnold Nordmeyer, the Minister of Health, on 14 July 1944; 'It is extremely difficult to exert any effective influence on the manner of doctors' prescribing'.[269] This aspect of the universal scheme was a political minefield. In future, 'any levying of charges for prescriptions would be an unpopular and difficult political decision for governments'.[270]

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[265] ibid., p.119; When in May 1941, the scheme was started, 'each of the four District Pricing Offices began to record a startling increase in the volume of prescriptions dispensed. In May 1941, for example, the Christchurch District Office received 1,107 prescriptions and only £146 was paid to pharmacists. The following month the number of prescriptions received had jumped to 11,543 and £1,506 was paid to pharmacists…In September 1941 the district office received 36,500 scripts and paid out £5,023 to pharmacists'. Baker, 1996, p.74.

[266] Norris, 1995, p.129; Astrid Baker, Setting the Rules: Pharmaceutical Benefits and the Welfare State, in *For Health or Profit*, Peter Davis, ed, Auckland, 1992, p.21.

[267] AJHR, 1947, H-31, p.30.

[268] AJHR, 1947, H-31, p.29.

[269] Baker, 1996, p.84.

[270] Baker, 1992, p.20.

New Antibiotics Enter the Market

In 1942, penicillin was followed by streptomycin, the first broad-spectrum antibiotic active against a wide variety of organisms. Recognizing the tremendous potential for product development, pharmaceutical companies began to launch massive screening programs in which soil, dust and molds from all parts of the world were examined for antibacterial activity. Chloramphenicol was derived from a sample of soil from a field in Venezuela in 1947, then successfully synthesized in 1949 by the chemists of Parke Davis and Company, to become the first synthetic antibiotic on the market. Lederle Laboratories produced Aureomycin in 1948 and Pfizer produced Terramycin in 1950, both derived from soil bacteria. A mold isolated in the sewers of Sardinia in 1945, Cephalosporium acremonium, was eventually marketed in 1964 as Ceporin, but only after Glaxo had spent £2 million in ten years work on the drug. The investments in research, production and marketing, were recouped by the huge profit margins from pharmaceutical sales. In an environment where prescribers, pharmacists and patients had no concern for the rising cost of medicines, 'drug manufacturers had little to fear from buyer resistance to higher prices'.[271]

Pharmaceutical Marketing

Antibiotics soon dominated among the total drugs prescribed in New Zealand and other western nations.[272] 'In 1951 (in the United States), the amount of penicillin used was sufficient to treat every member of the population for one attack of pneumonia. The amount of streptomycin used was sufficient for a year's treatment of a million cases of tuberculosis. In addition 250 tons of broad spectrum antibiotics were ingested'.[273] Antibiotic sales had an enormous impact on global pharmaceutical markets. Before

[271] Baker, 1992, p.20.
[272] 'By the early 1950s, penicillin was the single most important prescription pharmaceutical: in the United States, its sales alone accounted for 10% of the industries total'. Goodman, 2000, pp.141-154.
[273] J.A.K. Cuningham, Penicillin Reactions, *NZMJ*, 54, 1955, pp.261-266.

Health Benefit Expenditure April 1943 to April 1971 (millions of dollars)

Year ended 31 March	Pharmaceutical benefits	Maternity benefits	Medical benefits	Hospital benefits	Total supplementary benefits	Total health benefits	Pharmaceutical benefits (% of total)	Total health benefits (% of GNP)	Mean population (million)	Average cost of pharmaceutical benefits per head (current $)	Average cost of pharmaceutical benefits per head (1986 $)
1943	1.13	1.01	2.03	3.08	0.20	7.45	15.1	1.11	1.64	0.68	11.39
1944	1.52	1.03	2.35	4.33	0.27	9.51	16.3	1.27	1.64	0.93	15.24
1945	1.96	1.06	2.57	4.66	0.34	10.60	18.5	1.40	1.66	1.18	18.95
1946	2.27	1.20	2.86	4.35	0.46	11.13	20.4	1.39	1.71	1.33	21.08
1947	2.88	1.35	3.52	3.97	0.70	12.42	23.2	1.46	1.77	1.63	25.72
1948	3.12	1.60	4.34	3.90	1.09	14.04	22.2	1.46	1.81	1.72	25.79
1949	3.59	1.83	4.61	4.00	1.72	15.75	22.8	1.61	1.84	1.94	27.49
1950	4.09	1.74	5.05	4.02	2.02	16.92	24.2	1.54	1.88	2.17	30.22
1951	4.19	1.77	5.32	4.04	2.12	17.45	24.0	1.25	1.92	2.19	28.25
1952	4.86	1.77	5.52	4.23	2.36	18.74	25.9	1.30	1.96	2.48	28.73
1953	6.03	1.84	6.09	4.27	2.62	20.86	28.9	1.37	2.01	3.00	32.83
1954	5.84	1.85	6.17	4.37	2.99	21.21	27.5	1.26	2.06	2.83	29.57
1955	6.10	2.30	6.70	6.82	3.27	25.18	24.2	1.35	2.11	2.89	29.04
1956	8.08	2.75	7.10	9.53	3.64	31.10	26.0	1.58	2.15	3.76	36.85
1957	9.15	2.83	7.59	9.74	4.24	33.55	27.3	1.63	2.19	4.17	39.45
1958	8.93	2.90	7.86	9.86	4.57	34.12	26.2	1.56	2.25	3.98	36.85
1959	10.23	3.09	7.94	11.55	4.51	37.31	27.4	1.64	2.30	4.45	39.09
1960	11.91	3.12	8.49	11.30	4.96	39.78	29.9	1.63	2.35	5.08	43.62
1961	13.60	3.31	8.49	11.37	5.53	42.30	32.1	1.61	2.39	5.69	48.43
1962	15.36	3.51	8.76	12.52	5.80	45.94	33.4	1.69	2.44	6.29	52.39
1963	16.12	3.72	8.61	12.68	6.40	47.52	33.9	1.63	2.50	6.45	52.47
1964	15.83	3.61	8.63	13.36	6.96	48.39	32.7	1.51	2.55	6.21	49.42
1965	17.73	1.56	8.76	3.17*	5.31	36.53	48.5	1.05	2.60	6.82	52.24
1966	19.51	1.52	8.79	3.72	6.08	39.62	49.3	1.06	2.65	7.37	54.82
1967	21.07	1.95	8.68	4.13	6.39	42.23	49.9	1.09	2.69	7.82	56.40
1968	22.27	2.05	8.85	4.44	6.86	44.46	50.1	1.10	2.74	8.14	55.28
1969	24.46	2.07	8.79	4.85	7.24	47.40	51.6	1.09	2.76	8.86	57.60
1970	26.31	2.96	9.70	5.49	7.63	53.07	51.5	1.12	2.79	9.79	60.77
1971	30.78	3.13	11.76	6.63	9.38	61.67	49.9	1.14	2.83	10.87	62.53

Sources: Royal Commission on Social Security in New Zealand, *Social Security in New Zealand, AJHR* 1972, H.53, pp.553-554; Coopers & Lybrand Associates, *Report on the Removal of Medicines from Price Control* (Wellington, Department of Health, 1986), Table 1.3.

* Health benefits made payable from Consolidated Fund; Social Security discontinued; benefits for public hospital services discontinued and included in grants to hospital boards.

Figure 5: Health Benefit Expenditure – April 1943 to April 1971
Astrid Baker, Private Interests and Public Money: The State Provision of Medicines in New Zealand 1938-1986, PhD thesis, Massey University, 1996.

World War II the world market for pharmaceuticals stood at $600 million. By the mid-50s, this had risen to $4000 million then $7000 by the end of the decade.[274] The transition from proprietary preparations to prescription drugs occurred rapidly during the 1940s until by 1954, in the United States at least, the sales of prescription drugs were three times as high as proprietary medicines. Although penicillin and streptomycin could not be patented because they were derived from commonly available moulds, many different firms produced these drugs under a system of competitive international licensing and distribution.

As prices fell dramatically in the highly competitive environment, pharmaceutical companies claimed that the cost of research and development was driving them to reconsider the risks of investment in the production of new antibiotics. Patents and monopolies were needed to ensure returns commensurate with their investment. In 1948, the United States Patent Office ruled to protect the technique used to develop streptomycin. Patenting the process created the opportunity to identify new products however slight the biochemical difference between competing brands. The 1949 Patent Act established modern British patent law upon which New Zealand's own law was based.[275] The Act guaranteed secure patent on new chemical compounds and the processes for their manufacture for 16 years. Chemical modification of any drug already being produced under exclusive right would fall outside the original patent protection and might even be patentable as a separate product. While the intention was to nurture research and development in the pharmaceutical industry by protecting investment in promising areas of investigation, the net result was a plethora of similar compounds marketed under competing brand names.[276] 'The establishment of these principles of patent protection during the late 1940s, was a crucial stage in the development of the international pharmaceutical industry, and influenced the way in which companies would compete with each other. Each product, no matter how closely similar to another, could be clearly differentiated by a patent as well as a brand name'.[277]

[274] Goodman, 2000, p.149.
[275] Baker, 1996, p.58.
[276] 'Referring to his company's work on tetracycline and its new product forms, the president of Bristol Laboratories put the matter in the following words; None of these would qualify as a major scientific advance, but they were practical useful improvements. They lay in such areas as making liquid suspensions more stable, making liquid forms simpler and more pleasant for the patient to take, combining injectable forms with a superior anaesthetic, and the like.' Goodman, 2000, pp.147-148.
[277] Baker, 1996, p.58.

In practical terms the legislation led to backroom negotiations within the international pharmaceutical industry, agreed price fixing, and aggressive brand name promotion to doctors. Research and development was far less profitable than carefully managed marketing. The bargains, struck within the industry during this time, were revealed during the United States 'Kefauver' Hearings in the Senate in June 1960. The broad-spectrum antibiotic, Aureomycin, produced by Lederle, was chemically manipulated by a rival company, Pfizer, to create Tetracycline. Lederle and three other competitors challenged Pfizer's subsequent patent applications. 'In the resulting manoeuvres, the Patent Office which had the authority and responsibility to sort out the various competing and complicated claims, was sidestepped and the problems resolved in backrooms, boardrooms and courtrooms…Each of the tetracycline producers increased their advertising costs – including the budgets set aside for representatives – innovating in the style and nature of marketing their product and especially how they contacted and convinced physicians to prescribe their version of the drug'.[278]

Advertising to Increase Sales

Promotion to doctors included two main strategies – advertising and education. 'Doctors recognized the importance of drugs as the most effective means of reinforcing their professional position as scientifically advanced practitioners, and acknowledged the manufacturer's role as suppliers of up-to-date pharmaceutical information'.[279] In New Zealand, companies used local professional publications such as the *New Zealand Hospital* and the *New Zealand Medical Journal* to promote their products, as well as direct supply of drug samples to doctors' surgeries. They also provided education sessions for doctors. In Auckland, these were often held in comfortable and prestigious settings as evening presentations accompanied by generous hospitality. Dr Fred McConnell, a general practitioner during this period, recalled that, 'the drug companies ran very good lectures seminars on drugs and diseases. They were entertaining; they brought in very good lecturers from overseas and the best ones locally too. They were a very good source and knowledge and a very enjoyable source too – they'd give you lovely meals and lovely drinks too, twelve at a table and we'd have good lively discussions – a very effective way of learning'.[280]

[278] Goodman, 2000, p.149.
[279] Baker, 1996, p.54.
[280] Dr Fred McConnell, interviewed by Deborah Jowitt, 1 January 2003.

Drug company representatives were as keen to promote consumption of their products as they were to enhance medical education, however well they coated the pill. It would appear that their strategies were highly successful - Health Department spending on pharmaceutical benefits rose from $1.13 million in 1943 to $9.15 million in 1957 and $21.07 million by 1967.[281]

Controlling Prescribing

Although the Department of Health wanted to reduce costs by preventing the indiscriminate use of antibiotics and other drugs, attempts to control expenditure during the 1950s exposed some of the inherent difficulties of applying restrictions to doctor's prescribing under the Social Security Act. The Department identified the prescribing of oral penicillin as one cause of a large increase in the average cost of prescriptions in July 1952. From 1 August 1952, it set a limit for each prescription of ten penicillin tablets of any strength, and at the same time, imposed a general limit of 15 days prescribing treatment on all scripts. The results were unexpected; doctors tended to prescribe more frequently for the same patient, so prescription numbers increased. Not only did the 15-day limit cause a sharp increase in the number of scripts dispensed for the month of August (an all time record high), but pharmacists gained an increase in dispensing fees.[282]

The antibiotics chlortetracycline, chloramphenicol and oxytetracycline, became available in New Zealand in 1953. To contain costs, the Department of Health initially restricted the use of these antibiotics to hospital boards, however, in the face of persistent lobbying by doctors and the main wholesale distributors, the Department made these drugs available on the Drug Tariff in 1955. This step was calculated to cost an extra £250,000 per annum.[283] In 1956, the Government appointed a Special Committee on Pharmaceutical Benefits to inquire into the abrupt rise in the average costs of prescriptions from 5s 11d in 1955 to 7s 2d. The committee, consisting of three doctors, two pharmacists and two treasury representatives, was to advise the Minister of

[281] Royal Commission on Social Security in New Zealand, Social Security in New Zealand, AJHR, 1972, H.53, pp.553-554.
[282] Baker, 1996, pp.92-93.
[283] Baker, 1996, p.96.

Health on possible means of reducing the rising costs of pharmaceutical benefits.[284] After consideration of the issues they had very little to offer apart from a general acceptance that the scheme must inevitably face rising costs if it was to keep up with international medical progress. In their opinion, the scheme rested 'upon the integrity of the medical and pharmaceutical professions' and could not be made more efficient by applying a 'multitude of fussy, pettifogging regulations and restrictions'.[285]

Although the committee had acknowledged the complex issues impacting on rising costs – 'patient demand for new and expensive drug treatments available, pressure from pharmaceutical manufacturers, the prescribing of expensive new branded drugs, and the lack of stringent regulations to control 'extravagant' prescribing – the Department of Health was exceedingly reluctant to place restrictions on doctor's prescribing.[286] The basis of this unwillingness to act, seems to have been their ambivalent attitude towards the medical profession that, when challenged, had already proven itself an intractable opponent of any moves that might threaten professional independence or financial status. Department officials sought co-operation not conflict.

Regular circulars, sent to all medical practitioners by the Department of Health during the late 1950s, 'continued to emphasise its policy of making available as pharmaceutical benefits as wide a range as possible of new and valuable products'.[287] The Department was apparently resigned to the situation; 'New and potent remedies will continue to be produced as time goes on. They will be costly; but we cannot afford to do without them.

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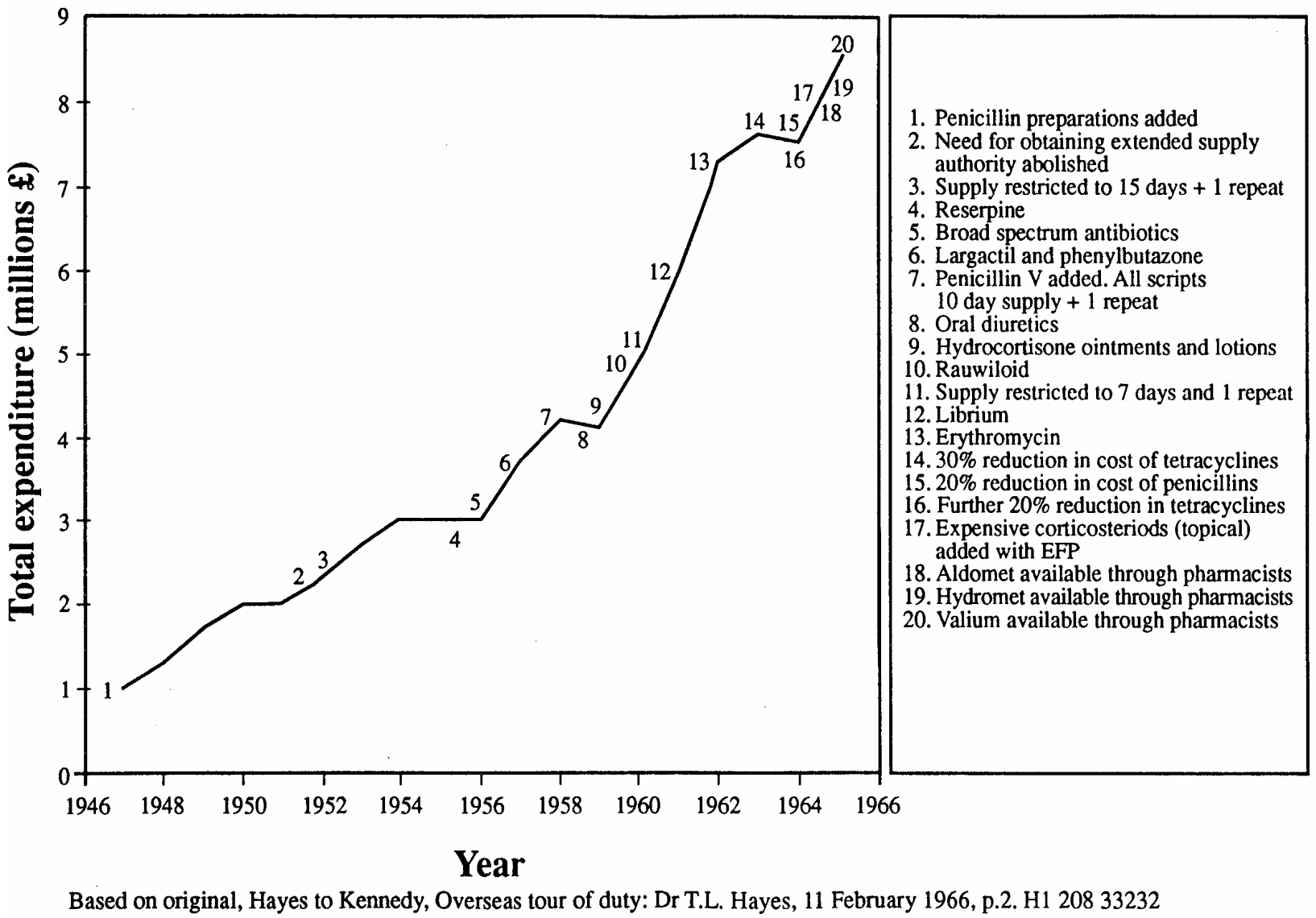
[284] Special Committee on Pharmaceutical Benefits, *Report*, Wellington, Government Printer, 1957, cited in Baker, 1996, p.93.

[285] Baker, 1996, p.95. The Special Committee on Pharmaceutical Benefits consisted of Dr A.S. Thompson, Department of Health, Dr J.M. Twhigg and Dr J.Keeling, the New Zealand Branch of the BMA, and two pharmacists, D.S. Dodds and N.R.C. Wilson, the Pharmacy Board and Chemist's Service Guild.

[286] Baker, 1996, p.95.

[287] Baker, 1996, p.98, cites as an example; Department of Health, Circular letter to all medical practitioners, A.W.S. Thompson, Director, Division of Clinical Services, 12 July 1957, p.1. H.1 208-25-2 26230. She comments that doctor's 'almost unrestricted access (to drugs) appeared to be part of the price the Government had committed itself to pay for doctor's co-operation a s the gatekeepers to all health services', p.102.



Based on original, Hayes to Kennedy, Overseas tour of duty: Dr T.L. Hayes, 11 February 1966, p.2. H1 208 33232

Figure 6: Changes in expenditure on pharmaceutical benefits 1947 to 1965
Astrid Baker, Private Interests and Public Money: The State Provision of Medicines in New Zealand 1938-1986, PhD thesis, Massey University, 1996.

While pursuing a vigorous campaign for careful prescribing…we must continue our policy of making the best of the new drugs available at the cost of the Fund…There can be no standing still, no holding fast to the present position. Any such plan would be short-sighted in the extreme'.[288] But when spending on pharmaceuticals soared in 1960, 'the situation called for drastic action'.

Changes to the Pharmaceuticals Benefit were made in 1960 on the advice of the two advisory committees most concerned; the Pharmacology and Therapeutics Committee (medical) and the Pharmaceutical Advisory Committee (chemists). Predictably, 'the reaction was immediate and violent. Resentment on the part of many doctors was intense, and the Department and the advisory committees came in for a great deal of acrimonious criticism'.[289]

Misuse and Overuse

Although the government was primarily concerned with the financial impact of 'indiscriminate' prescribing, the rising incidence of antimicrobial resistance in the mid-1950s, posed another challenge. Department of Health officials were by then well aware of the difficulties of controlling doctor's freedom to prescribe 'as they saw fit'. In the political and social climate of the 50s, the only acceptable source of restraint seemed to be the profession itself. From 1954 onwards, there were repeated calls from both individual practitioners and medical academics to reduce the amount of antibiotics being prescribed to control the emergence of clinically significant anti-microbial resistance in New Zealand. Papers in international medical journals had already drawn attention to the dangers of the increasing dependence on antibiotics in clinical practice. 'The possible tendency to use chemotherapy as a partial substitute for meticulous sterile technique' as well as 'the indiscriminate administration of antibiotics should be discouraged and prophylaxis and multiple drugs should be avoided except when they are known'. [290]

[288] AJHR, 1958, H.31, p.105.
[289] AJHR, 1958, H.31, pp.65-66.
[290] Chester W. Howe, Postoperative Wound Infections Due To *Staphylococcus Aureus*, *New England Journal Of Medicine*, 251, 11, 9 September 1954, pp.411-417.

Local practitioners were also aware of problems arising from 'bad doctoring'.[291] When penicillin resistant infections first emerged in New Zealand in 1955, Drs Cuningham and Beaven of Christchurch Public Hospital, cautioned against the tendency of some practitioners to prescribe large amounts of antibiotics inappropriately. 'Both in this country and overseas, the increasing dangers of this practice have now become manifest after several years grace…There is ample proof that the development of resistant strains is solely dependent on widespread use and abuse of antibiotics. The ready availability of erythromycin and its apparent freedom from side effects are popularizing this antibiotic. Unfortunately staphylococci all too readily develop resistance to erythromycin. For this reason it should not be used a primary treatment but might well be reserved for cases of staphylococcal enterocolitis or other staphylococcal infections due to resistant strains'.[292]

Cuningham and Beven's suggestion to control the use of erythromycin was taken up by the Department of Health in 1956.[293] Instances of controlled prescribing of erythromycin are documented as late as 1960, when Dr Audrey Jarvis examined the level of staphylococcal infection among mothers and babies in the Palmerston North Hospital maternity unit. 'Resistance to chloromycetin and cathomycin was rare and no resistance was found to erythromycin. This may well be because erythromycin is only used in this hospital with the permission of the medical superintendent, and both cathomycin and chloromycetin are used only to a limited degree'.[294] Infection Control Committees, such as that appointed by the Auckland Hospital's Committee, did useful research on the rates of infection within their own institutions. They advised on nursing and medical practice, referencing local and international work on the most effective means of preventing cross-infection.[295] When hospital administrators and committees gave advice to individual practitioners in the community, however, it was in the form of recommendations, not controls.

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[291] '"Good doctoring" does not imply expensive prescribing, but rather the reverse'. Dr A.S.W. Thompson, Director, Division of Clinical Services, AJHR, 1958, H.31, p.105.

[292] J.A.K. Cuningham & D.W. Beaven, 'Fatal Enterocolitis due to Antibiotics: A Report of Three Cases', *NZMJ*, 54, 1955, pp.645-646.

[293] 'In this country…this group of antibiotics (erythromycin, carbomycin, oleandomycin and spiromycin) have been reserved "for use in the treatment of dsevere staphylococcal infections or infections resistant to other antibiotics"'. Clinical Services Letter No.5, Antibiotics Related to Erythromycin, 20 August 1958, Department of Health, Pharmaceutical Society records, Wellington.

[294] Audrey W. Jarvis, Reduction of Staphylococcal Infection of Babies in the Maternity Unit of a New Zealand Hospital, *NZMJ*, 60, 1961, pp.570-573; A decision was made to 'relax restrictions on the use of erythromycin and spiromycin…now that other potent agents have become available for the treatment of resistant staphylococcal infections'. Therapeutic Notes No.29, 20 October 1961, Department of Health, Pharmaceutical Society records, Wellington.

The epidemic tended to be a divisive rather than cohesive force within the profession, as hospital administrators and general practitioners alike, struggled to deal with the effects of staphylococcal cross-infection and the workload involved in the often lengthy treatment for boils, breast abscesses and pneumonias. At times, highly publicized comments caused considerable resentment between different sectors of the medical community. A claim by Dr Selwyn Kendrick, Superintendent-in-chief of the Auckland Hospital Board, that 'the H-Bug arose because of poor treatment by GPs', was regarded as 'an awful slur' on general practitioners, who in turn were highly frustrated by the Health Department's refusal to import long-acting penicillin.[296] 'We had to go and inject patients every 4 or 5 hours – that was the recommended thing. Three times a day you'd have to go and shoot them with penicillin. We wanted long-acting penicillin…I spoke to the Medical Office of Health about it (but) he said it wasn't an economical thing. I said the Americans did research at the Veteran's Hospital on 10,000 patients. They proved unequivocally that this was the thing'.[297] While administrators sought to reassure the public, pathologists carried the burden of the often unnecessary and fruitless investigations; 'These and related investigations, could be very interesting if carried out without interruption by routine work. They cannot be adequately done in the panic atmosphere during an epidemic of staphylococcal infection. I cannot help feeling that frenzied swabbing of individuals and groups can become a substitute for desirable action along other lines'.[298]

Patients and Prescribing

Public recognition of the medical profession as the 'gate-keepers' to the benefits of health care, provided a strong disincentive for doctors to change their antibiotic prescribing patterns. The medical profession was well aware that their access to pharmaceuticals was an increasingly important element of their success and professional standing. Medical status was enhanced by the new treatments at the expense of traditional patterns of care. 'Instead of illness being treated in the home, increasing reliance came to be placed on doctors and hospitals…Over time, the growing feelings

[295] Auckland Hospital Board, Hospitals Committee minutes, 12 December 1955, H1 131/175 – 26673, Staphylococcal Infections, 1955-57, Archives New Zealand, Wellington.
[296] Dr Fred McConnell, interviewed by Deborah Jowitt, 10 January 2002.
[297] ibid.
[298] G.C.T. Burns, Some Observations of Hospital Staphylococcal Infection, Pathologist's Conference, Napier, May 1956.

that ‘doctor knows best’ and that home health care was inadequate became ingrained in the public’s consciousness’.[299] The sulphonamide drugs had demonstrated the ability of medical practitioners to cure bacterial pneumonia and meningitis, and antibiotics further extended the range of effective therapy for other previously untreatable bacterial illnesses such as tuberculosis and typhoid. Prescribing had rapidly replaced alternative forms of therapy. Dr Anne McKinnon recalled that; ‘Penicillin was regarded as so infallible that I think that other forms of treatment weren’t emphasized enough’.[300]

The editorial in the *Auckland Star* on November 29 1955, ‘The H-Bug kills, too’, took the medical profession to task for the ‘increasing – and often indiscriminate - use that is being made of antibiotics’. While the Editor acknowledged the good work being done to prevent cross-infection he went right to the heart of the issue;

> It is reassuring to know that in Auckland some measures have been taken already to counteract the spread (of staphylococcal infection)… But this clearly, is not sufficient. The root of the trouble lies in the too frequent use of these modern drugs, however admirable and useful they may be in themselves. The medical profession has been conscious of this for some time. There have been numerous warning articles in the international medical papers and statements from top-ranking authorities. But it is the medical profession that continues to prescribe antibiotics in enormous and alarming quantities – often for trivial cuts and minor infections that could well be treated in other ways. Medical authorities have repeatedly warned doctors to restrict themselves in the use of these drugs, but so far, it appears, in vain.[301]

The Editor also cautioned the public; ‘… all the responsibility does not rest on the doctors; their patients have a duty too. They should not put pressure on doctors to prescribe antibiotics when he does not regard them as strictly necessary. Now that the dangers of excessive prescribing have been so tragically emphasized doctors and patients should co-operate to restrict the use of antibiotics to cases in which they can save lives or prevent serious complications’.[302]

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[299] Iain Hay, *The Caring Commodity*, Auckland, 1986, p.147.
[300] Dr Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.
[301] The H-Bug kills, too, Editorial, *AS*, 29 November 1955.
[302] Ibid.

But how many patients would or could have argued that their doctor was over treating them at that time? There were strong social constraints against questioning the judgment of the medical profession and few were willing to challenge the wisdom of doctors, including the nurses who worked alongside them.[303] While patient expectations had changed, it is difficult to accept that the public and the press were responsible for years of departmental and medical inaction; 'A fact seldom appreciated is that the attitude of the public towards drug treatment has changed in less than a generation. It is true that twenty years ago doctors had to be careful not to write expensive prescriptions, lest the patient complained about the cost. But at that time all that most patients desired was a "bottle of medicine". The public knew little about drugs…Today they have been educated, largely through the popular press, to believe there is a specific remedy for every ill'.[304]

Restrictions on Prescribing

The initiative to restrict prescribing would have to come from a sector of the profession that had the support of clinicians. Sensitive issues, such as expert judgment and professional independence, would otherwise detract from the problem of restricting antibiotic prescribing in order to reduce the problem of microbial resistance. In 1955, Leonard Colebrook, whose pioneering work on sulphonamides and streptococcal puerperal sepsis had in part initiated the chemotherapeutic revolution, commented that, 'We have come to rely very much in recent years upon antibiotics for our defence against infections and there is some indication that this defence is, in some cases, breaking down'.[305] Not all his contemporaries agreed.

The use of antibiotics was spiralling as new brands and multiple variations on old compounds entered the market. Reliance on antibiotics had produced a huge reduction in infectious diseases worldwide. Previously untreatable diseases such as tuberculosis, typhus and diphtheria, were coming under control. In the industrialized countries, death rates from these diseases fell so dramatically through the 1950s and 1960s that they

[303] A.S.W. Thompson, How not to get on with your doctor, *Health*, June 1958, p.6. Dr Thompson guides patients on correct etiquette when consulting their doctor. The tragic consequences of patient compliance and the difficulties faced by patients who challenged clinicians are documented in *The Unfortunate Experiment*, that chronicles the experience of women treated for cervical cancer by Professor Herbert Green from 1960-1984, Sandra Coney, Auckland, 1988.
[304] AJHR, 1960, H.31, p.67.
[305] Leonard Colebrook, Infection Acquired in Hospitals, *Lancet*, 29 October 1955, pp.885-890.

ceased to command attention. Progress was exceptionally rapid. Ronald Hare, Colebrook and Fleming's colleague at St Mary's, recalled that 'starting in 1946 when penicillin became easy to obtain, the process [of making spectacular advances in combating diseases caused by microbes] was virtually completed in 5 years. Practically all the antibiotics, synthetic chemicals and vaccines to bring it about, had been discovered and were already in use before 1951'.[306] His droll style wryly conveyed the resulting optimism of the medical profession and the public in general; '…it is now difficult to be seriously ill with an infection and very nearly impossible to die from it'.[307]

The problems raised by resistance were small compared with the overall progress in treating infectious diseases. The drug companies were continually trumpeting their successes and there was profound confidence in their ability to find a solution for penicillin-resistant staphylococci.[308] Associations between academic institutions, the state and the pharmaceutical industry, were entrenched and complex, making objective assessment of the potential for antimicrobial resistance less likely. [309] Assessing the drawbacks of antibiotics was also made difficult by the lack of data on the pre-antibiotic era; 'Staphylococcal cross-infection has been recognised as a serious problem only since penicillin came into general use…Whether there has been a real increase in this form of infection, or whether it has been thrown into relief by the almost complete absence of streptococcal sepsis perhaps no one can certainly say'.[310]

At least one clinician, Dr Chester Howe, Assistant Professor of Surgery at Boston University School of Medicine, strongly contended that staphylococcal infection *was* on the rise. He used records kept by Massachusetts Memorial Hospital to demonstrate an increase in staphylococcal infection in clean operation wounds from 1.99% in pre-penicillin days to 7.22% in a period following the introduction of penicillin.[311] He advocated 'greater restrictions on the use of antibiotics (especially broad-spectrum

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[306] Ronald Hare, *The Birth of Penicillin*, London, 1970, pp.219-222.
[307] ibid., p.222.
[308] Henry P. Treffers, Drug Resistance – To-day's Research and Tomorrow's Medicine, *NZMJ*, 53, 1954, pp. 561-568. Treffers was a Fulbright Research Scholar at the University of Otago in 1954.
[309] Goodman, 2000, pp.141-154.
[310] Williams et al, 1966, p.272.
[311] Howe, 1954, p.411.

antibiotics)' adding that, ' …One last hope is that several new antibiotics active against the staphylococcus will be introduced so that we may, in treating staphylococcal infections, ring the changes in antibiotic therapy sufficiently to prevent the emergence of resistant strains'.[312] His wishful thinking was in fact accurate – new antibiotics effective against resistant gram-positive organisms arrived on the scene in the late 1950s. Vancomycin, derived from a soil sample from the interior of Borneo, was widely used after approval by the Food and Drug Administration in 1958.[313] Two years later, methicillin became available soon followed by the cephalosporins and lincomycin.

The End of the Golden Weather

With the ability to cure penicillin-resistant infections, the pressure was off clinicians – for the time being. Specialists in microbiology were less optimistic. R.E.O. Williams, Professor of Bacteriology in the University of London, St Mary's Hospital Medical School, was pre-eminent in the field of hospital infection at this time. His collaborative work on staphylococcal cross-infection was a seminal publication on preventative measures. 'The first principle in the use of antibiotics within a hospital is rigid restrictions to really necessary indications, in order that a resistant bacterial population may not be bred and disseminated…Treatment must be with an appropriate antibiotic. What this is cannot often be self-evident, and the laboratory must be called both to make a bacteriological diagnosis and if necessary to verify the sensitivity of the organism to the antibiotic that it is proposed to use'.[314] It is difficult to assess how widely these words were read in the mid-1960s. The staphylococcal pandemic had established the field of infection control among clinicians in the USA, but it was slower to evolve as a specialty in the UK and in Commonwealth countries.[315] Permanent infection control committees, other than those set up to respond to specific issues such as staphylococcal cross-infection, were not set up in New Zealand hospitals until the mid to late 1970s.[316]

[312] ibid., p.416..
[313] Glenn L. Cooper & Douglass B. Given, *Vancomycin: A Comprehensive Review of 30 Years of Clinical Experience*, New York, 1986.
[314] Williams et al, 1966, p.278.
[315] Dr Rod Ellis-Pegler, interviewed by Deborah Jowitt, 1 April 2003.
[316] Berenice Bird, A Historical Perspective on Infection Control Nursing, paper presented at the 9th Annual Infection Control Conference, July 1990.

A comfortable era of confidence in scientific endeavour set in during the 1960s. In spite of the prevailing complacence, 'bacteriologists' continued to repeat their messages about the potential for resistance and their recommendations for restrictions on prescribing. In 1976, E.J.L. Lowbury and colleagues at Summerfield Hospital, Birmingham, affirmed the need for 'having in each hospital an agreed policy for prescribing antibiotics'. Gram-negative organisms had emerged as hospital pathogens and 'resistant staphylococci remain a problem, and strains resistant to lincomycin, fucidin and the new penicillins are being increasingly isolated; in some units they are a major problem'. Lowbury et al recommended a three-pronged approach: personal advice and example with some '*aide memoir'* readily available on the wards, active laboratory surveillance of resistant microbial strains and reservation of antibiotics to 'preserve the useful life of an antibacterial agent'. Examples of suitable policies were included for the information of readers – it is interesting to note, however. that 'this policy was not rigidly enforced, but prescribers were quite satisfied to be guided by its recommendations'. [317]

As long as new antibiotics appeared on the market to overcome the problem of resistance, the traditions of professional independence and autonomous prescribing, would frustrate the efforts of microbiologists and infectious diseases specialists to restrict the prescribing patterns of their medical colleagues. In the 1980s, widespread outbreaks of methicillin-resistant staphylococci signalled the end of the twenty-year respite afforded by pharmaceutical industry's efforts to produce the penicillinase-resistant beta-lactams and other new antibiotics.

[317] E.J.L. Lowbury, G.A.J. Ayliffe, A.M. Geddes & J.D. Williams, *Control of Hospital Infection*, London, 1976, pp.189-190.

CHAPTER FIVE

From communal nurseries to 'rooming-in'

> New Zealand will be quoted for years to come as the country which showed the world how to bring puerperal sepsis deaths down *before* the discovery of the sulpha drugs and penicillin…today's doctors…blandly tell me that penicillin will take care of cross-infections! My prophecy… is that penicillin may not always take care. It's not a panacea for carelessness and some day those streptococci and staphylococci will stage a comeback.[318]

Introduction

In 1955, the death of a baby from staphylococcal septicaemia in one of Auckland's 'outlying maternity units', followed by the highly publicized deaths of eight babies with staphylococcal pneumonia in Christchurch, precipitated lasting changes in maternity hospitals and midwifery practice in New Zealand.[319] 'Rooming-in' of mother and baby was gradually introduced to replace communal nursery care of neonates, midwifery and medical practices were re-examined, and administrative measures were reviewed to prevent staphylococcal cross-infection in maternity institutions. The sustained effort to improve maternity care during the 'H-Bug' epidemic reflected both the serious nature of the infections affecting neonates and postpartum women, and the heightened public unease about the safety of mothers and babies in the nation's maternity hospitals.

The first sign that New Zealand hospitals might be affected by the international pandemic occurred during 1953 and 1954 was when patients in the newly opened postnatal wing of Queen Mary Hospital, Dunedin, were affected by an unexpected outbreak of staphylococcal disease. Although 'never very serious', the infections were persistent, 'with breast abscesses in the mothers and skin lesions in the babies'.[320] In 1955, the 'emergence of a new mutant form of *Staphylococcus aureus* with increased virulence' was held responsible for the increased incidence of hospital-acquired

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[318] Doris Gordon, *Doctor Down Under*, London, 1957, p.112.

[319] A. Douglas, and H.T. Knights, 'Some Public Health Aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55, 1956, pp.378-387.

[320] E.F. Battersby & Hugh Stringer, 'Pathogenic Staphylococci in a Maternity Annexe', *NZMJ*, 53, 1954, pp.420-422. The dominant pathogenic strain, 52a variant, was newly identified in New Zealand although it had already been implicated in staphylococcal infections in Sydney.

infection among newborn babies and nursing mothers throughout the country.[321] The characteristic staphylococcal strain of the worldwide 'H-Bug' pandemic, 80/81, was identified as the pathogen in the Calvary Hospital outbreak in November 1955, in which eight babies died. 'The soft skin of the newborn, the skin of the lactating breast and wounded tissue' proved to be highly 'suitable terrain for such organisms'.[322]

Antibiotics in Maternity Care

Antibiotics brought miraculous therapeutic benefits to maternity patients, but they may also have contributed to an 'unconscious relaxation' in prescribing among some doctors.[323] During her hospital inspections as Director of Maternal Welfare (1946-48), Dr Doris Gordon observed an increasing reliance on antimicrobial therapy for the prevention and management of infectious maternity cases. Streptococcal infection was no longer feared as it had been in the past, and the emergence of penicillin-resistant staphylococcal infections among maternity patients in other western countries did not appear to be of serious local concern.[324]

By the mid-1950s, conditions were ripe for an outbreak of infectious disease in New Zealand's overcrowded maternity hospitals. The post-war baby boom had seriously strained the capacity of maternity facilities, but the government had done little to increase accommodation or improve conditions for postpartum women and their babies.[325] Five years after Gordon's resignation, the first evidence of 'troublesome' cross-infection emerged, and once established, antibiotic resistant staphylococcal infections made a lasting impression on the organisation and delivery of New Zealand maternity services.

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[321] AHB Senior Medical Staff Meeting minutes, 25 October 1955, pp.101-102, BAGC A638/37a, Archives New Zealand, Auckland**.** Antibiotic resistant staphylococci had become 'the immediate source of danger and the more common cause of sepsis in lying-in wards'.

[322] Battersby and Stringer, 1954, p.422; Senior Medical Staff Meeting minutes, 25 October 1955, p.102, BAGC A638/37a, Archives New Zealand, Auckland.

[323] Janet McCalman, *Sex and Suffering, The Royal Women's Hospital, Melbourne 1856-1996*, Melbourne, 1998, p.230.

[324] Mary Barber & Mary Rozwadowska-Dowzenko, 'Infection by Penicillin-Resistant Staphylococci', *Lancet*, 23 October 1948, pp.641-644. Of 30 infected patients who had not had penicillin previously, 21 were from the maternity department, 19 having neonatal infections. Of these, 1 newborn infant with septicaemia died.

[325] AJHR, 1953, H-31, pp.55-56. To provide for more mothers within the limited facilities, hospitals had to use considerable ingenuity; Adelheid Wassner, *A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972*, Dunedin, 1999, p.66, '…in 1947…a bed was added to each room, and the alcove…was closed-in to make room for two more beds. During the night the newly delivered women were accommodated in the antenatal clinic…at weekends, those ready to go home were transferred to the clinic…'

The Management of Childbirth in the 1950s

The management of childbirth in New Zealand in the 1950s was highly prescriptive with regimented routines and procedures in place to reduce the possibility of infection. The principles were precisely defined in the Department of Health handbook, H.-Mt. 20, *The General Principles of Maternity Nursing*, regarded as the 'Bible' for midwives and maternity nurses.[326] Women were subjected to a vulval shave, warm water enema and shower-bath on admission in labour, with delivery conducted in the left lateral or dorsal positions, followed by bed rest for a fortnight. 'She may have a bath towards the end of her fortnight's stay, provided she feels fit and the bath is thoroughly cleansed before and after use'.[327] Babies were kept in the communal nurseries apart from closely monitored four hourly feeds; 'The baby should be put to both breasts for the first time about four hours after birth, and at four-hourly intervals from then on, with an eight hour interval at night-i.e., between 10 p.m. and 6 a.m'.[328] Husbands were not present for the labour or delivery, and visiting times were strictly observed. A gradual relaxation in this routine can be seen in the 1955 edition of the H.Mt.20; 'the patient is to have a sponge bath in bed every day until the sixth day when a shower is permitted', but asepsis was still rigorously promoted and, in principle, just as rigorously enforced.[329]

Analgesia was routinely given during labour, increasing the rates of intervention and assisted delivery. In the early 1950s, 'twilight sleep', complete sedation with nembutal and hyoscine, was still in common use as well as chloroform that could be administered by a midwife in small amounts during the second stage of labour. Pethidine became available in 1950, along with tranquillisers like Largactil, Phenergan and triflupromazine given with pethilorfane. Diamorphine (heroin) was restricted to acute maternal distress in labour by the Health Department in the mid-1950s.[330] Neonatal research had highlighted the dangers to the foetus when drugs, capable of suppressing the respiratory system, were administered to the mother during labour.

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[326] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.
[327] *The General Principles of Maternity Nursing*, H.-Mt.20, Wellington, 1945, p.21.
[328] *The General Principles of Maternity Nursing*, H.-Mt.20, Wellington, 1955, p.37.
[329] ibid., p.28.
[330] Wassner, 1999, p.96.

Neonatal medicine was yet to develop as a separate specialty during the early 1950s, but was increasingly the focus of serious research in New Zealand, in particular at National Women's Hospital in Auckland. Professor Harvey Carey, Head of the Postgraduate School of Obstetrics and Gynaecology from 1955 to 1962, actively recruited young medical researchers such as Dr (later Sir) William Liley, whose work culminated in the first intra-uterine blood transfusion in 1963. The increasing interest in neonatal medicine was accompanied by an upsurge in liberal thinking that challenged the concept that babies should be 'shoved in the nursery – they were just things and mothers, who were people, were kept in the wards'.[331] This change in thinking was reflected in the interest among a small number of health professionals in 'natural childbirth', as well as a new approach to the psychological aspects of childbearing and the mother-infant relationship.[332] Within the hospitals, however, a regimented attitude to baby care persisted. Breast-feeding was the norm, the infant's 'natural food', in the hospital at least; 'It is a grave reflection upon the efficiency of the nurse and/or mother if more than a very small percentage of infants leave the hospital not being breastfed'.[333] Most women breastfed their babies initially, and in larger maternity units the babies were transported between the nursery and the ward on baby trolleys, head to toe alternating.[334] Prescribed feeding routines, based on the Plunket Society text *Modern Mothercraft*, were followed closely for the duration of the hospital stay.[335]

Controlling Childbirth to Prevent Infection

The first edition of the *H.-Mt.20*, or *The General Principles of Maternity Nursing, Including the Management and Aseptic Technique of Labour and the P4uerperium*, published in 1926, was written in response to a crisis in maternity care in the 1920s. At this time puerperal infection was more commonly caused by the then prevalent anaerobic streptococcus rather than the staphylococcus.

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[331] ibid.

[332] Mary Dobbie, *The Trouble with Women*, Christchurch, 1990, p.38.

[333] *The General Principles of Maternity Nursing*, H.-Mt.20, Department of Health, Wellington, 1945; *The General Principles of Maternity Nursing*, H.-Mt.20, Department of Health, Wellington, 1955, p.36. 'New Zealand 1951-52 figures for breast-feeding at three months was 40 per cent, but at 6 months only 16 per cent…' ibid., p.70.

[334] Sue Paviour, interviewed by Deborah Jowitt, 21 November 2002; Wassner, 1999, p.64; The 'trolley technique' for preventing cross-infection while transporting babies from nursery to mother is described in the 1955 edition of *The General Principles of Maternity Nursing*, H.-Mt.20, p.51.

[335] Personal communication, Margaret Pye, 9 February 2004; *The General Principles of Maternity Nursing*, H.-Mt.20, Department of Health, Wellington, 1955, p.37.

Over a third of the maternal deaths in 1920 (6.48 per 1000 live births) were the result of puerperal sepsis, an infection of the bloodstream that could prove rapidly fatal after both normal and abnormal labours. 'A bulletin published by the Children's Bureau of the United States Department of Labour (in 1921) provided the catalyst for the campaign against maternal mortality…Parr, the Minister of Health, learned that more mothers died in childbirth in New Zealand than in any other developed nation apart from the United States…(he) reacted impetuously to his discovery and in doing so set in motion a panic about maternal death rates which 'snowballed' once it hit the press'.[336]

Sepsis after childbirth was a potentially preventable disease, most often the result of poor aseptic technique by the midwife or doctor during labour or delivery. A 1921 maternal mortality committee of inquiry reported that deaths from sepsis were largely preventable through better training of midwives and doctors, the extension of antenatal clinics, and regular inspections of all hospitals.[337] The British Medical Association (New Zealand Branch) deplored the publicity given to the report as unnecessarily alarming to women, but the deaths of five women from puerperal sepsis in 1923 at the Kelvin Hospital, a private maternity home in Auckland, caused a public outcry. The government appointed the Kelvin Hospital Commission to investigate the care and conditions provided by the hospital and doctors implicated by the inquiry. The commission's report unfairly laid much of the blame for the inadequate medical care and tardy notification of the deaths at the feet of Department of Health officials. In response, the government appointed two distinguished doctors, Henry Jellett and Thomas Paget, to raise the standard of maternity practice throughout the country.[338]

The 1923 Kelvin Hospital outbreak had both immediate and long-lasting effects on the public perception and administration of the maternity services in New Zealand. It 'produced a temporary aberration in the Auckland region, in the form of a swing towards home births…*The New Zealand Herald*…reported that "as a result of the publicity given to poor equipment in many hospitals, and the advice of the authorities, many women have lately preferred confinement in their own home. They think it

[336] Philippa Mein Smith, *Maternity in Dispute: New Zealand 1920-1939*, Wellington, 1986, p.7.
[337] ibid., p.11.
[338] Henry Jellett, previously Master of the Rotunda, Dublin, was appointed as Consulting Obstetrician to the Health Department while Thomas Paget, a respected GP obstetrician, was appointed Inspector of Private Hospitals from 1924 and Director of Maternal Welfare from 1937.

safer"'.[339] In the long term, it initiated a close investigation of existing conditions and precipitated dramatic changes in midwifery practice. Paget undertook a tour of inspection of all New Zealand's 250 private maternity hospitals in 1924. He described deplorable situations with little in the way of sterilizing procedures or equipment;

> …sterilized articles were frequently stored in unsterilized biscuit-tins, on shelves and tables with unsterilized cloths or worse still were stored on shelves in cupboards under sinks, alongside unsterilized bed-pans in sink-rooms where these faecally-contaminated articles were emptied and washed. So-called sterilized water was often kept in unsterilized jugs. Bedpans and chambers were insufficient in number, and were taken around from patient to patient for panning purposes after being roughly cleaned with a mop not kept in disinfectant and admirably, though unintentionally designed to spread sepsis to other patients…[340]

In 1926, Paget completed the first edition of the H.-Mt. 20, maternity guidelines for standardized aseptic technique. 'These numerous means of spreading sepsis had to be eliminated, and an idea of what asepsis meant and how to carry it out introduced to hundreds of midwives and maternity nurses, many of whom had no training'.[341] This deceptively small 'pamphlet' was to govern midwifery care in New Zealand for the next four decades.[342] It prescribed compulsory techniques for practising midwives, but did not extend to the medical profession over whom Paget had no direct control. 'Many medical men regarded the practice of asepsis as, at best, a desirable ideal impossible of attainment, and not a few were politely scornful'.[343]

Paget was well aware of the challenges he faced; in 1927 he commented, '…there is still much to do before all medical practitioners and all nurses recognize that only by strict asepsis in maternity work can preventable sepsis be minimized. I am glad to report that a considerable number of the profession actively support this view; but I cannot blind myself to the fact that in some few instances it is received with an amused and kindly tolerance, or even actively opposed and regarded as a useless fad'.[344] Paget sought to win the doctors round with his political skills and in 1926, with his tour de force, the

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[339] Mein Smith, 1986, p.34.

[340] F.S.Maclean, *Challenge for Health: A History of Public Health in New Zealand*, Wellington, 1964, pp. 306-307.

[341] ibid., p.307.

[342] 'It was 1968 or '69, I was going to a meeting with teachers at the AHB School of Nursing, discussing techniques for women to shower…how you could clean the perineum and suggesting they might use their hands and soap…it was ohhhhh! Couldn't do that! To get from swabbing women four-hourly for ten days to normal hygienic practice was a huge leap'. Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.

[343] ibid., p.307.

two-bowl sterilizer for maternity requirements.[345] This was a basic but effective piece of equipment, 'ideally suited to New Zealand's conditions, as it could be used on any stove or range…Largely because of the sterilizer's cheapness and efficiency, asepsis became usual practice in New Zealand obstetrics by the end of the 1920s'.[346] Consequently the New Zealand death rate from puerperal sepsis fell after 1927, declining to 0.33 per 1000 live births in 1935. [347]

The reluctance of New Zealand medical practitioners to adopt aseptic technique in obstetrics mirrored the practise of their colleagues in the UK. In 1930, even at Queen Charlotte's Hospital, 'generally regarded as the Mecca of obstetrics in Britain…it was not customary to wear gloves or masks or even sterilize instruments'.[348] In that year, Dr Leonard Colebrook took up the post of director of the Queen Charlotte's Hospital research laboratories that had been established specifically to investigate the causes and treatment of puerperal fever. He 'knew better than anyone the danger of such negligence and at once enforced proper aseptic precautions...There was a prompt fall in the incidence of puerperal fever…'[349] Childbed fever had been the scourge of women birthing in maternity hospitals since 'lying-in' institutions were first established in Europe in the 18th century.[350] Women confined at home died from puerperal fever on rare occasions, but when women were confined in hospitals, it became endemic and even epidemic at times.[351] In New Zealand, the transition from home to hospital delivery occurred rapidly from 1920. At this time approximately 65 per cent of births took place outside of hospitals, either at home or in small maternity homes under midwifery care. By late 1930s public hospital or maternity home care with doctor attendance had become the norm.[352]

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[344] Maclean, 1964, p.311.

[345] Jellett took a sterner approach than Paget, particularly towards GPs practicing midwifery. 'Any practitioner who 'knowingly and unnecessarily' refused to practise an aseptic technique should, in Jellett's opinion, have been 'tried for manslaughter' if the patient died of sepsis'. Mein Smith, 1986, p.29.

[346] Mein Smith, 1986, p.30.

[347] ibid., p.30.

[348] Irvine Loudon, *The Tragedy of Childbirth Fever*, Oxford, 2000.

[349] ibid., p.178.

[350] Irvine Loudon, *Western Medicine*, Oxford, 1997, p.215; Loudon, 2000, p.16.

[351] Joan Donley, *Save the Midwives*, Auckland, 1986, p.43.

[352] In 1935, '78 per cent of children were born in maternity hospitals'. Mein Smith, 1986, p.1.

The work of Leonard and Dora Colebrook in identifying the bacteria causing puerperal infection, was influential in changing medical opinion and obstetric practice in the late 1930s.[353] As early as 1930, however, Paget was able to produce statistics proving that most cases of puerperal sepsis could be traced to an exogenous cause. Because hospitals that admitted medical and surgical patients, as well as maternity cases, had a significantly higher maternal mortality rate than the strictly midwifery hospitals (8.23/1000 live births vs 3.03/1000 live births in exclusively maternity hospitals in 1929), Paget concluded that the proximity of infected cases to maternity cases was an important factor in cross-infection. Rather than close all mixed hospitals, the Department of Health licensed those that could provide separate facilities for sterilizing maternity equipment, and sufficient staff numbers to maintain separate maternity, medical and surgical services. Ironically, the fallout from the Kelvin outbreak contributed to the survival of small private maternity hospitals. Paget's cheap sterilizers in particular saved many private maternity homes from financial ruin and assisted them to re-establish their reputations as safe places for women to deliver.

The Move from Home to Hospital

With a permanent fall in maternal deaths from puerperal sepsis, New Zealand women gained greater confidence in local maternity facilities. Increasing numbers of women looked to hospitals for safe labours and deliveries. By 1935, 78 per cent of women were confined in hospitals and by 1938 the rate had risen to over 87 per cent.[354] The trend towards hospitalized delivery offered greater scope for the influence of doctors in childbirth.[355] Pain relief during childbirth emerged as a particular consideration for women and doctors at this time. 'By the late 1930s pain in labour began to be designated a major pathological feature. Not all forms of pain relief required the presence of a doctor, but 'painless childbirth', which was strongly advocated by the medical profession as a means of removing women's fears of labour, called for both doctor attendance and hospitalization.[356] Even with increasing numbers of confinements in hospital, New Zealand had reduced its rates of maternal mortality before the introduction of chemotherapy – a significant achievement and one to be proud of. 'In

[353] ibid., p.61.
[354] ibid., p.64.
[355] 'Official preoccupation with the dangers of maternity invited the medical profession to categorise childbirth as pathological. This approach encouraged hospitalisation', ibid., p.117.
[356] ibid., p.117.

1920 New Zealand had the second highest maternal mortality rate among the developed nations; in 1932 it earned worldwide acclaim for producing the lowest death rate from puerperal sepsis following childbirth of eight countries which used identical methods of compiling maternal mortality statistics'.[357]

Maternity hospitals, in spite of their potential for cross-infection and overcrowding, appeared to be the safest places for women to deliver. Doctor attendance and hospital deliveries were entrenched as the social norm in New Zealand at least ten to twenty years earlier than the USA and the UK.[358] As the risks of intervention declined due to the increased attention to asepsis and the improvements in surgery and anaesthesia, the rates of intervention in childbirth increased. Between 1930 and 1935, the rate of caesarean sections per 1000 confinements almost tripled, from 2.2% - 5.9%.[359] The use of pituitary extracts to induce labour, then gaining in popularity, 'epitomised the evolution of control of childbirth by the medical profession'.[360] The Social Security Act 1938, that provided free hospital and doctor services for maternity patients, consolidated medical dominance in the maternity services.

The 'Baby Boom'

Hospital capacity for maternity cases was, however, limited and nurses joining the army during the Second World War exacerbated staffing shortages. The post-war baby boom further strained the staffing situation. In all parts of the country, hospital boards struggled to meet the demand for maternity beds. 'Maternity bed accommodation has for some time been causing concern. The rising birthrate has in the last ten years increased the total number of births per annum from 33,574 to 51,928… in 1942 there was 1 bed for every 15.4 confinements, in 1952, there was 1 bed for every 20.4 confinements. 1 bed for every 18 patients is required to meet the needs of the peak months…there is…a total shortage of 431 beds.'[361]

[357] ibid., p.66.
[358] ibid., p.118.
[359] AJHR, 1935, H-31, p.64.
[360] Mein Smith, 1986, p.70.
[361] AJHR, 1953, H.-31, pp.55-56.

In Dunedin, the number of deliveries at Queen Mary Hospital 'rose meteorically from 525 a year, in the early 1940s, to 1,069 in 1947 and 1,496 in 1950. The Hospital Board took over Hill Jack as a maternity home with 17 beds in 1948 and Queen Mary took over Miller Ward at Dunedin Public Hospital in 1946'.[362] In Auckland in the mid-1940s, conditions were just as crowded; 'In one of the North Shore (AHB) maternity homes…eighteen mothers were jammed into premises licensed for twelve. Eighteen babies sharing a nursery so tiny that cot touched cot and infant's bath towels hanging on the wall also touched one another. Matron herself demonstrated her method of coping with an already overcrowded nursery: Just put two babies head to toe in one cot…and to save mixing them at feeding time, one is Maori and one is Pakeha!'[363]

In 1946, Doris Gordon, whose 'cyclical creative urges… drive, dedication and ability to manipulate political forces' were legendary, accepted the post of Director of Maternal Welfare in the Health Department.[364] Strongly pro-natal, she enthused over the benefits her new position would bring to New Zealand women; '…I've been appointed by a government whose platform is *nothing but the best* for mothers…'[365] A founding member of the Obstetrical Society in 1927, Gordon had campaigned vigorously to raise funds for a professorship in obstetrics at Otago Medical School. In the 1940s, her cause was a postgraduate training school and a modern women's hospital in Auckland.[366]

Although the baby boom put the country's maternity hospitals under visible strain, the public appeared to remain confident in the future of the maternity services. The Obstetrical Society's proposal to erect an Auckland women's hospital to provide 'further facilities for training doctors' was 'printed at the request of leaders of Women's Organisations'; 'We acknowledge many enquiries from women leaders asking how their associations can help'.[367] Organisations, such as the Country Women's Institute and the National Council of Women, were mobilised by Doris Gordon to raise large sums of

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[362] Wassner, 1999, p.55.
[363] Gordon, 1957, p.119.
[364] Donley, 1986, p.68.
[365] Gordon, 1957, p.109.
[366] Doris Gordon, *Backblocks Baby Doctor*, London, 1955, p.254. 'I knew then that I was going to be Director, not only to help the Auckland project and to preserve our midwifery standards, but to salvage out of our post war mêlée the best conditions possible for our mothers and babies'.
[367] The New Zealand Obstetrical and Gynaecological Society Incorporated, *The Proposed Auckland Hospital For Women To Function as a Post-Graduate School Of Obstetrics And Gynaecology and to assist with the training of undergraduates in these subjects*, Printed at the request of Women's Organizations, and to be read in conjunction with the Society's Statement issued in May, 1941, February 1945, HI 15/183/1, Archives New Zealand, Wellington.

money towards the hospital to improve obstetric and gynaecological training for post-graduate doctors. Gordon instilled women with a sense of mission, highlighting the importance of the paramount issue of separating maternity from surgical and medical cases**:** 'There was one more battle for me to fight for my mothers of every colour. It was the *battle of the sites*. The common sense of women in general told them that mixing pathology, suffering and sadness with the recreation of life was all wrong, and they asked for maternity units separated from the general hospitals, even if for convenience they were in the same grounds'.[368]

In 1946, the first National Women's Hospital was housed in buildings not long abandoned by the American forces in Cornwall Park, but 'the acceptance of temporary quarters is no excuse for any group forgetting the full objective, and the ultimate national benefits of a NEW BUILDING, on a SUITABLE SITE, adequately EQUIPPED and STAFFED to assist in the future improvement of New Zealand's obstetrical and gynaecological services'.[369]

Gordon later wrote that she was shocked by the conditions she found in 1946 as she commenced the regular inspections of maternity hospitals begun by Paget over two decades before;

> In the main [Christchurch] city hospital…the tiny ward meant for premature babies or infants sent in because of grave feeding difficulties…is overcrowded with normal babies…their mothers, failing to find a bed anywhere in the city…arrive with the infants head half-born… These poor women come in as gate-crashers, at the last moment, and either give birth in the taxi, or soon after they get into our outpatient's rooms…its contrary to all I was ever taught about midwifery to deliver in a room used daily for accidents or for the treatment of discharging cases…The Christchurch St Helens…former balcony had been glassed in to take four or six more patients; and these verandah beds could only be reached by a route across the end of the nursery. This meant that everything printed in modern textbooks, and everything drilled into trainee-midwives about the technique of excluding chest and skin infections from nurseries, was hourly being annulled in the pupils' consciences by the sight of visitors, meal trays and other conveniences skipping through the nursery to reach verandah patients.[370]

[368] Gordon, 1957, p.134.
[369] The New Zealand Obstetrical and Gynaecological Society Incorporated, February 1945, HI 15/183/1, Archives New Zealand, Wellington.
[370] ibid., p.124.

These overcrowded, at times haphazard conditions, were highly likely to precipitate an outbreak of infectious disease. Streptococcal infection was no longer the danger it had been – the work of Leonard Colebrook and Maeve Kenny on sulphonamides published in 1936 had demonstrated the efficacy of 'Prontosil' in the treatment of puerperal sepsis.[371] Changes in New Zealand's maternity services tended to follow British trends closely. 'Sulphonamides, for example, were introduced shortly after breakthrough research findings were published in Britain'.[372] The introduction of penicillin and subsequent antibiotics in the mid-1940s, had confirmed the drop in maternal mortality rates, but in her visits to maternity hospitals, Gordon observed an appalling ignorance of the ways in which puerperal infection had been prevented in the first place.[373]

The Emergence of the H-Bug in New Zealand Maternity Hospitals

During the latter half of 1955, a series of 'troublesome' staphylococcal outbreaks affected North Island hospitals with 'similar reports…from the South Island and from Australia…'[374] The death of a baby from staphylococcal septicaemia in one of the Auckland Hospital Board's outlying maternity units, prompted the temporary closure of this unit, while Green Lane Hospital 'reported an increased incidence of mammary gland infection from the same cause'. As chair of the 'Special [Staphylococcus] Committee' appointed by the Medical Advisory Committee on 3 October 1955, Professor Carey was particularly interested in the carriage rates for penicillin-resistant staphylococci among staff and patients at National Women's Hospital. In a report presented to the AHB Hospitals Committee on 12 November 1955, eight of the sixteen doctors (50%) tested were carriers as against 27% of nurses, however; 'As the nursing staff handle the patients more intimately and consistently than the doctors they become the more important contributors' to the transmission of infection to patients.[375]

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[371] Leonard Colebrook & Maeve Kenny, 'Treatment of Human Puerperal Infections, and of Experimental Infections in Mice, With Prontosil', *Lancet*, June 6 1936, pp.1279-1286.

[372] Mein Smith, 1986, p.118.

[373] Gordon, 1957, p.112.

[374] Epidemic of Staphylococcus Aureus Infection, Report of the Special Committee to the Medical Advisory Committee, Auckland Hospital Board, 14 November 1955, H1 131/175 – 26673, Staphylococcal Infections 1955-57, Archives New Zealand, Wellington; In 1956, a Canadian bacteriologist, C.E. Dolman reported that, 'in many countries nowadays, hospitalization seems to entail a special risk of complications from puerperal mastitis, (and) pemphigus neonatorum…moreover some hitherto unfamiliar clinical entities such as staphylococcal pneumonia …seem to be emerging…Troublesome though seldom fatal outbreaks among infants and nursing mothers have brought closure of maternity wards…', C.E. Dolman, 'The Staphylococcus: Seven Decades of Research (1885-1955)', *Canadian Journal of Microbiology*, 2, 1956, p.189.

[375] ibid.

Already short staffed, the wards and theatres were to stand down any staff with boils or infected skin lesions. All carriers of coagulase positive staphylococcus aureus were to be issued with antibiotic nasal ointment, hexachlorophene soap and Hibitane antiseptic hand cream. The international literature was quoted as the source of useful and effective recommendations that could be put tried in the New Zealand situation.[376] Of particular interest in the National Women's survey was the high rate of colonisation among the infants over four days old (40%). Younger babies had a much lower rate of carriage (11%), and very few of the positive cases among the infants potentially related to mother to baby or baby to mother transmission. These figures supported the research suggesting that frequent handling by colonised or infected staff was the means for infecting neonates in maternity hospitals.

The Calvary Hospital Outbreak 1955

Within 10 days of the Staphylococcal Committee Report being presented to the Hospitals Committee of the Auckland Hospital Board, a crisis occurred in Christchurch. The District Office of the Health Department was notified that five babies born in the maternity unit of Calvary Hospital had died of a staphylococcal infection. The unit was closed pending further investigations, but in the following days three more of the thirteen babies admitted to Christchurch Hospital for treatment had died, bringing the total death toll to eight. The high number of fatalities in the city's most popular maternity unit inevitably caused public interest and concern.[377] 'Rapid expansion of population in the Christchurch metropolitan area and the rise in the birth rate finds Christchurch with 191 available maternity beds compared with the 226 which are necessary if the desirable two cases per bed month rate is followed…popular private institutions are prone to accept additional maternity cases and so may run the risk of cross-infection'.[378]

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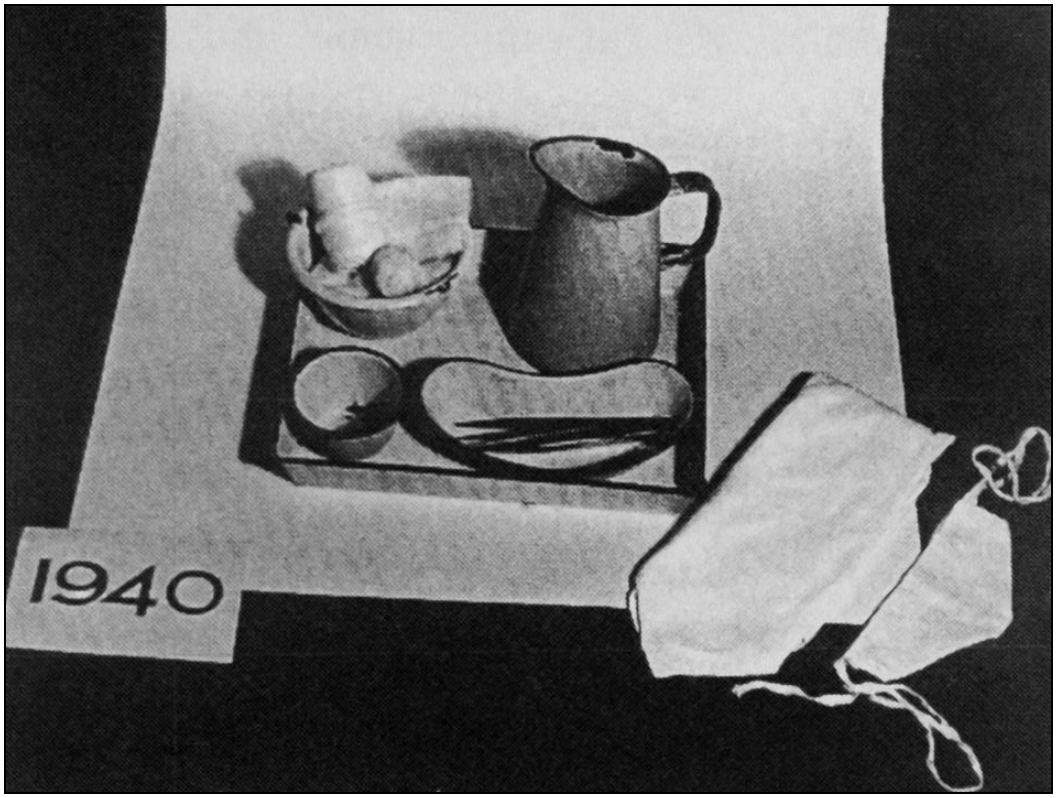
[376] An article in the *British Medical Journal* was quoted as reporting that at Queen Charlotte's Maternity Hospital, London, the use of Hibitane had led to a marked decrease in the cases of staphylococcal infection.

[377] A. Douglas and H.T. Knights, 'Some Public Health Aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55, 1956, pp.378-387.

[378] ibid., p.384.



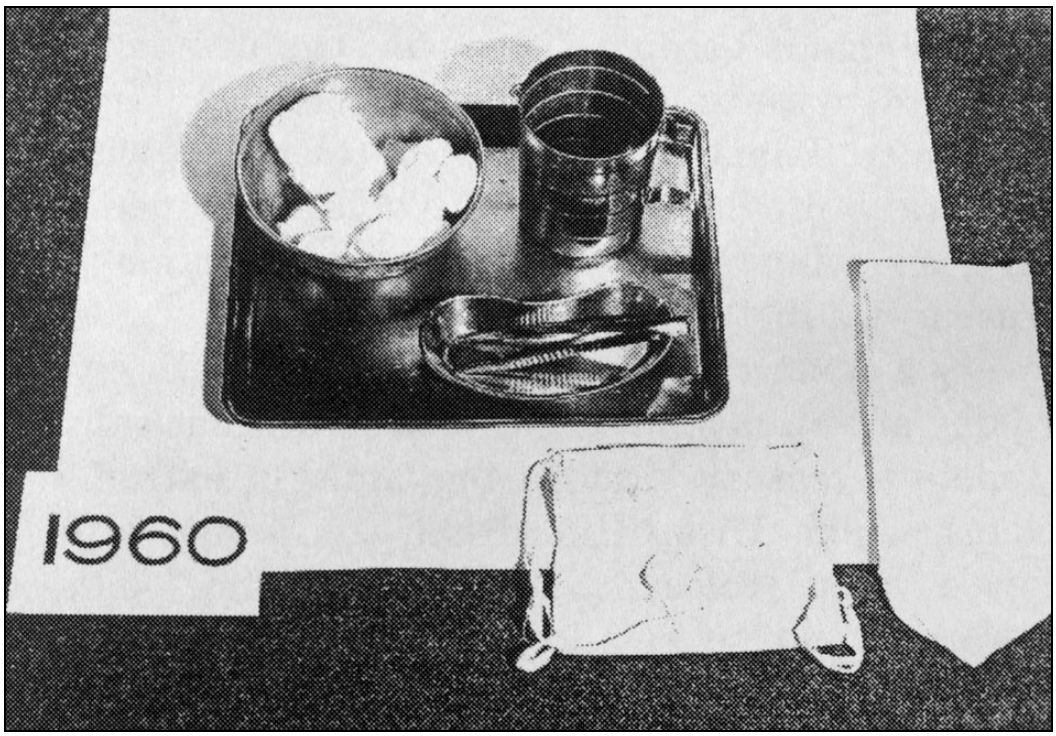


Figure 7: Swab Trays

The swab tray, used by nurses to swab the perineum in the days after birth. The jug held antiseptic solution, the dishes held a maternity pad , sterile muslin swabs and cotton wool balls. The chipped enamelware of the 1940s was replaced by stainless steel equipment in the 1960s. Otago Hospital Board Photographic Department, Adelheid Wassner, Labour of Love: Childbirth at Dunedin Hospital 1872-1972, Dunedin, 1999.

Although nurses' hands were the suspected source of infection, 'the lack of history of staff illness and the failure of bacteriological confirmation made it impossible to prove this chain of events'. There had been isolated cases of penicillin resistant staphylococcal infection in the general side of the hospital, but careful questioning and study of hospital administration by Drs Douglas and Knights, the Medical Officers of Health, could establish no link between the two. Evidence from Plunket Society nurses, suggested that there had been a much higher incidence of skin infection and upper respiratory lesions developing at home in babies born at Calvary over the previous six months. 'This incidence fluctuated, but showed a general rising tendency until the month of October, when 40 per cent of the babies born at the institution sooner or later developed such infections'.[379]

The Department of Health acted swiftly in response to the serious nature of the outbreak. 'The future conduct of maternity hospitals in their clinical practice, nursing techniques, planning and construction will require modification as a result of these investigations'.[380] The department endorsed legislative change to make 'pemphigus neonatorum and staphylococcal skin infections of the newborn infant notifiable. A series of distressing deaths of infants in or connected with a maternity hospital revealed that a number of babies had suffered from septic skin conditions followed later by fatal pneumonia'.[381] Recognising that antibiotic usage was at times 'indiscriminate', erythromycin, an antibiotic effective against severe staphylococcal infections, was restricted to the treatment of severe and resistant infections only. 'The fact that antibiotics are freely available under pharmaceutical benefits, pressure from the public and commercial drug firms, together with the dramatic and often time-saving effects of these therapeutic agents have led to the use of antibiotics without a clear diagnosis or the use of sensitivity tests. In some hospitals the giving of large doses of antibiotics without charting the prescription is a frequent practice and antibiotic resistance results'.[382]

[379] AJHR, 1956, H.31, p.123.
[380] Douglas and Knights, 1956, p.385.
[381] AJHR, 1956, H.31, p.18.
[382] Douglas and Knights, 1956, p.386.

The dangers of overcrowding, clearly evident in the Calvary Hospital nursery; 'for some time the area per baby had been 10 sq.ft. per baby below that of a desirable 30 sq.ft. per baby… ', were graphically related to the infectious outbreak, leaving no doubt as to the consequences of working for long periods at overcapacity. No solution was suggested, however, and it is clear from a letter to the *Christchurch Press* in May 1958 that due to the 'discriminatory and unenviable publicity', women simply abandoned Calvary for other maternity homes and hospitals in the city.[383] Nurses and doctors at Calvary were subjected to special criticism; increasing demands upon them had resulted in antibiotics being used 'at the expense of well established aseptic techniques'. The Department was already well aware that standards of care and accommodation had dropped throughout the country to meet the pressures exerted by the steadily rising birth rate. In their annual report for 1953, the Division of Maternal Welfare noted that, 'a shortening of hospital stay has in some places been adopted, and there has been overcrowding to an extent that in pre-penicillin days would have given considerable cause for anxiety'.[384]

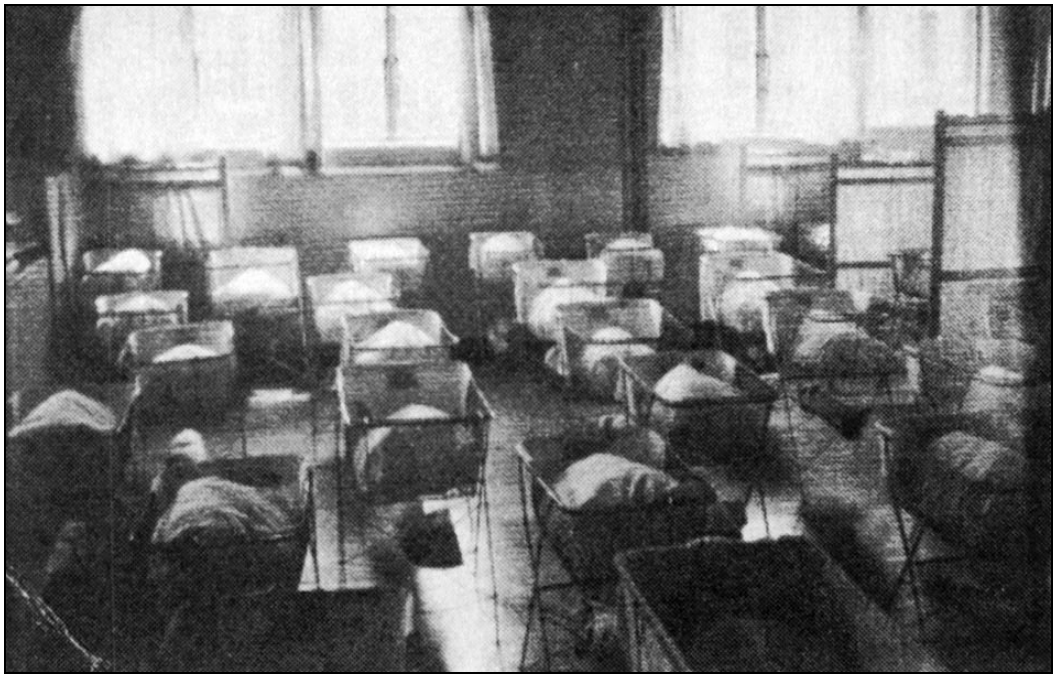


Figure 8: Queen Mary Hospital 1954

The nursery in the first Queen Mary Hospital, about 1954.The Health Department recommended that cots were placed at last 2 ft apart. Adelheid Wassner, A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972, Dunedin, 1999..

[383] *Christchurch Press*, 30 May 1958, HI 131/175, Archives New Zealand, Wellington.
[384] AJHR, 1953, H.31, p.87.

Leaving these insoluble issues aside, Douglas and Knights looked to practical and administrative measures to meet the new challenge of endemic staphylococcal disease. The 'rooming-in technique' was considered although overnight feeds in the communal nursery presented a problem if the requirements of the H.-Mt. 20 for infant feeding were followed; 'ideally babies should not be returned to a nursery at night if absolute isolation from other babies is aimed at'.[385] The father and other family members were seen as a potential source of infection. 'Restrictions on visiting should be part of maternity hospital policy. Only the mother, the nursing and medical staff (masked) should be in bacteriological contact with the baby. The father and other visitors should only view the baby through glass'.[386] The environment and equipment deserved special mention as a potential source of infectious organisms – shared breast pumps, methods of decontaminating bedding, and the ventilation and cleaning of hospital accommodation, were singled out for future research and attention.

Home Births and Mixed Hospitals

During 1956, the Department of Health, hospital administrators and the public waited nervously for further outbreaks of staphylococcal disease. In Women's News and Views, *Standard* columnist Sally Blake, asked women readers of her article 'H-BUG BLAMED FOR HIGH INFANT DEATH-RATE' to consider 'the incidence of five to 15-day-old infants in the death notices of your daily newspaper'.[387] Blake raised several sensitive issues in her brief column; general concern over the actual and official rates of illness and death among neonates with staphylococcal disease, the benefits of home confinement, and the dangers of 'mixed hospitals'. 'These are the tales which circulate among young mothers-to-be, "A sister at the ---- hospital told me for heaven's sake to have my baby at home, rather than in the hospital. They've got the H-Bug terribly badly". But it will be noted that if the statements are tracked down and collated that all these stories stem from ordinary hospitals which have a maternity annexe' [i.e. mixed hospitals not stand alone maternity institutions]. Blake referred to Paget's recommendations re mixed hospitals – 'a warning was given to Government years ago – that maternity annexes to general hospitals were most unwise because of the risk of

[385] Douglas and Knights, 1956, p.386.
[386] Douglas and Knights, 1956, p.386.
[387] *TS*, 26 September 1956, H1 131/175, Archives New Zealand, Wellington.

infection spreading to babies and their mothers'. She recalled the words of Doris Gordon, 'It was not named the H-Bug then, but it was precisely the form of infection which maternity specialists predicted would endanger babies' lives. How many lives that unheeded warning has claimed through an ungenerous provision of maternity facilities may never be known…every mother-to-be should know that there is less risk if she goes to an exclusively maternity hospital'. [388]

Although relatively few voices were raised in favour of home birth during the 1937 Committee of Inquiry into Maternity Services, a new approach to childbirth exemplified in Grantly Dick Read's influential books, had awoken interest in 'natural' births and home confinements during the late 1940s and 50s.[389] The rigid practices, enforced by the H.-Mt.20, were an added incentive for some women to consider an alternative venue for delivery. 'Women opting for a home confinement [in the mid-1950s] often gave as their reason their strong desire not be separated from their baby. It was one of the contradictions of the hospital system that while mother love was held to be instant and instinctive, any mother who took it to heart when her baby was removed from her was considered neurotic'.[390] That delivery in a large hospital put mothers and infants at higher risk of infection was not disputed; the 'Summary of the Position at National Women's Hospital' stated that the hospital's rate of staphylococcal cross-infection was 'comparable to that found in other large maternity units…in hospitals of this type the carrier rate among babies is seven times greater than that for babies delivered at home'.[391]

In spite of the potential benefits of home confinement in preventing staphylococcal colonization and cross-infection, the medical profession did not support a return to home delivery. 'Advances beneficial to women' had come from 'a marriage of clinical practice and laboratory science, and the great teaching hospitals with their ample

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[388] ibid.

[389] Grantly Dick Read, *Introduction to Motherhood*, London, 1951; Evidence to the 1937 Committee of Inquiry into Maternity Services, Library Archives, Auckland , Vol. 1-2, MS78.

[390] Dobbie, 1990, p.47.

[391] Auckland Hospital Board, Hospitals Committee, 12 December 1955, HI 131/175-26673, Staphylococcal infections 1955-57, Archives New Zealand, Wellington.

'clinical material' and intellectual capital, provided the ideal environment' for maternity care, research and training.[392]

In October 1957, the editor of the *New Zealand Medical Journal* went on the offensive against 'uninformed criticisms of the New Zealand maternity services based on fallacious interpretation of statistics in the public press…Recently the maternity services have come under uninformed general criticism on the strength of a few episodes of infection affecting mother or infant…We firmly believe that the New Zealand policy of general hospitalisation of maternity cases with strict attention to nursery planning and all the details of infant care [has been] largely responsible for [our] lead in dealing with postnatal infection of the newborn'.[393] Some doctors did challenge the status quo, but they courted fierce criticism from both their medical and nursing colleagues. Dr Jim Henderson, who had returned to New Zealand from directing the Obstetric and Gynaecology Department in Miraj, India, in the mid-1940s, was outspoken in his opposition to heavy sedation and the lack of support he observed for women in labour. His support of unsedated 'natural childbirth' was met with deep antagonism; 'The air was electric when I put my nose inside the local maternity hospital…So strong was the feeling against me that I scarcely dared visit my patient. At one stage things got so bad I thought I would be forced out of practice in the area'.[394]

Dr Kilpatrick Jack, an English GP, wrote to the New Zealand Medical Journal in 1958 after two and a half years in New Zealand. He too, questioned the prescriptive practices and the total emphasis on hospital birth he had found in New Zealand. 'In the United Kingdom many women prefer to have their confinements at home and it was a novel experience to find all confinements in New Zealand were in hospital…The reasons as we all know are: (1) Lack of nursing staff. (2) Lack of domestics. (3) Teaching of the population by propaganda.'[395] Dr Jack went on to describe the advantages of a home birth over a hospital confinement in a time of overcrowding and endemic infection. 'She would avoid what seems to happen often, that she has to be admitted to another hospital

[392] McCalman, 1998, p.223.
[393] Editorial, Maternity Service in New Zealand, *NZMJ*, October 1957, pp.491-493.
[394] Dobbie, 1990, p.15. 'What struck me on returning to New Zealand was the tremendous fear of labour here…and this despite the fact that all maternity cases are conducted in hospitals. What worried me most…was the militant, domineering, bullying attitude of many of the nursing staff. The whole atmosphere was upsetting'.
[395] Kilpatrick Jack, 'Domiciliary Midwifery', Letter to the Editor, *NZMJ*, 57, 1958, pp.640-641.

under the care of another doctor due to bed shortage…(and there is)…no risk of cross-infection from baby to baby as so often happens in any maternity hospital'.[396]

The 'New' National Women's Hospital

Separating maternity units from general hospitals and separating 'clean' from 'infected' maternity and gynaecology patients, had been a major focus of Doris Gordon's last campaign on behalf of New Zealand women and their babies. It proved a prickly issue, as the plans for the new National Women's Hospital took shape. In 1956, the Director General of Health, Dr John Cairney, and Director, Division of Hospitals, Dr J.P. Kennedy, laid down three main principles regarding the proposed hospital. In June 1956, Cairney wrote to the AHB that, 'Our primary objectives in this matter must be to minimize the risks of infection to both mothers and infants, especially at a time when the problem of drug resistant organisms cannot but be a cause of considerable concern'.[397] In October 1956, Kennedy added that; 'The principles of most importance in securing effective isolation and nursing of [infectious] cases appear to be those of location of the isolation unit and its staffing, coupled with a rigid adherence to the proven nursing techniques detailed in the current sixth edition of the H.Mt.20. To deal first with the question of location, the consensus of opinion is that such a unit should always be separate from the 'clean' maternity hospital'. Later the same month he wrote again that 'the conjunction of infected cases in the same building in the new National Women's Hospital is considered undesirable'.[398]

Infection Rates at National Women's Hospital

Increasing notifications of puerperal pyrexia at Cornwall Hospital, the 'old' National Women's Hospital, reached a peak in October and November of 1956. The situation lead to a report being prepared for Cairney of an official inspection of the premises and practices observed at the hospital.[399] The examination of the records of pyrexia associated with genital tract infections was disquieting; '…the rate steadily increasing to such an alarming degree…we are constrained to feel that in this relatively large Hospital

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[396] ibid., p.641.

[397] Auckland Hospitals Committee Minutes 12 April 1965, Proposal of National Women's Hospital Medical Committee to vary the intended use of the beds in the first floor, Isolation Block, HI 56/7/14/1 closed no 31071, Archives New Zealand, Auckland.

[398] ibid.

[399] Inspection of National Women's Hospital: 28 and 29 November 1956 by Drs. Taylor & Davis and Miss Cameron, H1 131/175, Archives New Zealand, Wellington, pp.1-8.

we are faced with an infective process which is fast reaching epidemic proportions. The Hospital Staff admit that 20% of the babies are infected with some manifestation of Staphylococcus infection. This, by world standards and our own observations elsewhere in New Zealand, is unduly high'.[400]

> Once again the issue of overcrowding in the postnatal wards and nurseries was prominent; 'the highest incidence [of infection] was in the consistently overcrowded Ward 28', while the generally 'poor facilities and conditions' were emphasised. Cornwall Hospital left much to be desired as a maternity institution. Many of the arrangements for working and limited facilities provided would not permit of it being licensed as a private hospital. Most of the Wards present a grubby appearance, probably induced by numerous wooden structural excresances and crevasses…The Ward arrangement is particularly bad – large 26 bed Wards within each some 250 yards of Britway curtaining in an almost continual state of disturbance by staff…During "panning time" the whole atmosphere of the Ward must be charged with bacteria-laden dust. One statement was made that the screens were changed every 6 months, another every 6 weeks. If they were changed every week they would still constitute a hazard.[401]

As well as the hospital environment, nursing and midwifery practice at National Women's Hospital were carefully scrutinized. The Matron, Miss Millar, was particularly proud of the aseptic perineal swabbing technique as carried out by the nurses, however she did note that 'while qualified nurses showed some aversion in doing this work nurses in training were very willing'.[402] Instructions for this technique, designed to maintain 'as far as possible the vulva and perineum in a state of surgical cleanliness', were described in detail in the H.-Mt.20.[403] The use of gowns and masks in the hospital nurseries was inconsistent; 'doctors are not entirely without blame in this connection', but efforts were being made to improve compliance.[404]

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[400] ibid., p.2.
[401] ibid., p.4.
[402] Inspection of National Women's Hospital: 28 and 29 November 1956 by Drs. Taylor & Davis and Miss Cameron, H1 131/175, Archives New Zealand, Wellington, p.7.
[403] *The General Principles of Maternity Nursing*, H.-Mt.20, Wellington, 1955, p.28.
[404] Inspection of National Women's Hospital: 28 and 29 November 1956 by Drs. Taylor & Davis and Miss Cameron, H1 131/175, Archives New Zealand, Wellington, p.7.

Figure 9: The Armstrong Incubator

Matron Norah Corson (1948-1958) looking at a baby in an Armstrong incubator. Surgical masks were worn when nursing premature or ill babies. Dunedin Evening Star photograph, Adelheid Wassner, A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972, Dunedin, 1999.

A request was made by National Women's staff for nursing trainees to be allowed to return to Professor Carey's Ward 26 where pyrexial notifications had been consistently low, however, the inspectors were not 'satisfied that the experiment had been carried out long enough'. The report noted that Ward 26 had been reduced from 26 beds to 17, to allow for rooming-in.

In her history of the Parents Centre movement, Mary Dobbie recalled that Carey had told her that 'in my ward you may have to do a lot for yourself. There are no junior nurses. The Nurses and Midwives Board has withdrawn all trainee nurses – they don't approve of the new techniques we've been using, the early ambulation and perineal showering'.[405] The Health Department argued, that because the Board had prohibited maternity trainees from working on Professor Carey's ward, other wards where adequate staffing with trainees could be achieved were overcrowded. 'If the bed state of each ward is reduced to 20 and the wards are divided up into cubicles rooming-in would be possible…It would eliminate the baby wagons which are a potential source of cross infection'.[406]

The practice of placing sulphacetamide drops routinely in the newborn infant's eyes, as required under H.Mt.20 to prevent gonorrhea, was discontinued at this time. 'This is one way the eyes are traumatized and staphylococci introduced…Gonococcal infection is no longer a problem and the occasional case can be very speedily cleared with penicillin'. The Department did not stop at infant care; 'the present techniques and solutions used for the vulval preparation of the patients in labour ward should be reviewed in the immediate future without waiting for the next revision of the H.Mt.20.'[407]

Although no mention of a rooming-in 'experiment' has been found before this date, on 22 January 1957, Dr Cairney and Dr Claude Taylor visited National Women's Hospital and after their inspection, 'a conference was held with them…with Mr Grierson, Mr Galbraith, Miss Kirkness, Miss Millar (the Matron), Dr Green (First Assistant) and

[405] Dobbie, 1991, p.51.
[406] National Women's Hospital Medical Committee Meeting, 12 February, 1957, BAGC A638/38a, Archives New Zealand, Auckland, p.278.
[407] ibid., p.278. Adelheid Wassner reports that during the 1940s there had been 'rampant gonorrhoea among the childbearing population of Dunedin', p.90.

Professor Carey. After discussion, Dr Cairney agreed that all the postnatal wards should be altered to enable them to function on the 'rooming-in' principle.[408]

Rooming-In

While New Zealand and American maternity services had embraced total nursery care of infants in the 1930s as part of an 'aseptic' approach to hospitalised childbirth, British and European hospitals had maintained rooming-in during the puerperium. In the late 1940s, American obstetricians, commenting on the newly recognised benefits of rooming-in, noted the practice of 'housing-in in Dublin in the Rotunda and also in the Coombe Hospital [where] it is carried to the full extreme and the baby stays in bed with the mother the whole time…At the Rotunda Hospital the baby was in a separate crib…In London, at the Queen Charlotte Hospital, they had much the same system; and in two hospitals in Paris they seemed not to have heard of a central nursery but have always had the babies with the mothers'.[409] American physicians and consumers promoted rooming-in in the late 1940s as a way of maintaining 'natural mother–infant relationships, reinforcing the potentialities of each mother and infant and encouraging the family unit'.[410] Overflowing maternity wards during World War II, combined with the diversion of civilian medical and nursing professionals to the military, had changed postpartum care dramatically. Hospital care was shortened, in some cases to 24 hours or less, to match the beds and staff available. As 'the impermissible became the unavoidable', surprising facts emerged. The women who experienced early ambulation had fewer complications and a lower morbidity rate than those who kept to their beds.[411] Hospitals that had previously offered women a respite from domestic responsibilities during their postpartum stay, saw the potential to lighten nursing workloads while still maintaining round the clock supervision of infants – by their mothers. As the 'hospital' staphylococcus hit American nurseries, many hospitals dealing with outbreaks converted to rooming-in to break the chain of infection.

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[408] National Women's Hospital Medical Committee Meeting, 12 February, 1957, BAGC A638/38a, Archives New Zealand, Auckland.

[409] Thaddeus L. Montgomery, Robert E. Steward and Pauline Shenk, 'Observations of the Rooming-In Program of Baby with Mother in Ward and Private Service', *American Journal of Obstetrics and Gynaecology*, January 1949, pp.176-186. Anne McKinnon recalled that as a child in England in the early 1930s 'visiting a new mother in a nursing home, she had the baby there at her bedside'. Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.

[410] Elizabeth Temkin, *Unlimited Mothering: Rooming-in in Post War America*, a paper presented at the Social Science Research Seminar, Wake Forest University, 23 March 2000, available at : http://www.wfu.edu/~caron/ssrs/roomin.doc

[411] Garth Holdaway, 'A Year's Experience of Rooming-in in a Maternity Home', *NZMJ*, 58.1959, pp.163-169.

Aware of the many advantages of this model of maternity care to New Zealand hospitals, the Health Department strongly recommended that it be adopted in all wards at National Women's to minimise contact between babies and staff. 'When regard is paid to the known method of spread of staphylococcal infection the method of control most likely to be effective is a reduction in the amount of handling babies receive from the nursing staff. This can be implemented only by the introduction of "rooming-in" throughout the hospital'.[412] Rooming-in did not, however, comply with the guidelines for care of the infant in the H.-Mt.20.[413] As evidence of a need for a complete change in approach to infant care, the Health Department quoted the Medical Research Council Memorandum No.11 on the control of cross-infection in hospitals. 'The practice of placing infants in large communal nurseries is fraught with danger and should be avoided. Under such conditions it is extremely difficult to control infection which may spread with alarming rapidity…Infants should be nursed in the ward with their mothers'.[414]

The Response to Rooming-In

While National Women's administrators 'warmly welcomed' the assistance of the Health Department in securing a safe environment in their hospital, the response of many members of staff may have been less than enthusiastic. Medical and midwifery staff had diverse opinions on the benefits of rooming-in. Some, like Dr Jack Dilworth Matthews, were part of the'new guard' of young doctors at National Women's Hospital in the 1950s, who promoted the practice to encourage breast-feeding and as 'a way of bonding mothers and babies… as a more natural way of treating newborns'. To encourage 'feeding on demand' he and his registrar of the time, Dr (later Sir) Mont Liggins, introduced 'little wheeled cots much to the annoyance of most of the nursing staff …so everyone had their babies beside them all the time… The whole idea was to remove all the inhibitions you could safely remove. Less restrictions, more normal…that was the way forward'.[415]

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[412] National Women's Hospital Medical Committee Meeting minutes, 12 February, 1957, BAGC A638/38a, Archives New Zealand, Auckland,

[413] *The General Principles of Maternity Nursing*, H.-Mt.20, Wellington, 1955, p.51.

[414] Minutes of a Meeting of the National Women's Hospital Medical Committee held in the Tutorial Room at 8.00P.M. on 12 February 1957, BAGC A638/38a, Archives New Zealand, Auckland.

[415] Dr Jack Dilworth Matthews, interviewed by Deborah Jowitt, 10 January 2003.

Ann Nightingale, later Principal Midwife at Auckland St Helen's and National Women's Hospitals, trained as a midwife in 1957. She saw resistance to rooming-in coming from the medical profession as well as from nurses and midwives. 'There were a lot of doctors who had practised obstetrics for a lot of years who didn't think it was a good idea at all. They saw the mothers at home and thought about [their need for] rest'. In her experience many mothers who had started their childbearing before the introduction of rooming-in were unhappy about the change in practice. 'They wanted to have a rest at night…They had other children and they wouldn't get a rest at home, so hospital was a rest and probably the only rest those women got. The St Helens Hospitals weren't dealing with women who had any sort of care at home, they had their babies and went back to work…their hospital time was rest time'. At Lower Hutt Hospital, where Ann worked from 1957-1959, she was in charge of a ward that was a 'Nightingale [open-plan] ward, divided into four sections, but all in in the one ward. The rooms were very small and they expected to fit a baby into that with all its gear. There wasn't the thought that might have gone into the design of maternity wards'.[416]

Doris Holford, Principal Midwife of Waiuku Memorial Hospital from 1957-1964, instituted rooming-in at the first sign of staphylococcal infection. The response from mothers, in what was primarily a farming community, was more enthusiastic. 'I saw this baby with pemphigus and there and then I put all the babies out to their mothers. That was when rooming-in started. The mothers loved it. They loved being able to change their babies and have their babies there with their husbands in the evening'. She was, however, cautious about the possibility of the babies being handled by potentially infectious siblings and grandparents. 'During afternoon visiting I would put the babies in the nursery because I didn't want people touching them'.[417] None of the existing maternity hospitals had been built to accommodate rooming-in. Multi-bedded rooms meant that all mothers in the room would be disturbed by one crying baby, necessitating a modified form of total rooming-in. 'I think that we brought babies into the nursery at night if they cried and were restless. If they wanted feeding that was different but if they wouldn't settle, they were taken down to the nursery'.[418]

[416] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.
[417] Doris Holford, interviewed by Deborah Jowitt, 17 May 2003.
[418] ibid.

In his visits to maternity hospitals to assess potential infection risks, Dr H.T. Knights assessed the frequency with which rooming-in had been adopted, and the extent to which hospital design limited a change of approach. He noted a generally negative response from staff to the idea. In September 1957, he visited all six maternity units within the Waikato Hospital Board. At the Campbell Johnstone Ward at Hamilton Hospital, ' "rooming-in" is not practised. It would be difficult to arrange in the accommodation provided without cutting down on the maternity bed state'. At the newest hospital of the group, Te Awamutu Maternity, 'while not unfavourable to "rooming-in", Miss Warner, the Matron, considered that the present two-bed wards were unsuitable'. At Putaruru Maternity, ' "rooming-in" was not practised nor looked upon very favorably by the matron', similarly at Otorohanga Maternity, a small ten bed unit, '"rooming-in" is not favoured'.

Staff attitudes were crucial to the success of the new scheme. At Tokoroa Maternity Hospital, 'the staff was most enthusiastic about it and the patients (most of them multiparae) even more so. This was the one unit that practised "rooming-in" but this was only on a partial basis, the babies being removed to the nursery over night. Despite the fact that the ward units are no larger than those elsewhere where the staff say they are not light enough for rooming-in the staff here were out to make the plan a success and there was a manifest air of contentment'.[419] Like National Women's Hospital, most maternity hospitals only embarked on rooming-in to provide a solution to the on-going problem of H-Bug infection. In late 1957, Knights took the opportunity to perform 'air slit sampling' at National Women's Hospital 'in view of the present division of opinion over "rooming-in" and the fact that [it] is one of the few institutions carrying out this programme'.[420]

Waiouru Maternity Home was among those few; on October 14 1957, 'a rooming-in programme was instituted…following a minor epidemic of staphylococcal skin lesions and breast abscesses…before an even more serious epidemic should occur'.[421] The routine was simple, although it completely contradicted most of the H.-Mt.20 directives

[419] Report Upon Visit of Dr H.T.Knights, Medical Officer of the National Health Institute, to Maternity Units of the Waikato Hospital Board, September 1957, HI 131/175-27839, Staphylococcal Infections 1957-61, Archives New Zealand, Wellington.
[420] Knights to Cairney, 20 September 1957, HI 131/175 – 27839, Staphylococcal Infections 1957-61, Archives New Zealand, Wellington.
[421] Garth Holdaway, 'A Year's Experience of Rooming-in in a Maternity Home', *NZMJ*, 58.1959, p.164.

for bed rest and rigid feed times. 'Each mother has a bedside locker and her baby's bassinette beside her bed…From the time of delivery the patients may get up as they please. Demand feeding is encouraged…' Some of the mothers' new routines were designed to duplicate staff practices; 'Mothers soon learn to weigh their child accurately. In this aspect, as in all others, the mothers were anxious to maintain a high standard of nursing of their babies when their welfare was at stake. This leads to a standard of nursing care of the babies, which equals and sometimes surpasses that standard attained in the smaller homes dependent on nursing aides for much of the daily nursing routine'. The first 24 hours after delivery, 'when the mother is often tired after the sedatives given during the late first stage of labour…[is]…often the only time when the mother-baby team need help'. [422]

Although some women were enthusiastic about being able to become more competent and confident at handling their babies before discharge home, others, like many maternity staff, were not happy to relinquish established routines for the sake of infection control. In her history of childbirth at Dunedin Hospital, Adelheid Wassner states that the first definite evidence of rooming-in at Queen Mary Hospital came from an informant who gave birth there in 1961. Another woman talked about 'Queen Mary experimenting with the idea of "rooming-in"' as late as 1964.[423] This woman was apparently not convinced of the benefits of demand feeding and mother-baby bonding. 'It was not an uncommon sight to see mothers with their babies padding the corridors at 2 a.m., 3 a.m. and 4 a.m. and most often at this stage in complete despair…For the nurse too there was little hope, routine seemed to fly out the window and the three Bs (babies, bottoms and breasts) that are commonly associated with maternity nursing were all mixed up. …the result seemed to be one of confusion'. Like Dr Knights, she perceived that staff attitudes were critical to the success of the new regime. 'The ward Sister ran a marvellously organised ward considering she was coping with day and night rooming-in'.

The effectiveness of rooming-in as a means of preventing cross-infection, was, however, reduced by routines such as the daily rest period; 'between 11a.m. and midday each day … she completely shut the ward to wards maids and doctors, and the nurses

[422] ibid., pp.164-165.

tiptoed about caring for any demanding baby'. Attempts to establish complete rooming to protect babies from handling by the staff, was later abandoned. By 1967, the practice of complete rooming-in was modified, to the relief of at least two informants (#3 and #8) who both commented on the advantages of a 'good night's sleep', when all babies went into the nursery at night.[424]

'Dirty Babies are the Healthiest'

In late 1958, Professor Carey caused a public outcry by his widely reported statement recommending that 'dirty babies are the healthiest'. Mrs T. Baker, The Federation of Housewives, Western Suburbs, Auckland, wrote to Dr Derek Taylor, Director of the Division of Maternal Welfare to complain. 'If as reported "the germ content of the air in nurseries is so laden with harmful bacteria that the bathing of newborn babies, the movement in the air, the turning of the blankets and bedclothes, and the shifting of mattresses released germs into the air which might circulate and do some harm to the baby" then surely it is the nurseries and the unhygienic equipment that are at fault and not the bathing of babies. The non-bathing of babies can only add to the general unhygienic conditions'.[425] A hand written note, added to the bottom of the letter, suggested that, 'Dr Knights [to] answer this. What Carey meant was that babies did not need to be bathed. Oiling was a good substitute only he didn't say it'.[426]

A combination of oiling and soap and water sponging was recommended by the H.-Mt.20 from at least as early as 1945; 'a full immersion bath is not given until the cord has separated. Wrap the infant…wash the face, rub warm oil into the head and creases of the neck, and wash the head and neck with warm water and a good soap…Now uncover the arms and upper portion of the body and rub warm oil over the skin down to the feet. Sponge gently and rapidly with warm water and soap, making no effort to remove all the vernix caseosa'.[427] In the sixth edition, 1955, a further caution against damaging the infant's skin was added. 'A baby's skin is very tender and easily damaged…The greatest care should therefore be taken to see that the skin is handled

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[423] Wassner, 1999, p.276.
[424] ibid., p.274.
[425] Baker to Taylor, 10 February 1959, H1 131/175, Archives New Zealand, Wellington.
[426] ibid.
[427] *The General Principles of Maternity Nursing*, H.-Mt. 20, 1945, p.26. This is repeated verbatim in the 6th edition, 1955, p.35.

with extreme gentleness and every effort made to avoid subjecting it to infection by pathogenic organisms'.[428]

Mary Dobbie, who gave birth at National Women's Hospital in 1956, asked Carey how her baby might be best protected from H-Bug infections. He replied, 'Room-in, handle the baby yourself, don't bath it but clean it with a bit of olive oil on a swab – even a face cloth can open up a scratch on a baby's fine skin'.[429] Knights had raised concerns over the dangers of bath time and techniques during his epidemiological investigations with the Casella sampler. At National Women's Hospital, Knights sampled nursery air on several occasions to detect 'the bacterial content'. He concluded that the air in the general nurseries was comparable to the wards until 'the babies are in the process of being bathed (when) the count shoots up to the vicinity of 150 to 200 bacteria carrying particles per cu.ft. 80/81 staphylococci were isolated from the air of one of the nurseries'. His findings proved to be persuasive evidence for a change from the communal nursery care. 'More than anything else, the spectacle of a culture plate taken in the nursery as compared with one from a general ward convinced the staff that something had to be done…the majority felt that some form of "rooming-in" was the solution'.[430]

During Knights' visits to outlying AHB maternity units, a number of severe cases of 80/81 infection in babies were reported. Helensville Hospital 'had its nursery plans altered at the last moment when the epidemic in Calvary Hospital occurred'. Knights suggested that possible measures to combat the danger of aerial contamination might include ' occlusive dressings to the cord, less baby bathing, bathing babies one by one' and the construction of small nurseries attached to small wards. Calvary Hospital, investigated with other Christchurch maternity units in March 1958, showed very low bacterial counts that 'compare more favourably with other institutions in the area. It does seem to show that oiling as opposed to bathing has something to commend it… only oiling is practised until the day of departure'.[431]

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[428] *The General Principles of Maternity Nursing*, H.-Mt. 20. 1955, p.35.
[429] Dobbie, 1990, p.51.
[430] H.T. Knights, National Women's Hospital, Examination of Wards 24 and 34 Nurseries and Theatre Environment, 23 - 26 February 1959, HI 131/175-27839, Staphylococcal infections 1957-61, Archives New Zealand, Wellington.

In spite of the evidence, making changes to bathing practices proved to be even more difficult and contentious than instituting rooming-in. In 1962, in his booklet, *Notes on Staphylococcal Cross Infection in Hospitals*, Knights referred to strong social pressure to continue the practice. 'There has been a large body of opinion which advocates less bathing. In any case, it should never be done in the communal sink….Total discontinuance of bathing in maternity units is unacceptable to most mothers and if oiling is used great care must be taken to ensure the oil is free from pathogenic organisms'.[432] As late as 1978, Professor Ross Howie, a member of the Maternity Services Committee, stirred up unanticipated controversy by providing 'some notes on the care of the baby's skin after birth. I looked up the literature, particularly a statement by the American Academy of Paediatrics, which basically said do nothing but gently wipe off blood and meconium. Bath before baby goes home which at that time was about a week. That caused a real ruckus among the midwives'.[433]

Ongoing Infections

In June 1956, Cairney, Director General of Health, approved the AHB's proposal to provide an isolation ward at 'the existing National Women's Hospital at Cornwall Park' provided no infected gynaecological patients were housed with the infected maternity cases. Although this decision was contrary to departmental policy, transferring delivered and undelivered infectious cases to general hospitals for isolation and treatment 'is not a practicable solution of your Auckland problem in present circumstances'. [434] The proposed nine-bed isolation unit was finally completed in October 1958. While the situation at National Women's hospital continued to give cause for concern, reports from other centres indicated that the H-Bug problem was still widespread.

In December 1957, at a conference of Medical Officers of Health, '…it was agreed that the First Schedule to the Health Act 1956 should be amended by including a new heading "Staphylococcal pneumonia and staphylococcal septicaemia of the newborn infant".[435] From 1 April 1958 staphylococcal pneumonia and staphylococcal

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[431] Knights to Cairney, 17 April 1958, Investigations of Staphylococcal Cross Infection in Christchurch Hospitals, 2 March – 20 March, HI 131/175, Archives New Zealand, Wellington.
[432] H.T. Knights, *Notes on Staphylococcal Cross Infection in Hospitals*, Wellington, 1962, p.37.
[433] Professor Ross Howie, interviewed by Deborah Jowitt, 15 February 2004.
[434] Cairney to Auckland Hospital Board, 8 June 1956, HI 56/7/14/1 closed no 31071, Archives New Zealand, Auckland.
[435] Minutes of Conference of Medical Officers of Health Held at Wellington 11 and 12 December 1957, HI 131/175 – 27839, Staphylococcal Infections 1957-61, Archives New Zealand, Wellington.

septicaemia of the newborn infant were declared notifiable diseases.[436] This move was intended to ensure that cases would not only come to the attention of the local Medical Officer of Health, but would also be accurately collated for official records. The Auckland Women's Branch of the Labour Party had been particularly persistent in requesting the national figures for the infant deaths associated with staphylococcal infection, and the numbers of women treated for breast abscesses in public hospitals since the beginning of the epidemic. Supplying these figures represented a major effort on the part of hospital bureaucrats. From 1955 - 1957, the 'number of cases where breast abscess associated with lactation had been treated in public hospitals' rose from 338 to 708. The number of infants under three months who 'died from any disease where the underlying disease was staphylococcal' had also risen, from 12 to 21 during this period.[437]

A change to the Health Act did not, however, ensure that cases of staphylococcal infection were notified. On 14 August 1958, Dr Brian Christmas, Medical Officer of Health, reported the death of a baby at Cook Hospital Maternity Annexe, Gisborne. The infant had died two weeks after birth, but when the annexe was inspected following notification, 'five of the twelve infants resident were found to be infected, one of whom had a large abscess on the scalp, and another had purulent otorrhea. This latter had been a resident of the Annexe for 31 days. None of the staphylococcal infections had been notified'.[438] In November, a baby born at Christchurch St Helens, died from staphylococcal septicaemia. Senior medical and midwifery staff 'had been rather concerned about the increasing number of eye infections and the number of unexplained temperatures in infants'. Five members of the staff were colonised with phage type 80/81.[439] The impact on staffing was immediate; 'As this is an extremely busy month for St Helens, the situation that arises as the result of excluding [colonised] personnel is rather serious'. [440]

[436] AJHR, 1959, H.31, p.31.
[437] Taylor to Johnston, 30 November 1959, HI 56/7/14; 26929, Archives New Zealand, Wellington.
[438] Christmas to Director-General of Health, 14 August 1958, HI 131/175 – 27839, Staphylococcal Infections 1957-61, Archives New Zealand, Wellington.
[439] AJHR, 1958, H.31, p.118. 80/81 continued to be the commonest cause of hospital staphylococcal infections.
[440] Paterson to Taylor, 12 November 1958, H1 131/175, Archives New Zealand, Wellington.

Exclusion from Work

Nursing and midwifery shortages, a constant problem around the country, were exacerbated by the frequent exclusions of colonised and infected staff from the workplace. In 1956, staffing at National Women's Hospital was critically low, a reflection of the long hours worked by nurses and midwives especially in the labour ward, where staff 'fairly consistently work overtime…At the present time there is a 100% turnover of staff each year'.[441] Faced with the issue of cross-infection at the hospital, the Department of Health considered the possibility of discharging patients home 'on the 3rd or 4th day when domestic help is available and home conditions satisfactory', as a means of reducing staff workload. Another option, was to augment staff numbers by 'recruiting girls immediately on leaving school and employing them as hospital aids. This is preferable to classifying them as cadet nurses as this latter class are not permitted to work after 5.00 p.m.'. Student nurses were an important part of the hospital workforce. In 1957, Flora Cameron, Director, Division of Nursing reported a 'considerable increase in the incidence of boils and septic fingers… in all training schools. The loss of duty time by those contracting these conditions means a reduction in the number available for nursing care and is a serious matter when it is viewed in conjunction with general shortage of staff'.[442]

In 1958, the question of staff persistently colonised by pathogenic strains of staphylococci was addressed in a memorandum to the Medical Officer of Health, Christchurch;

> The situation concerning nursing staff who are persistent carriers of staphylococcal infection is causing an embarrassment to the Department in that although they are unable to pursue their normal employment they are able to take up other suitable work. They are not strictly incapacitated within the meaning of the Workers Compensation Act. However a recommendation has been made to the Commission that the Department be authorised subject to certain conditions, to make payments similar to weekly compensation payments with a denial of liability under the provisions of the Workers Compensation Act. It is hoped that an early decision can be made by the Commission so that the question of payment to the

[441] National Women's Hospital Medical Committee Meeting minutes, 12 February 1957, BAGC A638/38a, Archives New Zealand, Auckland, p.277.
[442] AJHR, 1957, H.31, p.60.

> present and any future nurses who are inflicted with this infection can be dealt with promptly.[443]

For individual staff members, the impact of exclusion from work or training could be prolonged and disruptive. Bunty Graham started her maternity training in Balclutha in 1956. 'After three weeks they asked me to my general training. That's when I cared for a baby with hydrocephalus and I got H-Bug in my eyelids…It was a nasty, nasty bug. They put me into hospital and fed me up on malt to boost my immune system then sent me home. Any scratch on my skin got infected – even a scratch from the catch of my watch started up a sore. It lasted several months'. Her GP was concerned about treating the resistant infection: He said, we'll have to be very careful or we won't have anymore antibiotics for you to take…I couldn't go back to nursing for two years….I went to Queen Mary Maternity Hospital in Dunedin and got it once more in 1959 – they put me into 'sick nurses' – a ward in the hospital. I just wanted to get rid of the damn thing and get on with my life'.[444] She received novel advice from the GP who carried out her medical examination before returning to training; 'Dr Eastgate told me that I carried a bug in my nose and throat. He asked me if I smoked and when I said no, he said that it might be a good idea. I smoked for forty years'. Ann Nightingale applied for Plunket training in 1959. 'Part of the screening was the nasal swabs and I had staph in my nose. I wasn't allowed to work and I wasn't allowed to go to Dunedin until it cleared…There were no extra staff employed to cover in those days and no bureaus so there was no one you could call in'.[445]

Boils and Breast Abscesses

If babies developed even minor staphylococcal infections – an eye infection or paronychia – they were isolated, often with their mothers, but sometimes in separate nurseries. The most common infections to affect the postpartum women, boils and breast abscesses, did not usually occur until they went home. Women were well aware of the danger of catching the H-Bug during their postpartum stay. Margaret Pye, who had four babies between 1950 and 1958, remembered, 'When I was in hospital in 1958, I just couldn't wait to get out because babies were getting the H-Bug and being taken

[443] Turley for Deputy Director General of Health to Medical Officer of Health, Christchurch, 21 May 1958, HI 131/175, Archives New Zealand, Wellington.
[444] Bunty Graham, interviewed by Deborah Jowitt, 9 December 2003.
[445] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.

away from their mothers and put in isolation. My baby was beside my bed during the day and taken away to the nursery overnight. I was only in for five days which was a record. They were letting women go home earlier'.[446] The women who developed postpartum breast infections in the hospital or community, were usually treated by surgical incision and drainage of the affected ducts. The impact on breastfeeding, however, even after future confinements, was often very negative; 'A lot of them would never breastfeed again. Mostly they [the surgeons] would make the incision on the line of the duct so that very few ducts would be destroyed. The main thing was though, once bitten, twice shy. If a woman had breast abscesses she wouldn't want to breastfeed ever again'.[447]

Jessie Gillies gave birth to her second baby in 1956, then spent 'about two weeks' in the Campbell Johnstone Ward at Waikato Hospital after the delivery. During this time, her baby boy developed staphylococcal lesions on his legs. She was aware that the unit was experiencing a problem; 'they had removed all the curtains from the ward – a small ward with four mothers – and anything that could be a nuisance because of the infection'. Not long after leaving the hospital, she developed a large carbuncle on her neck and a breast abscess. 'The GP came and sort of operated on it at home. I had to stop breastfeeding him because of the abscesses'.[448]

Beryl Short was admitted as an antenatal patient to Cornwall Hospital in 1959. She had pneumonia, but after six weeks eventually recovered. 'By the time I was well enough to go home, my baby was due to appear in two weeks so they decided I should stay put. While there I contacted the H-Bug, which as I remember consisted of red spots that seemed to fester', on her upper thighs and pelvis.[449] The infection was very persistent; 'The nurses went to all sorts of trouble trying to cure it. Once I remember when they showered me they thought some sunshine might help so they put me in a chair so the sun streamed into the room on to my pelvic area. I called this 'Fanny in the Sun!' My main worry really was that the baby would catch the bug in the process of being born. I was in hospital for about six weeks until it finally cleared up'. Her daughter Gay

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[446] Margaret Pye, interviewed by Deborah Jowitt, 24 February 2003.
[447] Dr Jack Dilworth Matthews, interviewed by Deborah Jowitt, 10 January 2003.
[448] Jessie Gillies, interviewed by Deborah Jowitt, 16 February 2003.
[449] Beryl Short and Gay Johnstone, interviewed by Deborah Jowitt, 7 August 2003.

Johnstone, remembered her mother's lesions being 'painted' with Mercurochrome, a commonly used red mercurial antiseptic, to hasten the healing process. She also recalled that the long hospitalisation seemed to have a depressing effect on her mother. 'I remember going up one day. You were sitting with Nana and you were crying your eyes out. I've never seen you cry like that before or since – you were really down to it'.[450]

Caring for women in isolation also put enormous pressure on the nurses and midwives whom often had to work in improvised situations. Ann Nightingale remembered the difficulties of trying to provide optimal care with minimal staff, and labour intensive methods of decontaminating linen and equipment;

> When the H-Bug became established, we had to set up isolation units. So at Lower Hutt before the new maternity unit was built, we converted one of the areas for isolation. It was dreadful, you'd have one or two or three ladies in there with their babies and all their paraphernalia - linen bags, gown hangars and rubbish bins. Sometimes you'd come on duty and in the morning and it would look like a tip and you'd think, my God, how can these women stand to be here! You'd race round, clean them up, clean the place, get rid of the rubbish. And of course we had to soak all the linen; there was no separate infectious linen disposal like there is now…everything was made of stainless steel. Everything was boiled, bedpans were boiled, all the baby's gear as well you had to boil, even to the teats. And then there was the awful process of double panning. One pan to use and one for swabbing…So it was a real exercise and a half and you hardly ever caught up before you were on to the next lot.[451]

Nightingale recalled how difficult the experience was for the affected women; 'It was really hard on the mothers. They had restricted visiting and weren't allowed to mix with the other women'. She saw that the physical conditions also impacted on the women's experience. 'I can remember going in one morning to a woman who was sitting up in bed with the room around her looking like a bombsite. It was awful…I can still remember her face! It was one of the times when I really realised how important the environment is to recovery… a person needs to feel rested in a place they are trying to recover in'. This period had a lasting effect on her own approach to care; 'Certainly it affected my practice. It made you think all the time about what am I doing? Is this safe?'[452]

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[450] ibid.
[451] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.
[452] ibid.

Midwives and nurses were held responsible for the persistent infections among the women and babies. They were the focus of on-going swabbing and removal from duty, on the grounds that they had the greatest contact with patients. Doctors were a much smaller component of the total hospital staff and do not appear to have been similarly singled out, even though they provided a potential conduit of infection from hospital to private patients.[453] Knights did much of his research on nursery air contamination in the maternity unit at Lower Hutt Hospital where Ann Nightingale worked as midwife. 'You were so particular about hand washing. That was one of Dr Knights' prime messages – you only got cross-infection when hand washing was not good…We'd be in the nursery working in the mornings, bathing frantically and like nurses everywhere they'd stand and throw the soiled linen into the linen bags. Dr Knights used to trace the path of the linen with his air sampler and say "Don't do that!" He'd swab your hands before and after washing…you became very conscious of the things that you needed to do to avoid passing on infection'. Doris Holford also emphasised the importance of accountable practice with her midwifery staff; 'The greatest thing that ever happened in midwifery was the realization that if a mother enters a hospital healthy and she becomes ill, it is the hospital's fault. I always made sure my staff knew that if a woman comes in well gets an infection, it's the hospital's fault'.[454]

At times, containing the risk of cross-infection may have compounded already rigid and authoritarian practices. Although I have found only brief references to enforced separation between mother and baby in the New Zealand literature, it is likely that, at times, fear of infection lead to experiences similar to those of nurses and women at Royal Women's Hospital, Melbourne. From 1956 there was an increase in staphylococcal cross-infection among 'the newly born' in the hospital, with particular problems emerging in the premature babies nursery. Peggy Taylor was charge sister of the premature nursery from 1958 to 1971; 'The thing that convinced me that [separating mother and baby] was absolutely the wrong thing to do was that we had one baby in the isolette which was dying and the mother was not allowed into the nursery at all. And she stood at the window and she was crying, she was hysterical and tears were

[453] Ann McKinnon recalled that neither she nor her husband was advised to curtail patient contact when they were colonised with the H-Bug. He had a busy GP obstetric practice at the time. Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.
[454] Doris Holford, interviewed by Deborah Jowitt, 17 May 2003.

streaming. She was wanting to touch that baby, to hold it, to cuddle it, and she couldn't. And we were so cruel to do that'.[455] Another nurse suffered excessive guilt after helping a patient, who had delivered her first live child after fourteen miscarriages, to have a brief cuddle with the baby in the premature nursery. 'I had the most horrific worries for the rest of that baby's stay that somehow if it got an infection, it was all my fault because I'd let the mother nurse the baby'.[456]

'Dry Bathing' Babies

An investigation by the Royal Women's Infection Control Committee into the use of 3% hexachlorophene emulsion or pHisoHex, started in November 1958, proved highly effective against neonatal staphylococcal colonisation and infection.

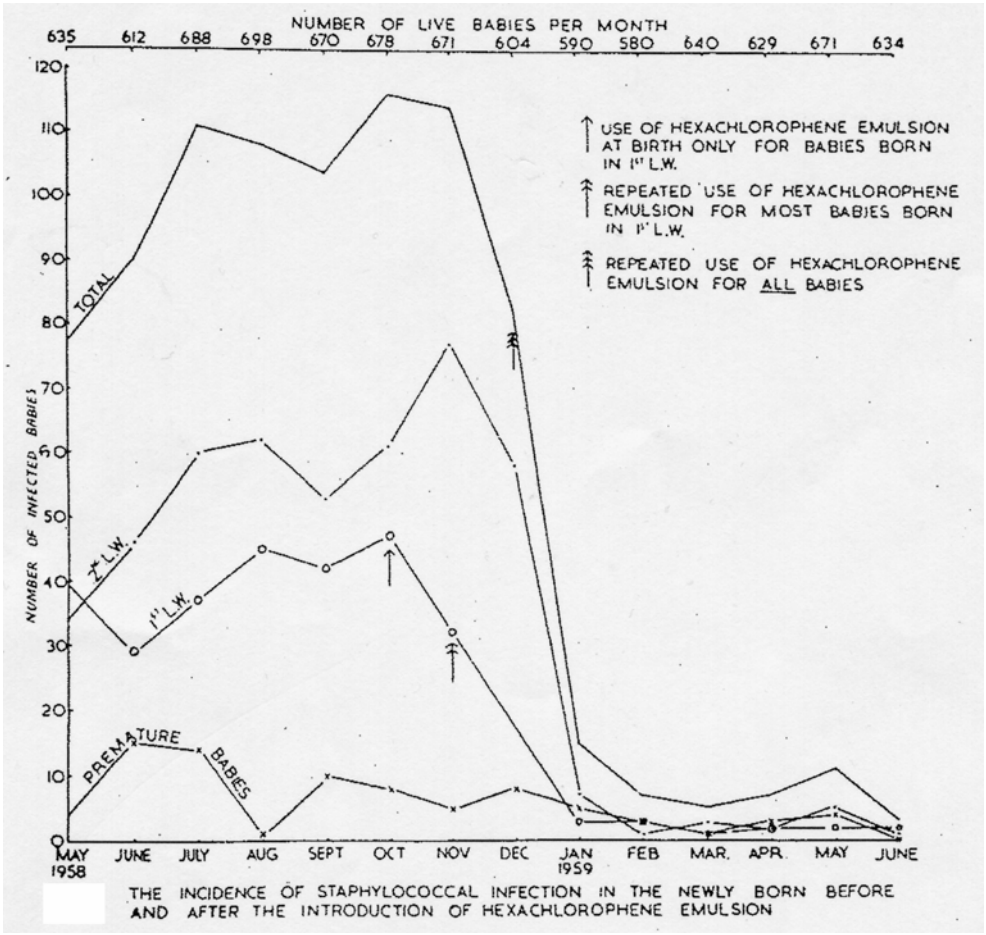

Figure 10: The results of dry bathing babies with 3% hexachlorophene emulsion

Arthur M. Hill, Hildred M. Butler and J.C. Laver, 'Reduction of Staphylococcal Infection in the Newly Born', Medical Journal of Australia, 31 October 1959.

[455] McCalman, 1998, p.230.
[456] ibid.

The Committee had followed similar approaches to their New Zealand counterparts, with the same limited success. 'Despite these measures, the staphylococcal infection rate in babies was 10% between January and April 1958 and rose to 15% in the six months May to October, reaching a peak of 17% in the last month'. A case controlled study restricted treatment to babies born in one of the hospital's two labour wards. 'In the next four weeks 230 of 249 babies born in this ward were treated and only four (1.7%) developed signs of staphylococcal infection. Of the 19 babies who were not treated, five (26%) became infected'.[457]

The results were convincing and the routine use of the emulsion was started for all babies. 'During the next six months only 48 (1.3%) of 3744 babies born in the hospital developed clinical staphylococcal infections, all of a minor degree'. The number of babies who became nasal carriers of pathogenic staphylococci while in hospital was also reduced. 'Before the introduction of hexachlorophene emulsion, 90% of premature babies and 70% of term infants born in the hospital became nasal carriers within 10 days of birth. In the most recent check, however, only 30% of 106 premature babies and 38% of term babies were nasal carriers of Staph. Pyogenes'. The application technique consisted of swabbing the entire surface of the baby with 2ml. of emulsion, with particular attention to the scalp, neck, axillae, groin and natal clefts. This process was repeated with a cottonwool swab moistened with warm tap water. An additional 1ml. of emulsion was then swabbed over the baby and allowed to dry. Standard baby bathing was restricted. 'Apart from a demonstration bath immediately before discharge, no baby is bathed in the hospital'.[458]

A report of this research into the use of hexachlorophene, published in the *Medical Journal of Australia* in October 1959, prompted an investigative visit to Australia by Dr S.C. Peddie for the National Health Institute. In his report to Derek Taylor, Director-General of Health, Knights, epidemiologist for the Institute, endorsed the use of pHisoHex for the pre-delivery pubic shave, pHisoHex preparation of all patients for delivery and pHisoHex of all babies immediately on delivery as measures of 'proved

[457] Arthur M. Hill, Hildred M. Butler and J.C. Laver, 'Reduction of Staphylococcal Infection in the Newly Born', *Medical Journal of Australia*, 31 October 1959, pp. 633-634.
[458] ibid., p.634.

value'.[459] The development of the methicillin antibiotics in 1959, and an effective method of applying hexachlorophene directly to the baby's skin, were opportune discoveries.

The promised benefits of rooming-in had not materialised. A study by Dr Margaret Liley of babies nursed on the postnatal wards at National Women's Hospital in September 1959, concluded that 'rooming-in has not to date… markedly reduced the number of babies who temporarily acquire staphylococci'.[460] At the same time as the Department of Health continued to actively support this principle; 'Much attention is being paid to rooming-in in maternity hospitals and planning of new hospitals; for example the new St Helens Hospital in Auckland is designed for this type of management', Knights had his doubts.[461] In 1962 he admitted that; 'So far in the New Zealand experience continued swabbing has not shown, whatever the other great advantages claimed for "rooming-in", the high degree of improvement in the carriage rate of staphylococci anticipated'.[462] On a similar note, he concluded that home birth would confer more benefits than rooming-in, but there is a note of resignation in his tone; evidence-based research had proven to be only part of the picture. 'It has been shown repeatedly that from the point of view of neonatal and postnatal staphylococcal cross-infection, there is far less in domiciliary than in hospital practice even though the nursing staff may be identical. While for medical, geographical and socio-economic reasons the prevailing trend is against domiciliary midwifery in this country, it may be possible to consider earlier discharge from maternity units'.[463]

In 1960, Knights collaborated with the Director of Division of Materal Welfare in the revision of the H.-Mt. 20.[464] During this year, he followed up a report from the Lancet on mercurial antiseptics that demonstrated the futility of using these solutions when epidemic staphylococci were present. 'The umbilical stumps of neonates treated with mercurochrome have been shown to provide profuse cultures of 80/81 phage type

[459] Knights to Taylor, 27 May 1960, HI 131/175, Archives New Zealand, Wellington.
[460] H.Margaret I. Liley, 'Babies Nasal & Umbilical Swabbings on the 7th Day of Life for all Post-natal Wards', September 1959, BAGC A638/38b, Archives New Zealand, Auckland.
[461] AJHR, 1959, H.31, p.57.
[462] Knights, 1962, p.37.
[463] ibid.
[464] AJHR, 1960, H.31, p.88.

staphylococci'.[465] 1% iodine in spirit or 0.5% Hibitane provided alternative solutions for cord treatment. The recommendations of the Royal Women's team led by Hill to 'dry bath' babies with pHisoHex were being implemented cautiously in New Zealand at this time. A study conducted by Audrey Jarvis at Palmerston North Hospital, published in the December 1961 edition of the *New Zealand Medical Journal*, demonstrated a 'statistically significant reduction in staphylococcal infections in babies following the use of pHisohex for bathing babies'.[466] Her study duplicated the results of the Melbourne research and influenced the decision to adopt this practice by the National Women's Hospital Medical Committee in December 1961.[467] A pHisoHex trial, carried out in the hospital by Margaret Liley, had apparently already been effective. 'That this Committee, having already taken into consideration the fact that successful trials have already been run in this hospital and elsewhere including Palmerston North and the Royal Women's Hospital, recommends that pHisoHex be used in the whole hospital in the immediate future'. Baby bathing was promptly abandoned. 'From this it will be seen that the bathing technique is no longer required and should be replaced by the pHisoHex technique for the cleaning of new born babies'.[468] A year later, in September 1962, pHisoHex was adopted in Dunedin at Queen Mary Hospital.[469] It was discontinued as an infant preparation in the early 1970s when it was discovered that premature babies absorb hexachlorophene through the skin, with potentially neurotoxic effects.

The End of the Epidemic

By 1961, the H-Bug epidemic was on the wane. A survey of 427 patients with septic lesions conducted in two Dunedin hospitals showed that in comparison with a similar survey conducted in 1957, when 44% of staphylococcal strains were phage type 80/81, only 12.5% of the staphylococcal strains were of this type by late 1960 and early 1961. The successful use of the new antibiotic celbenin (penicillinate monohydrate B.R.L. 1241) in children and infants with antibiotic resistant staphylococcal septicaemia was reported in the *New Zealand Medical Journal* in March and July 1961. The treatment of these cases represented 'a safe and highly effective therapeutic advance against serious

[465] H.T. Knights, 'Mercurial Antiseptics and Staphylococci,' Letters to the Editor, *NZMJ*, 60, 1961, p.80.
[466] Audrey W. Jarvis, 'Reduction of Staphylococcal Infection of Babies in a Maternity Unit of a New Zealand Hospital', *NZMJ*, 60, 1961, pp.570-573.
[467] Minutes of the National Women's Hospital Medical Committee, December 1961, BAGC A638/3aa, Archives New Zealand, Auckland.
[468] ibid.
[469] Wassner, 1999, p.118.

staphylococcal disease'.[470] In December 1961, Knights was called to investigate a cross-infection at the Karitane Hospital, Wellington. Three babies had died from phage type 80/81 staphylococcal pneumonia, while six other babies were affected. The hospital was closed until two days before Christmas 1961, when 'having been thoroughly spring cleaned, it was reopened'.[471] One baby, 'apparently moribund, responded dramatically to the new penicillin BRL.1241,' and survived.[472]

Infections were still occurring, but the new antimicrobials gave much improved results against a background of the reducing incidence of the previously ubiquitous H-Bug strain.[473] Soframycin Spray, a new treatment for the clearance of nasal carriers of coagulase positive staphylococci, was released in 1961, with reports that 85% of cases were cleared after 24 hours.[474] Effective pharmaceutical methods of treating H-Bug colonisation and infection had finally emerged, overshadowing the efforts of Knights and others to find a solution to the epidemic through improved aseptic techniques, hand washing practice, and isolation facilities. Knights continued to investigate improved techniques for the maternity services; 'the amount of equipment needed to sterilise baby's bottles and teats by boiling led to extensive work being done on sterilisation by hypochlorite', but his research increasingly focused on peripheral issues such as the effect of vacuum cleaners on aerial contamination and the relationship between hospital coats and cross-infection.[475]

In August 1963, Knights was again called to an outbreak of staphylococcal pneumonia, this time involving the deaths of three babies at Kaponga Hospital, Taranaki. Hospital staff had admitted a woman in labour suffering from a septic condition reflecting the 'repeated reports that septic sores, infected cuts and boils were prevalent in the area'.[476] In his paper, published in the *New Zealand Medical Journal* in January 1964, he concluded that antibiotic resistant staphylococcal infection was probably as prevalent in

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[470] W.B. Jackson, 'Recurrent Staphylococcal Septicaemia Treated by Celbenin: Report of a Case', *NZMJ*, 60, 1961, pp.337-338.
[471] Knights to Taylor, Report on Staphylococcal Infection Karitane Hospital, Wellington, December 1961, HI 131/175, Archives New Zealand, Wellington.
[472] AJHR, 1961, H.31, p.73.
[473] K.T. Corlett, 'Staphylococcal Septicaemia with Ulcerative Endocarditis, Successfully Treated with Celbenin', *NZMJ*, 60, 1961, pp.112-113.
[474] Knights to Lindsay, Findlay and Averill, 10 March 1961, HI 131/175, Archives New Zealand, Wellington.
[475] AJHR, 1962, H.31, p.76; H.T. Knights, 'Hospital Coats and Cross Infection', Letter to the Editor, *NZMJ*, 61, 1962, p.287.
[476] Knights to MacKay, Neonatal Staphylococcal Pneumonia at Kaponga Hospital, 9 August 1963, HI 131/175, Archives New Zealand, Wellington.

the community as it had been in hospitals; '…New Zealand experience has shown that the "H" can also well stand for "home" since on more than one occasion outbreaks of minor sepsis have stemmed from the admission of a patient with boils'.[477] Professor Dennis Bonham, appointed Harvey Carey's successor at National Women's in December 1963, concurred with Knights in his inaugural lecture, the recent 'Evolution of Obstetrics and Gynaecology'.[478] He described the H-Bug epidemic as a 'troublesome stand taken by the staphylococcus in the early 1950s' that had since given way to the problem of 'occasional varied infections, brought in by the [maternity] patients themselves'.[479]

The new National Women's Hospital was officially opened in February 1963 – without a separate isolation block. The original plans for the hospital, published on 10 August 1957, showed a multi-storied obstetric and gynaecology unit with isolation facilities for thirty maternity and twelve gynaecology patients 'to combat the dangers of infection… the occurrence of resistant cross-infections present a particular danger in our maternity institutions'.[480] The final recommendation on 26 August 1957, to Cabinet by Rex Hanan, the Minister of Health, was that the construction of the isolation block be delayed with the Nurse's Home for completion by 1964. In the interim, alternative proposals were considered by the Auckland Hospital Board, including the retention of the existing isolation block at Cornwall Hospital. The Health Department had referred all infected cases from private and outlying public obstetric hospitals to this unit that had accommodation for nine maternity cases and a separate nursery with two cots. While waiting for the completion of the isolation block, infected cases were being isolated within the new hospital in Ward 1. This ward had just twelve beds, but from January to October 1964 had only a 63% occupancy; an average daily bed state of eight beds. The obvious conclusion was that the need for a large isolation block had been made 'at a time when serious hazards to patients were being experienced due to the prevalence of "H" Bug infections. These hazards have now largely, if not entirely, disappeared'.[481]

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[477] H.T. Knights, 'Neonatal Staphylococcal Sepsis in a Small Maternity Unit Involving the Death of Three Babies', *NZMJ*, 63, 1964, pp.13-17.
[478] Dennis Bonham, 'The Evolution of Obstetrics and Gynaecology', *NZMJ*, 63, 1964, pp.709-714.
[479] ibid., p.713.
[480] G.R. Hanan, Minister of Health to the Minister of Finance, 1 August 1957, National Women's Hospital – Apportionment of Cost, HI 131/175, Archives New Zealand, Wellington.
[481] Auckland Hospital Board Buildings Committee, 5 March 1962, HI 56/7/14/1closed no 3107, Archives New Zealand, Auckland.

The Board was faced with other issues. Even in the new hospital, overcrowding was a problem; 'for a long time now we have had to practice early discharge and, as you know, there have been some complaints about this from time to time…The effective use of the obstetric beds in the new [isolation] block should materially increase the average days' stay to a figure less likely to invite criticism'.[482] As well, Dr Algar Warren, Medical Superintendent of National Women's Hospital, was keen to remove the stigma of infection from the new hospital. 'The new National Women's Hospital should not be of sub-optimal standard, as it will be the foremost O. & G. Hospital in this country and should really be a 'show place'…we have it in mind for some time to do away with the term "Isolation" as this seems to conjure up in the minds of the uninformed (particularly lay people) something unpleasant or taboo, particularly in maternity matters'.[483] The new hospital symbolized progress and forward looking policies, distanced from 'the time when certain drug-resistant organisms were causing concern in the country and the so-called "H-Bug" was so feared that many patients disliked the thought of being confined in a large hospital such as National Women's'. The isolation block was to be used as a postnatal ward, 'the term "Isolation" dropped and the block referred to the New Extension'. [484]

The H-Bug epidemic fundamentally altered the delivery of maternity services throughout the country. The prescriptive practices that had been introduced in the 1920s to overcome high rates of maternity mortality, were challenged when a new infectious crisis appeared in maternity care. Rooming-in replaced the communal nursery, women were encouraged to get up and care for their babies, perineal swabbing and bed rest gave way to early ambulation and showering before early discharge home. Rather than relinquish the model of hospitalised childbirth, doctors and health department officials redefined acceptable maternity care. The tenets of the H.-Mt.20, the 'Bible' of New Zealand childbirth, were overturned to allow women to care for their own babies at the bedside.[485] Midwives and nurses, previously portrayed as the arbiters of aseptic practice, were reframed as the primary link in the chain of infection. Postpartum routines were

[482] Auckland Hospital Board Hospitals Committee, 12 April 1964, HI 56/7/14/1closed no 3107, Archives New Zealand, Auckland.
[483] ibid.
[484] ibid.
[485] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003. 'All the (maternity) hospitals in New Zealand operated on H.-Mt.20. It was like the 'Bible'… You didn't deviate an inch'.

rearranged to reduce staff contact with babies to a minimum. Teaching mothercraft skills replaced complete nursery care as women were encouraged to rediscover their ‘natural’ role as mothers.

The epidemic accelerated those changes that were in tune with emerging social attitudes. Evidence-based measures, such as oiling babies, that might have reduced infection rates, were not necessarily adopted. Rooming-in did not reduce the rates of cross-infection, but it met with the combined approval of women, progressive professionals and health department officials, and remained. Rooming-in was frequently cited as evidence of an active official response to the H-Bug epidemic, while the persistent overcrowding and short staffing that undoubtedly contributed to the level of cross-infection, were conveniently overlooked. The introduction of new antibiotics and a method of ‘dry bathing’ babies in hexachlorophene coincided with the end of the epidemic. Confidence in a scientific solution to the problem of antimicrobial resistance was enhanced at the same time as doubts about the safety of hospital birth were once again erased from the national consciousness.

CHAPTER SIX

The Everywhere-Bug: H-Bug in the Community

> "The term H-Bug or Hospital Bug is unfortunate," said the Minister. "It could much more aptly be described as the E-Bug, or Everywhere-Bug. It does not belong primarily to hospitals at all. It is ubiquitous".[486]

Introduction

In November 1955, at the same time as hospitals around the country reported a significant increase in penicillin resistant staphylococcal infections, 'practitioners working outside the hospital also reported an increased incidence of infection due to this virulent strain'.[487] Resistant organisms, multiplying in the hospitals, inevitably affected the wider population as infected or colonised patients were discharged home to their families. Newborn infants, handled almost exclusively by midwifery and nursing staff during their ten to fourteen-day stay, were often colonised or infected by resistant staphylococcal strains before they were discharged.[488] They subsequently infected their mothers, some of whom developed breast abscesses that did not manifest until several weeks or months later.

General practitioners (GPs) bore the burden of treating infections in the community, although the recurrent nature of many skin lesions meant that families sometimes relied on basic methods of treatment in the home. The H-Bug epidemic raised concerns over the safety of patients entering New Zealand hospitals, particularly maternity hospitals, where rates of antibiotic-resistant staphylococcal carriage and infection among staff and patients remained high until the early 1960s.

A New 'Mutant' Strain

In the past, boils and minor skin infections due to *Staphylococcus aureus* were reported as being ' relatively benign', although the level of endemic infection present in the

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[486] Press Statement: Staphylococcal Cross Infection, 7 May 1958, HI 131/175, Archives New Zealand, Wellington.

[487] Report of the Superintendent-in-Chief (16/11/55), Hospitals Committee, Auckland Hospital Board, HI 131/175 – 26673, Archives New Zealand, Wellington, pp.260-265.

[488] Approximately 60% of infants were carriers of penicillin resistant staphylococci by the time of discharge from National Women's Hospital. Of these 36% of these were positive for the epidemic strain 80/81. Minutes of a Meeting of the National Women's Hospital Medical Committee held in the Tutorial Room at 8.00P.M 12 February, 1957. BAGC A638/38a, Archives New Zealand, Auckland, p.277.

community was hard to estimate in the absence of any reliable data.[489] The exception was a study undertaken among Hokianga schoolchildren in 1953.[490] The researchers, McCarthy and Marples, found that of 294 primary school children, 22.1% had impetiginous lesions and 8.8% had infected wounds. The infecting organisms in 79% of cases were 'pathogenic staphylococci'. It is safe to assume that these levels were higher than anticipated in the general community as they conclude that, 'Polynesian children…in New Zealand suffer considerably from superficial skin infections'. Inadequate facilities for maintaining 'satisfactory standards of cleanliness' and the close contacts of life in the overcrowded Maori dwellings were cited as probable contributing factors. It would appear that while boils, furuncles, carbuncles, pustules, paronychia and impetigo (or 'scrum pox') were all common afflictions, they were not usually the cause of serious illness. The epidemic strain of staphylococci affecting hospital patients was described by contrast as a 'new mutant form' of *Staphylococcus aureus* that could cause severe local and systemic infections resistant to the commonly used antibiotics.[491]

The Link between Home and Hospital

A probable epidemiological link between hospital and home was found between the November 1955 Calvary Hospital deaths and a fatal case of enteritis several months later. In October 1956, the *New Zealand Medical Journal* published an account by Drs Stewart and Cuningham, physicians at Christchurch Public Hospital, of a 'Fatal Antibiotic Resistant Staphylococcal Enteritis Arising in General Practice'.[492] An eight year old girl, whose mother had been a patient at Calvary Hospital at the time of the outbreak three and a half months previously, had a tooth extraction 'on account of severe pain and localised swelling'. Oral penicillin was prescribed, but five days later the child was still febrile. The treatment was changed to a broad-spectrum antibiotic, Achromycin. On the ninth day of treatment the child was gravely ill with slight diarrhoea. She was admitted to hospital in a moribund state, semi-conscious, irritable

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[489] 'A comparison of present day staphylococcal infection with that which has previously occurred in this country has not been possible because of the lack of published data'. N.P. Markham and H.C.W. Shott, 'Staphylococcal Infection in General and Hospital Practice', *NZMJ*, 57, 1958, pp.55-62.

[490] D.D. McCarthy and M.J. Marples, 'A Study of the Incidence and Aetiology of Skin Infections in a Group of Maori Children', *NZMJ*, 53, 1954, pp.232-236.

[491] Report of the Superintendent-in-Chief (16/11/55), Hospitals Committee, Auckland Hospital Board, HI 131/175 – 26673, Archives New Zealand, Wellington, pp.260-265.

[492] D.T. Stewart and J.A.K. Cuningham, 'Fatal Antibiotic Resistant Staphylococcal Enteritis Arising in General Practice', *NZMJ*, 55, 1956, pp.376-377.

and dehydrated. 'A rectal swab showed on direct smear clumps of staphylococci with virtual absence of other organisms. Her condition continued to deteriorate and she died some hours after admission. Cultures of the throat and rectal swabs the next day revealed heavy growths of staphylococcus aureus resistant to penicillin, streptomycin, aureomycin and terramycin, but sensitive to chloromycetin and erythromycin'.[493]

The previous year, Cuningham and another Christchurch Hospital colleague, D.W. Beaven, had published a report of three cases of fatal enterocolitis due to an overgrowth of resistant staphylococci in the bowel after treatment with broad-spectrum antibiotics.[494] They commented that, 'patients entering hospital soon become carriers, as a result of cross infection from the staff or long-stay patients. Discharged patients spread these organisms to family groups. Resistant organisms also develop in those patients treated at home with antibiotics and constitute further foci of spread'.[495] In their summary of the case of fatal enteritis, Stewart and Cuningham alerted their colleagues to the increasing incidence of community-acquired infection; 'Hitherto it has been customary to regard antibiotic-resistant staphylococcal infections as peculiar to hospitals. These institutions are certainly the breeding grounds of such organisms which are harboured in the nasopharynges of the nursing and medical staffs and also of some patients…However, it is now apparent that these resistant organisms are becoming commoner outside hospitals as an increased incidence of resistant infections has been noted in outpatients for many months'.[496]

Baby Blues

For childbearing women and their babies, the initial source of infection was likely to be the local maternity unit. Jessie Gillies developed a carbuncle not long after she was discharged home from the Campbell Johnstone Maternity Ward at Waikato Hospital in 1956. 'We had a GP who was the husband of a second cousin of mine. He made house calls to see me when I came back from the hospital after having my second baby. The baby's legs were all covered in bandages because of the boils that had appeared. The GP

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[493] ibid., p.376.
[494] J.A.K. Cuningham and D.W.Beaven, 'Fatal Enterocolitis due to Antibiotics: A Report of Three Cases', *NZMJ*, 54, 1955, pp.644-647.
[495] ibid., p.645.
[496] Stewart and Cuningham, 1956, p.377.

said to my mother, 'Take the little girl down into the garden because this isn't going to be nice'. I had a huge carbuncle on my neck and he was going to deal with that'. Later on she developed a breast abscess. Surgical treatment was accompanied by the advice to stop feeding. 'It was very unpleasant. It was on the tendon going under the arm. The GP came and sort of operated on it in the home. I had to stop breastfeeding. I was feeding him when I went home but I had to stop because of the abscesses'.[497]

The number of cases where breast abscess associated with lactation was treated in a public hospital more than doubled between 1955 (338) and 1957 (708).[498] Figures were unavailable for private institutions, where additional cases were undoubtedly treated. With the recommended advice to stop feeding on the affected breast and the associated pain and trauma, most women did not attempt to breast feed again after subsequent pregnancies.[499]

The impact of on-going infection in families could be profound. Merilyn Beken recalled that when her youngest sister, born in December 1958, came home from Howick Maternity Hospital, she already had an infection in her groin. 'It was very swollen and inflamed. My mother got carbuncles on her face; the whole side of her face was hugely swollen with these big pus-filled cores. Her eye was so swollen that she couldn't open it and she had dreadful headaches'. In time the whole family was affected. 'My father got boils all over his knees and his elbows. Every time he got run down he got another crop. I was at primary school and I had to go to school with a cushion. There were four of us girls and each of us had boils, but my memory is that mine were the worst! I had them on my knees and on my backside and I was a very thin spindly child with very little fat. There were no cushioning effects and I had to sit on boils with neat Elastoplast on them'.

Treatment was cursory and just as likely to encourage infection as prevent it. 'Each night I'd get home and I'd have to bend over and my mother would rip the Elastoplast off to get the cores and then squeeze the boils. Dettol seemed to be the treatment until

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[497] Jessie Gillies, interviewed by Deborah Jowitt, 16 February 2003.
[498] Taylor to Johnston, 30 November 1959, HI 56/7/14; 26929, Archives New Zealand, Wellington.
[499] Jack Dilworth Matthews, interviewed by Deborah Jowitt, 10 January 2003.

the [disinfectant] paints came out – I think we used Mercurochrome. My knees were very decorative. The local chemist used to stock hexachlorophene soap - my father just about smothered himself in it, just about took it internally to try to get rid of the boils'.[500]

Women entering maternity hospitals were well aware of the potential for cross-infection and wanted to avoid it if at all possible. Margaret Pye barely 'escaped' the H-Bug during her last confinement in Lower Hutt Hospital; 'When I was in hospital having Gaye in 1958, I just couldn't wait to get out of hospital because babies were getting it [the H-Bug]. I just wanted to go home before one of us got it'. Her second son was hospitalised for three months in 1956, but it was not until 1962, during a surgical consultation, that she became aware that he had developed staphylococcal pneumonia during his earlier admission. 'They didn't tell us he had got that infection while he was in the hospital'. In 1958 she and her older children developed boils and persistent infections that started after any small injury to the skin. 'Melody got it on her mouth where she fell against the side of the bed. Allen cut his foot in the garden and it got swollen and infected. He had boils on his bottom too'. She found the advice and treatment offered by her GP to be relatively unhelpful. 'When we went to the doctor with these eruptions, he said it would take about 6 weeks to clear them up. I think I was using Gentian Violet and onion poultices'. In desperation she went to a colour therapist recommended by a friend. 'He had a book with all the different coloured embroidery threads and this little bamboo stick that he put on your wrist. He put an expanding bracelet on you that had a wire that went to this huge array of colours in the middle of the room. We weren't getting any help from anything else and we'd tried all sorts of things'.[501]

Even health professionals could find it difficult to obtain a correct diagnosis and effective treatment for persistent infections. Anne McKinnon delivered her fourth child at Cornwall Hospital in early 1955 without infectious problems complicating her confinement, but five months later was admitted to Kaitaia Hospital with a severe case of ethmoidal sinusitis. 'Michael was a lovely baby, breastfed and gaining weight

[500] Merilyn Beken, interviewed by Deborah Jowitt, 11 June 2003.
[501] Margaret Pye, interviewed by Deborah Jowitt, 24 February 2003.

steadily. I on the other hand was very tired trying to work in general practice part-time as well as bringing up the children'.[502] When her illness started she was treated with penicillin but in spite of this she became progressively worse;

> A Canadian GP whom we had helping us at the time insisted that I went into hospital to have further antibiotic treatment. Because Michael was being breastfed he was admitted as a boarder baby. When we went home, I was still pretty tired and in order to take more rest I decided to bottle feed him. He started to spike temperatures of unknown origin, some sort of infective focus that lasted for four or five days. During this time he would vomit, his temperature would spike, he wouldn't be able to eat and it was very hard to keep him well hydrated. I used to sit up at night with a dropper to get water and glucose into him. He would seem to recover and then it would start all over again.

The paediatric specialist she approached initially diagnosed his illness as a form of food allergy:

> When he was about eight months old I got desperate about this as nobody seemed to be offering any help or clues. We went to Auckland to see Dr Dilworth Matthews…He took one look at Michael and said…this is a recurrent resistant *Staph. aureus* infection. At the same time as Michael was ill, the other children had persistent boils that were very hard to clear up. Dr Matthews had the whole family swabbed and every member of the family was carrying penicillin resistant staph in their noses. Michael was put on erythromycin, which was being reserved for resistant staphs at the time. He progressively improved and got better but he still hadn't reached his expected physical milestones by the time he was one.[503]

Hospitals – Safe Havens or Plague Spots?[504]

The popular press carried reports about the infection risk in hospitals, as well as careful statements about the safety of individual institutions by hospital administrators and senior medical staff.[505] The *Standard* tended towards an alarmist approach in the titles of articles dealing with the problem; 'H-Bug Blamed for High Infant Death Rate' and 'Deadly Danger to Mothers and Babies: Fatal Folly'.[506] Hospital administrators were

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[502] Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.
[503] ibid.
[504] J.A.K. Cuningham, 'The Use and Abuse if Antibiotics', *NZMJ*, 56, 1957, pp.175-178.
[505] 'Care taken here against "H-Bug"', *AS*, 28 November 1955. This article described the measures taken by National Women's Hospital to prevent cross-infection with 'antibiotic-resistant bacteria'.
[506] *TS*, 26 September 1956; *T S*, October 16, 1957.

frustrated by the lack of public confidence in the safety of hospitals. In an article in the *Standard* entitled 'No H-Bug Secrecy, Auckland Doctor Says', Dr Selwyn Kendrick, Superintendent-in-Chief of Auckland Hospital, expressed his irritation. 'Whenever I advise a patient to enter hospital they invariably ask me if it is all right with all the H-Bug infection in the hospitals…There is no more infection inside a hospital than outside it.'[507] By November 1956, Health Department officials were confidently stating that the public presented a reservoir of antibiotic resistant staphylococcal infection that should be guarded against on admission to Cornwall Hospital. 'With the presence of a larger amount of antibiotic resistant strains of pathogenic infecting organisms widespread in the public at large, and in patients coming to hospital for confinement, not only special care with technique must be exercised, but further adaptation and improvement to the Ward and Labour Units must be put in hand forthwith, so that every possible precaution can be exercised'.[508]

While the profession was willing to take some responsibility for 'indiscriminate' prescribing, it was affronted by any inference that hospitals were not 'the safest places' for care, especially with regard to the maternity services where the alternative of home birth was still theoretically an option.[509] Much was made of 'rooming-in' of mother and baby as a means of reducing the 'hazards of staphylococcal cross-infection' in maternity practice in both the medical and lay press.[510] Attention was drawn to the fact that the H-Bug was not only a concern in New Zealand but was part of 'a worldwide danger and an unfortunate accompaniment of the otherwise great benefits accruing from the use of antibiotics'.[511]

In an article prepared for the *Standard* in May 1958 by 'Mr Clark after discussion with the officers of the [Health] Department', the Minister of Health, Rex Mason, emphasised medical success as the reason for the relative prominence of the H-Bug; '…when a medical victory was obtained over one organism, that organism became of

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[507] *TS*, 21 November 1956.
[508] Inspection of National Women's Hospital: 28 and 29 November 1956 by Drs. Taylor & Davis and Miss Cameron, H1 131/175, Archives New Zealand, Wellington, p.10.
[509] In fact there were few midwives and GPs willing to support home births at this time. Mary Dobbie, *The Trouble with Women*, Christchurch, 1990, p.4.
[510] Editorial, Maternity Service in New Zealand, *NZMJ*, 56, 1957, pp.491-493.
[511] ibid., p.492.

lesser importance in infectious illnesses, but others became relatively greater in importance'.[512] He went on to highlight the fact that it was the community that brought the infection to the hospital, not the other way round. 'Staphylococcal infection occurred in hospitals for an obvious reason, the Minister said. Infection developed in the community and cases therefore entered the hospital, the logical place for their treatment. The infection had been widespread in the community throughout New Zealand…In consequence it followed that it had been widespread throughout the country's hospitals'.[513]

Drs Markham and Shott, from the Department of Microbiology, University of Otago, concurred with the Minister.[514] A six-month review of specimens sent to the hospital laboratory from both community and hospital patients led them to conclude that; 'staphylococcal lesions which required hospital treatment, when encountered in general practice were more frequently caused by drug resistant staphylococci than were those which could be treated adequately without hospital admission. There is thus a constant feeding into the hospital environment of relatively drug resistant staphylococci and this factor must contribute towards the perpetuation of this type of organism in hospitals'.[515]

Not all the experts agreed however. A survey conducted among GP practices the same year by the pathologist at Christchurch Hospital, G.C.T. Burns, and the Medical Officer of Health, Dr W.I. Paterson, led them to take the opposite view.[516] Swabs from 233 patients obtained from GP surgeries over a four-month period were examined. 'Among the179 swabs that yielded a coagulase positive staphylococcus… 54% of staphylococcal strains were penicillin resistant and of these 42% were of the epidemic phage type 80/81'.[517] Only one case was admitted to hospital during the four-month survey period, but association with hospital as a previous in-patient, as a relative of an in-patient or both was strongly associated with staphylococcal infection by the epidemic 80/81 strain. Paterson and Burns concluded that hospitalisation was a significant factor in the spread of phage type 80/81 into the community. When members of the community entered the

[512] Press Statement: Staphylococcal Cross Infection, 7 May 1958, HI 131/175, Archives New Zealand, Wellington.
[513] ibid.
[514] Markham and Shott, 1958, pp.55-62.
[515] ibid, p.61.
[516] W.I. Paterson and G.C.T. Burns, 'Staphylococcal Infection in Christchurch in 1958', *NZMJ*, 58, 1959, pp.787-791.
[517] ibid., p.791.

hospital as patients, they were exposed to cross-infection and colonisation with resistant strains of staphylococci.

Otago University microbiologists, Burkinshaw, Hamer and Swier, were of the same mind; in their survey of staphylococcal nasal carrier rates in a large Dunedin maternity hospital they 'confirmed that babies acquire their staphylococcal flora from the nurses rather than their mothers'.[518] Dr Neil Begg, Director of Medical Services to the Plunket Society, took a similar stance in a 1961 circular to Plunket Nurses with the heading 'Epidemiology of Staphylococcal Infections'. 'Obviously the most important way to prevent the spread of virulent staphylococci into the community, is to clear the organisms from the hospitals, particularly the maternity units. This, I imagine, is a long way off'.[519]

Patients Have a Duty Too

The lay public was castigated for contributing to the problem of antimicrobial resistance by 'pressuring' doctors to prescribe antibiotics when he did not regard them as entirely necessary.[520] The use of antibiotics, both in the community and in hospitals, had risen steadily since penicillin was first introduced in 1946. As a result of the 1938 Social Security Act and subsequent introduction of the Pharmaceutical Schedule in 1941, antibiotics could be obtained free on the 'Fund'. The cost of drugs, particularly the expensive ones like broad-spectrum antibiotics, was not a consideration for patients contemplating a medical consultation, leading some to believe that the 'free medicine' scheme had encouraged New Zealanders to become 'a nation of pill swallowers and medicine guzzlers'.[521]

The launch of the Health Department magazine, *Health*, in 1948, and the weekly broadcasts of Dr Turbott, the 'Radio Doctor', from September 1952, had already given impetus to the role of preventive medicine in the relationship between doctor and

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[518] J. Burkinshaw, J. Hamer and J. Swier, 'Staphylococcal Nasal Carrier Rates in a Maternity Hospital', *NZMJ*, 57, 1958, pp.366-369.
[519] Neil C. Begg, Circular to Plunket Nurses: Epidemiology of Staphylococcal Infections, 28 March 1961, HI 131/175, Archives New Zealand, Wellington.
[520] Editorial, *AS*, 29 November 1955.
[521] AJHR, 1958, H.31, p.105. The broad-spectrum antibiotics are described as forming 'one of the most expensive classes of drugs in common use'; AJHR, 1960, H.31, p.65.

patient.[522] 'Boils – and All About Them' in the June 1955 edition of *Health*, discussed the causes and treatment of boils including penicillin, hot fomentations and the 'elastoplast' method – 'some doctors prefer to cover the boil with an elastic adhesive dressing and leave it alone for ten days or so. If the boils bursts, the matter is absorbed…if it doesn't burst, so much the better, because there will be no scar'.[523] Dr Turbott revisited 'Boils and Their Cause' in a radio talk the next year. He advice was upbeat; 'It is obvious when smitten with one or with recurrent boils you have to tone up the body generally…If you are in a period of stress, there's nothing for it but to break away and relax as the quickest means of recovering poise and getting on top of recurrent boils'.[524]

Dr Turbott's talks were used in response to requests from the public for information from the Health Department. 'We do not have any pamphlet on the control of staphylococcal infections other than a rather technical booklet on cross infection…2% hexachlorophene soap is recommended for hand washing…I enclose our booklet on slimming as requested and a copy of Dr Turbott's talk, Crops of Boils'.[525] An article in the Otago Daily Times, quoting Dr Knights of the National Health Institute on the treatment of hospital bedding to prevent staphylococcal cross-infection, brought a flurry of correspondence, including a letter from Mrs E.M. Vincent of Oamaru. 'Could you advise me on any precaution I could take with regard to the bedding of my seventeen year old daughter? She has had a succession of six abscesses in her left armpit. The doctor says they are of the staphylococcal type and after tests said that they were immune to most drugs. However they now appear to have cleared up…I was most careful with all her clothing, bed linen, dressings, etc., and all our home conditions are of the best. I would appreciate your advice regarding a method to ensure no germs are left in her bed'.[526]

[522] Derek A. Dow, *Safeguarding the Public Health: A History of the New Zealand Department of Health*, Wellington, 1995, p.151.
[523] 'Boils and All About Them', *Health*, June 1955, Wellington.
[524] H.B. Turbott, 'Boils and Their Cause', *Health*, September 1956, Wellington.
[525] Taylor to McKenzie, 16 October 1961, HI 131/175, Archives New Zealand, Wellington.
[526] Vincent to Knights, 11 October 1961, HI 131/175, Archives New Zealand, Wellington.

Knights was not amused by the results of the 'undue publicity'. He took the opportunity to write to the Director General of Health to suggest that Turbott could tackle the issues in a radio broadcast.[527] For Turbott's benefit, he outlined preventive measures for the home. These included ensuring that the infected person had his own towel, that a shower rather than a bath was used, that laundry was either soaked in disinfectant or boiled during the washing process, and that mattresses and pillows were regularly sunned and aired. As a final request, he asked for departmental support; 'In view of the scare headlines in the daily press which may result from articles submitted for publication in the medical press, could it not be made routine to have all such articles submitted to the Public Relations Officer who will ensure by contact with the writers that such aspects of the subject as are properly informative are handed to the newspapers?'[528]

The Role of General Practitioners

General practitioners played a key role in educating families about good hygiene and the appropriate management of skin lesions. Dr Fred McConnell, a general practitioner in Mt Albert during this period, recalled the approach he took with his patients; 'We just got on advising families. We used soaps, some of them antiseptic…you can't stop children wrestling and playing around at school, contacting at kindergarten…but one [important] thing is the cleanliness and gentleness when you are dressing the children and making sure they don't use one another's towels. Long trousers – people had infections from rubbing at the knees…you get pressure areas on the knees and elbows and under the arms and this is where you got staph infections occurring'. He was adamant that as a doctor, 'you've got to general instruction on all that [personal hygiene]. You mustn't be rough with the skin…it feels good to dry yourself by rubbing yourself down vigorously but this is what you shouldn't do because you can knock the top of pussy things and give yourself minute abrasions'. GPs were treating staphylococcal lesions with penicillin in the home and at the surgery. 'Things like boils, abscesses, carbuncles – you don't shoot these patients to the [hospital] outpatients, you can treat them at home provided you've got adequate supplies of drugs'.

[527] Knights to Taylor, 16 October 1961, HI 131/175, Archives New Zealand, Wellington.

Dr McConnell had strong ideas on the appropriate management of staphylococcal skin lesions:

> You get these little satellite boils and pimples coming up and these must come from microscopic abrasions of the skin. So you have to be very careful cleaning the skin, swabbing of the pus. It's got to be done gently, not a rough process and it's quite prolonged. The core [(of a boil] will come away. You leave it, you don't tear or break it. You've got to wait till the right time to open these boils and carbuncles. No squeezing or pressing…the zone where the infection is meeting the body is very soft and friable and breaks…heat is really an unnecessary thing is so many ways – this poulticing that went on…I decided long ago there was no need for it. Applying all that heat…it's destructive, frankly. Protect the area and make it more comfortable.[529]

Another GP working in Matamata, Dr Charles Howden, took a similar approach. 'Boils are localized infections. Pressing a boil is the worst thing you can do'. He was, however, in favour of poultices; 'Some of the things you used then – magnesium sulphate poultices would have an osmotic effect and draw them out. When the boil was fluctuant, it was generally ready for a poultice'.[530]

The Dr Doris Gordon Hospital

The final planning for the new National Women's Hospital in the mid-1950s, coincided with the emergence of the H-Bug in the maternity services. Considerable debate had focused on the provision of separate or combined clinical gynaecological and obstetrics services as well as the need for a discrete isolation ward. When the planning committee for the hospital first met in October 1950, it agreed that 'a separate isolation unit would not be necessary as infectious diseases would be treated at Auckland Hospital and other cases would be admitted and treated in single rooms'.[531] The difficulties encountered controlling and preventing staphylococcal infection in maternity hospitals forced the Auckland Hospital Board to review its plans in 1957. This issue galvanised politically active women in the community, who had already been united by Dr Doris Gordon in a

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[528] ibid.
[529] Dr Fred McConnell, interviewed by Deborah Jowitt, 10 January 2003.
[530] Dr Charles Howden, interviewed by Deborah Jowitt, 6 April 2003.
[531] Gerald Wakeley, *For the Women of New Zealand: The Story of National Women's Hospital*, Auckland Hospital Board, 1963, p.9.

common cause, to fundraise for a national women's hospital. They found themselves fighting, after Gordon's death in July 1956, to retain her vision of clinically separate obstetric and gynaecological departments and a stand-alone isolation unit.

Evelyn Lovegrove was one of Gordon's most vocal supporters. A journalist on *The Standard*, Lovegrove met Gordon as a member of the National Council of Women's (N.C.W.) maternity sub-committee in 1954.[532] Gordon charged her with seeing that her vision for the women's hospital was carried through. 'She expressed her satisfaction that there were still women prepared to act as "vigilantes" or guardians of younger women's weal'.[533] According to Joan Donley in her exploration of midwifery in New Zealand, Evelyn Lovegrove was motivated for personal reasons as well as political ones. Her grandchild and daughter-in-law had been victims of the H-Bug; her grandchild with suppurating eyes, nose and body sores, and her daughter-in-law with a series of breast abscesses necessitating three months in hospital and separation from her baby. She described their traumatic experience in an article called 'Mangled Motherhood' for the *Standard* in May 1957.[534]

Evelyn Lovegrove left the N.C.W. over disagreements within the group when plans to go ahead with a large combined gynaecological and obstetric multipurpose hospital were confirmed in 1957. She joined the Labour Party and Housewives Association, keeping up a steady criticism of the Maternal Welfare Division of the Health Department and the A.H.B. for the next seven years. The Women's Branch of the Labour Party maintained active correspondence with the Division throughout 1959-60, requesting statistics for staphylococcal infections affecting women and their newborn babies in both public and private institutions. Officials were initially helpful. Derek Taylor, the Director of the Division of Maternal Welfare, went to some lengths to provide accurate information. In a letter to Taylor, C.E. Gardiner, a medical statistician for the Health Department, described the difficulties in getting any measure of accuracy in estimates of staphylococcal morbidity and mortality rates from the official records. 'To obtain these figures it is necessary to personally scan some 20,000 death cards and

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[532] Joan Donley, *Save the Midwives*, Auckland, 1986, p.70.
[533] ibid., p.70.
[534] ibid., p.71.

160,0000 hospital cards for each year in order to ascertain the number of cases in which staphylococcal infection has been mentioned and the resulting figures still do not give the number of cases where infection was actually present'.[535]

Evelyn Lovegrove continued to write regularly to health department officials, and to Mason, the Minister of Health. In a letter to the Prime Minister, 14 January 1960, Mason described his mounting frustration with her persistent correspondence:

> Mrs Evelyn Lovegrove…has written a number of letters critical of the…National Women's Hospital now being erected in Auckland…It is fair to say that both the Auckland Hospital Board and the Department of Health have accorded the highest of motives to Mrs Lovegrove but on the other hand there is a strong conviction that she is not able to be convinced by a large body of considerable medical opinion patiently expressed by senior medical officers of the Board and of the Department…In short I am not prepared to accept the statement in Mrs Lovegrove's letter that I acted on unreliable advice.[536]

Lovegrove made use of a variety of publications to express her views. On 4 February 1964, twelve days before the new hospital was officially opened, a telegram was sent to the Minister of Health from the Auckland City Housewives Association. 'Request immediate removal of medical and surgical and gynaecological patients from the obstetric ward of the new National Women's Hospital'.[537] A series of question marks with the name Evelyn Lovegrove are written in longhand beside the message. In true 'Dr Doris' fashion, Lovegrove had been actively lobbying organizations around the country to support her cause. A letter to the editor of the *Auckland Star* a few days earlier had reiterated her concerns about the hospital; 'the structure may appear imposing but by world health standards is baceteriologically unsafe'.[538] *Zealandia*, the official publication of the Catholic Church, followed up with an article on 20 February 1964; 'the new building departs from principles followed in maternity centres for years. It includes both medical and surgical wards in the same block, and critics say that this permits the spread of infection to the new babies and their mothers'.[539]

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[535] Gardiner to Taylor, 28 March 1960, HI 56/7/14/ 26929 closed no, Archives New Zealand, Wellington.
[536] Mason to Nash, 14 January 1960, HI 56/7/14/ 26929 closed no, Archives New Zealand, Wellington.
[537] Lovegrove to McKay, 4 February 1964, HI 56/7/14/ 26929 closed no, Archives New Zealand, Wellington.
[538] Lovegrove to the Editor, *AS*, 31 January 1964.
[539] *Zealandia*, 20 February 1964.

Professor Derek Bonham, Head of the School of Medicine at National Women's Hospital, and Algar Warren, the Medical Superintendent, took a pro-active stance. They invited Dr R.W. Kirstner, associate professor of obstetrics and gynaecology at the prestigious Harvard Medical School in Boston to visit the new premises on 28 February 1964. The *New Zealand Herald* reported on the visit the next day; 'Authority From Harvard Praises New Hospital'. 'This is just the sort of combined hospital we have been trying to get for years at Harvard…People who criticised women's hospitals by suggesting that cross-infection could occur between gynaecological and obstetric wards were out of touch with modern hospital practice'.[540]

Under the banner of the Auckland City Housewives Association, Evelyn Lovegrove persisted with her campaign. In a letter to David McKay, Minister of Health, in March 1964, she reiterated her goal of safe maternity care in the new National Women's Hospital:

> No-one, to my knowledge, has opposed the building of the O.&. G. Hospital – only the design…When and if a history of the resistant-H-bug is written, as it should be, it will be found, as predicted by the late Dr. Doris Gordon, that the main reason for its very high incidence in New Zealand arose from the relaxation of maternity standards which formerly insisted upon the complete separation of maternity facilities and nursing staff…carefully built up nursing techniques crumbled beneath the impact of 'mixed' hospital situations. Medical and nursing personnel lost heart and the indiscriminate use of powerful antibiotics was resorted to…It is the unanimous opinion of the Association [that] separate maternity units and staff…are the only real safeguards against the ever-present risks of hospital cross-infection.[541]

Lovegrove continued to pursue Health Department officials, taking her issues to the Ombudsman in early1965.[542] It was becoming clear by this time, however, that the threat of staphylococcal infection in general and maternity hospitals had subsided. The methicilllin antibiotics were effective against drug-resistant staphylococcal infections. The introduction of 'dry bathing' of newborn babies with a 3% hexachlorophane product, pHisoHex, had reduced neonatal staphylococcal colonisation rates. For women

[540] *NZH*, 29 February 1964.
[541] Lovegrove to McKay, 19 March 1964, HI 56/7/14/ 26929 closed no, Archives New Zealand, Wellington.
[542] Kennedy to the Ombudsman, 11 February 1965, HI 56/7/14/ 26929 closed no, Archives New Zealand, Wellington.

entering maternity hospitals, the environment had changed dramatically from a decade before. Attempts to control cross-infection had precipitated movement in other areas of maternity care. Less bed rest, early mobility, showering, and demand feeding had been introduced as elements of the rooming-in concept. Women were generally positive about the experience as long as 'mother-only care' was not imposed too rigidly.[543]

The community experienced an increased incidence of staphylococcal infection over a nine-year period (1955-1963). During this time not only were infections more numerous, they were often more persistent and more severe. Mother and babies were most frequently affected and childbearing women became fearful of acquiring the H-Bug during their hospital admission. When breast abscesses occurred, they could have a long lasting effect on a woman's desire or ability to breastfeed.

Family groups, colonized with antibiotic-resistant strains of staphylococci when newborn babies were taken home from the maternity hospital, often developed ongoing boils, carbuncles and abscesses. GPs became adept at treating staphylococcal skin infections, although many homes continued to use basic methods to manage skin lesions. The epidemic heightened community interest and debate over the conditions in New Zealand maternity hospitals, particularly the provision of isolation facilities in the long-awaited National Women's Hospital, before gradually fading from public concern in the mid-1960s.

[543] Adelheid Wassner, *A Labour of Love: Childbirth at Dunedin Hospital, 1862-1972*, Dunedin, 1999, p.276.

CHAPTER SEVEN

CONCLUSION

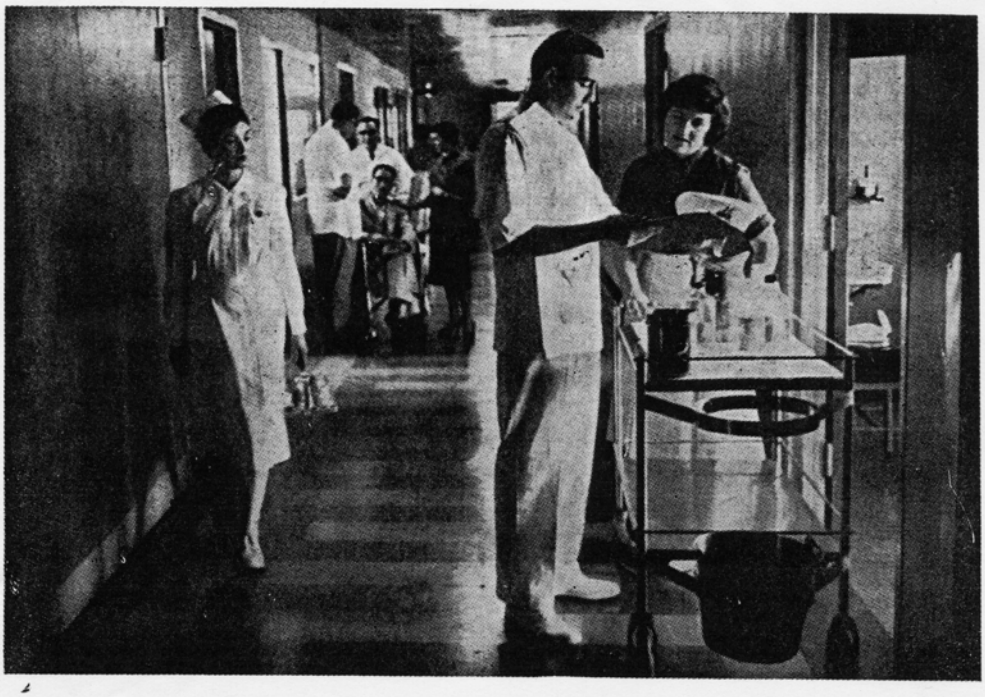
New Zealand experienced an epidemic of antibiotic resistant staphylococcal infections in the years from 1955 – 1963. Dubbed the 'H-Bug epidemic' by the popular press, it had considerable impact on hospital patients and staff and on people in the community plagued by persistent staphylococcal skin lesions. A range of measures was put in place to prevent and control infection, including the introduction of 'rooming-in' of mother and baby in maternity hospitals. Hospital administrators and politicians emphasized efforts made to contain nosocomial infection, but did little to restrict patterns of prescribing to prevent antimicrobial resistance. Although it was a matter of intense public and medical interest at the time, it was quickly forgotten after new antibiotics, effective against penicillinase- producing staphylococci, came into general use in the early 1960s. No official overview of the epidemic in New Zealand has been written, despite the considerable morbidity and mortality associated with antibiotic-resistant staphylococcal disease during this period.

A Worldwide Pandemic

The New Zealand epidemic started later and finished sooner than the staphylococcal pandemic that occurred in many other countries between 1946 and 1966.[544] Medical researchers and clinicians in the UK and the United States USA became aware of increasing staphylococcal resistance to penicillin in the mid-1940s, as patients entering hospitals without infections began to develop staphylococcal sepsis in alarming numbers.[545] Post-operative patients, the frail elderly and maternity patients and their babies, were the most seriously affected. Members of the medical and nursing staffs developed skin infections, many were found to be skin or nasal carriers of antibiotic

[544] A. Douglas and H.T. Knights, 'Some Public Health aspects of an Outbreak of a Penicillin-Resistant Staphylococcal Infection in a Maternity Hospital', *NZMJ*, 55, 1956, pp.378-387. England, the United States, Canada, Australia, France, Scandanavia, the U.S.S.R. and Chile were all mentioned as experiencing a rapid increase in the incidence of antibiotic resistant staphylococcal infection by the authors.

[545] Robert I. Wise, Elizabeth A. Ossman, and Dwight R. Littlefield, Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance, *Reviews of Infectious Diseases*, 2, 6, 1989, pp.1005-1019.



IN TOTAL HOSPITAL WAR AGAINST STAPH.

antibacterial detergent with 3% hexachlorophene

pHisoHex

Thorough washing with the antiseptic detergent, pHisoHex, is a simple hygienic measure that can help reduce staphylococcal and other infections if adopted by **all hospital personnel attending patients.** Such a hospital procedure has "...proved effective in controlling the spread of infection...."[1] Routine washing with pHisoHex is suggested not only for surgeons, physicians and nurses, but also for nurses' aids, food handlers and members of the housekeeping and laundry staff. Home use by surgeons and nurses augments results still further.

"...the bactericidal effect of pHisoHex can be attributed to the efficient deposition of hexachlorophene as a semi-permanent film on the skin of frequent users."[1] Hexachlorophene is particularly effective against staphylococci.[2]

pHisoHex is a potent antibacterial, hypoallergenic detergent with "...a surface tension reducent 40% more powerful than soap."[3]

1. Benson, Margaret E.: **Am. J. Nursing** 57:1136, Sept., 1957. 2. Smylie H. G.; Webster, C. U., and Bruce, M. L.: **Brit. M. J.** 2:606, Oct. 3, 1959. 3. Ayliffe, G. A. J.; Alder, V. G., and Gillespie, W. A.: **Lancet** 2:456, Sept 26, 1959.

Winthrop LABORATORIES Division of Sterling Pharmaceuticals (N.Z.) Ltd. AUCKLAND

Figure 11: pHisoHex: In Total Hospital War Against STAPH

Hexachlorophene detergent, marketed under the pHisoHex brand, was promoted worldwide as an effective antibacterial, particularly against staphylococci. 'Advertisers' Announcement', NZMJ, 60, 1961.

resistant staphylococcal strains. This information was published in well-regarded international medical journals from the late 1940s, however, Department of Health officials and medical practitioners in New Zealand appear to have had limited interest in a problem that had yet to emerge in New Zealand hospitals.

The first locally published paper cautioning doctors about microbial resistance appeared in 1953.[546] Dr H.J.H Hiddlestone proposed close collaboration between clinical and laboratory colleagues to maximize the benefits of antibiotic therapy while reducing the potential for resistance, but he appeared to be a lone voice among his peers. There was little appreciation of the potential impact of antibiotic resistant staphylococcal strains on clinical practice in hospitals and in the community. The Health Department took no pre-emptive steps to restrict antibiotic prescribing or to caution medical practitioners to prescribe with regard to preventing antimicrobial resistance.[547]

Once the increase in nosocomial staphylococcal infections was recognized, the Health Department and senior hospital staff looked to international literature and the experience of other western nations for possible solutions.[548] They followed the approach already taken in other western nations to prevent and control nosocomial infection. Rooming-in of mother and baby and the use of hexachlorophene emulsion for bathing newborn infants, were among the initiatives introduced overseas to reduce newborn colonisation and infection that were subsequently followed by New Zealand authorities.[549]

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[546] H.J.H. Hiddlestone, 'The Action of Antibiotics', *NZMJ*, 52, 1953, pp..207-209.

[547] This contrasts with the stance taken by the Ministry of Health in recent years. In 2001, the Ministry announced a strategy to approach infectious diseases that included hospital-acquired infections and antibiotic resistance among its main priorities. *An Integrated Approach to Infectious Diseases*, Wellington, 2001.

[548] Raftopoulo to Blomeyer, 13 August 1960, HI 131/175, Archives New Zealand, Wellington. Following a request for information about 'central sterilization plants' from Timaru Hospital, Dr J.A.Raftopaulo of the Biophysical Research Centre for Applied Medicine in Odenwald, Germany, responded by describing a system whereby hospitals would be air-conditioned, '…with sterilized air supplied through a suitably designed ventilation ceiling…The air is exhausted on the floor along the walls and the air in the rooms constantly is renewed and hence remains free from dust…The windowpanes should be of plexiglass, which admits the important ultra-violet and infra-red rays. In this manner we can create reliable premises for keeping room and furniture sterile'. He assured the Timaru Board that, 'the process here outlined has already been patented in Germany…this type of planning…already enables us to tackle with courage and hopes of success the extremely contentious problem of "H-Bug infection" and the permanent sterilization of our hospitals'.

[549] Arthur M. Hill, Hildred M. Butler and J.C. Laver, 'Reduction in Staphylococcal Infection in the Newly Born', *Medical Journal of Australia*, 31 October 1959, pp.633-634.

The Calvary Hospital Deaths

By October 1955, there was sufficient concern over 'the increasing incidence of staphylococcal infection' within the Auckland Hospital Board to appoint a representative committee 'to collect and correlate information on the subject with a view to improving the local position'.[550] The Senior Medical Staff minutes for 25 October 1955, refer to the situation as an 'emergency' against which 'barrier nursing has proved a dismal failure'.[551] The general public, however, appears to have been unaware of the issues until the death of eight babies delivered at Calvary Maternity Hospital in late November 1955. This news coincided with a resurgence of poliomyelitis in North Island districts and was widely reported in the national press. According to Dr G.C.T. Burns, pathologist at Christchurch Public Hospital, the publicity created 'a panic atmosphere', with an uncoordinated response from hospital administrators under pressure to demonstrate leadership in a time of crisis. Burns was unimpressed; 'I cannot help feeling that frenzied swabbing of individuals and groups can become a substitute for desirable action along other lines'.[552]

The serious nature of the Calvary outbreak and the public exposure that it brought to hospital services, stirred the Health Department to action. In 1956, erythromycin was restricted to consultant prescription in an attempt to conserve one of the few antibiotics still effective against the epidemic staphylococcal strain 80/81.[553] The same year, pemphigus neonatorum and staphylococcal skin diseases were included in the list of notifiable diseases.[554] Although the legal requirement to notify the Health Department was no guarantee that all cases would be reported, 484 cases of pemphigus neonatorum were notified in 1957.[555] In April 1958, staphylococcal pneumonia and septicaemia

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[550] Auckland Hospital Board (AHB), Hospitals Committee minutes, Epidemic of Staphylococcal Infection, 12 December 1955, HI 131/175-26673, Staphylococcal infections 1955-57, Archives New Zealand, Wellington.

[551] AHB Senior Medical Staff Meeting minutes, 25 October 1955, BAGC A638/37a, Archives New Zealand, Auckland.

[552] G.C.T. Burns, 'Some Observations of Hospital Staphylococcal Infection', presented to Pathologist's Conference, May 1956, HI 131/175 – 26673, Staphylococcal Infections 1955-1957, Archives New Zealand, Wellington.

[553] All staphylococcal strains remained sensitive to Chloramphenicol, but this antibiotic was used sparingly as it could cause 'bone marrow depression' in rare individuals. J.A.K. Cuningham, 'The Use and Abuse of Antibiotics', *NZMJ*, 56, 1957, p.175. 'Chloramphenicol is unique among the antibiotics in that its composition includes a nitrobenzene fraction known to be dangerous to life processes…which has been …responsible for serious blood dyscrasias'. C.R. Burns, Letter to the Editor, 'Chloramphenicol', *NZMJ*, 56, 1957, p.468.

[554] AJHR, 1956, H.31, p.18. 'A second condition recently made notifiable is pemphigus neonatorum and staphylococcal skin infections of the new born infant. A series of distressing deaths of infants in or connected with a maternity hospital revealed that a number of babies had suffered from septic skin conditions followed later by fatal pneumonia. Notification should ensure that knowledge of such conditions comes more quickly to the notice of the Medical Officer of Health'.

[555] AJHR, 1958, H.31, p.20; Christmas to Cairney, 14 August 1958, 'Cases of Staphylococcal Pneumonia: Cook Hospital Annexe 8.8.58, HI 131/175, Archives New Zealand, Wellington.

were added to the list of notifiable diseases. The 1957 'Asian' influenza had affected a third of all New Zealanders, causing the deaths of 28 infants from staphylococcal pneumonia.[556] Notifications remained high until 1961 when reported cases of pemphigus neonatorum dropped dramatically, with only two cases of staphylococcal pneumonia being reported that year.[557]

Epidemiological Investigation

When the 52a staphylococcal strain emerged in a new maternity unit in Dunedin in 1953, causing 'troublesome' but mostly minor staphylococcal infections in newborn babies and their mothers, the researchers were perplexed rather than overly concerned.[558] Although several infections had been severe, 'needing extensive chemotherapy', and 'sporadic breast abscesses in the babies were a curious feature', an outbreak of infectious staphylococcal disease in a 'new, modern and well run maternity annexe' was seen as puzzling rather than alarming. A report of the outbreak was published in the *New Zealand Medical Journal* the following year, outlining a new method of epidemiological investigation. All coagulase positive staphylococcal organisms from patients and staff, were sent to Royal Prince Alfred Hospital in Sydney for bacteriophage typing to identify pathogenic strains and trace any connection between affected patients and staff.

Phage typing of bacterial specimens, developed in England in the late 1940s, and used widely from the early 1950s, allowed epidemiological investigation of outbreaks by identification of staphylococcal strains.[559] In 1955, the National Health Institute (NHI) acquired standard bacteriophages for typing. It was the sole laboratory in the country with this facility until 1959 when it was decentralised to the four main base laboratories. 'Demand for phage typing of cultures of staphylococci has grown from a few hundred in 1955 to a probable ten thousand [in 1959]. For some time, the National Health Institute has not been able to meet all demands nor provide as quick a service as could

[556] AJHR, 1958, H.31, p.15.
[557] AJHR, 1962, H.31, p.104; *AJHR*, 1963, H.31, p.97; *AJHR*, 1964, H.31, p.95. Only 47 cases of pemphigus neonatorum were reported in 1961. The incidence of infection remained consistent in 1962 and 1963.
[558] E.F. Battersby and Hugh Stringer, 'Pathogenic Staphylococci in a Maternity Hospital', *NZMJ*, 53,1954, pp.420-422.
[559] Richard I. Wise, Elizabeth A. Ossman and Dwight R. Littlefield, 'Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance', *Reviews of Infectious Diseases*, II, 6, 1989, pp.1005-1019

be desired'.[560] By 1960, five New Zealand laboratories were capable of phage typing. Phage typing became a routine step in the investigation of staphylococcal outbreaks and the swabbing of hospital nursing staff.[561] Maternity nurses, trainee nurses and midwives were screened regularly as they were regarded as the primary source of infection for maternity patients.[562]

From 1957 to1964, Dr H.T. Knights studied the transmission of antibiotic resistant staphylococci in hospitals. He travelled the country testing the levels of pathogenic bacteria in the air of theatres, nurseries and maternity wards, making detailed recommendations for improvements to cleaning techniques, laundry practices, ventilation and to sub-standard facilities that contributed to the high levels of cross-infection.[563] The initial emphasis he placed on airborne transmission of pathogenic staphylococci was reassessed in 1960, when international research confirmed the importance of direct contact as a means of transmission between a staphylococcal carrier or infected person and a susceptible patient.[564]

Knights undertook investigations wherever hospital cross-infection was reported. In 1960, he visited Wanganui, Raetihi, Waiouru, Palmerston North, Hastings and Napier hospitals. 'In every case, medical superintendents and their staffs were extremely cooperative and, from the experience gained…a fund of knowledge is being built up to provide material for a booklet upon the control of cross infection in hospitals'.[565] Maternity nurses and midwives, whose techniques had been honed to prevent streptococcal disease, were no longer regarded as experts in infection control practice. Knights gave teaching sessions as part of his activities in the field; '…there is still a long way to go in ensuring that all staff adopt a safe technique for themselves as well as their patients. In all the rush of the bathing sessions of a busy nursery…there occur

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[560] Taylor to the Medical Superintendent, Otago Hospital Board, 6 February 1959, HI 131/175, Archives New Zealand, Wellington.
[561] Audrey W. Jarvis, 'Reduction of Staphylococcal Infection of Babies in a Maternity Unit of a New Zealand Hospital', *NZMJ*, December 1961, pp.570-573. 'At (Palmerston North Public Hospital) all strains of staphylcocci isolated during routine laboratory work are phage-typed…to determine whether infections are sporadic or epidemic in nature', p.572.
[562] AJHR, 1960, H.31, p.69. 'The figures in relation to staphylococcal infection…indicate that the incidence in student nurses is higher than amongst trained staff…all necessary precautions must be taken to ensure that student nurses adopt the correct aseptic procedures…'
[563] 'Dust removal from floor surfaces previously undertaken by sweeping after sprinkling with moist tea leaves has, in most institutions, long given way to vacuum cleaning followed by electric polishing'.
[564] Knights to the Director-General of Health, 4 July 1960, HI 131/175, Archives New Zealand. 'The often very early colonization of the infant's umbilicus…with pathogenic organisms prompts enquiry as to the means and place of its contact with bacteria. The most obvious means is the hand of the nursing or medical staff…'
[565] AJHR, 1960, H.31, p.87.

those breaches of aseptic technique, which promote baby-to-baby spread of infection. Not only this, but if accepted techniques are analysed, here and there occur obvious and previously unperceived routes of cross infection'.[566]

Who's To Blame?

At the beginning of the epidemic, senior doctors and Health Department officials clearly identified hospitals as the source of antibiotic resistant staphylococcal infection. 'The staphylococcus is present in the environment of the ward and carried by its staff, and the visitor to the hospital is more likely to become infected than to carry infection'.[567] The Director-General of Health, Dr John Cairney, admonished medical practitioners, for 'an orgy of indiscriminate use' of antibiotics that had 'hastened the emergence of the present staphylococcus which is resistant to most of the antibiotics in current use'.[568] Some members of the profession and the public questioned whether hospitals were the safest places for maternity care. A few radical doctors recommended a revival of home births, a proposal supported by women who saw the benefits of 'domiciliary maternity units for those who wish for this service'.[569] Conservative members of the medical and nursing professions regarded such attitudes with hostility, the eminent obstetrician Thomas Corkill describing Parents Centres members as 'a bunch of Communists'.[570]

By late 1957, diverse views on the source and severity of the epidemic began to emerge. Hospitals and hospital care were central to the organization and delivery of health services during the 1950s and 60s, and politicians and the medical profession came forward to defend the status quo. Maternity patients, mothers and babies, were worst affected by infection – both in the hospitals and after discharge, in the home. The editorial in the October 1957 *New Zealand Medical Journal* took a strong stance against, 'uninformed general criticism [of the maternity services] on the strength of a few episodes of infection affecting mother or infant…this country has a maternity service which has proved itself in the past, has maintained its lead and deserves general

[566] AJHR, 1960, H.31. p.87.
[567] G.C.T. Burns, 'Some Observations of Hospital Staphylococcal Infection, presented to Pathologist's Conference', May 1956, HI 131/175 – 26673, Staphylococcal Infections 1955-1957, Archives New Zealand, Wellington, p.4.
[568] Dr John Cairney, 'Annual Report of the Director-General of Health 1955-1956', *NZMJ*, 53, 310, 1956, pp.439-440.
[569] N.C.W. Votes for Rooming-in, *Parents Centre Bulletin*, 13, 1959, p.5
[570] Linda Bryder, *A Voice for Women*: *The Plunket Society and Infant Welfare 1907-2000*, Auckland, 2003, p.128.

confidence'.[571] In May 1958, the Minister of Health, G.R. Mason, issued a press statement that placed the source of hospital infection squarely back in the community. 'Staphylococcal infections occurred in hospitals for an obvious reason…Infection developed in the community and cases therefore entered hospital, the logical places for their treatment'. The fault of the medical profession, if any, was that it had achieved so much success in treating other infections in the maternal and neonatal fields. This had the effect of bringing staphylococcal infection, 'into prominence… there was something of a parallel in cancer springing into more prominence as a cause of death because of medical success against tuberculosis'.[572]

Were antibiotic resistant staphylococcal infections brought into the hospitals by infected patients? Or were hospitals, where the routine use of antibiotics eliminated sensitive staphylococcal strains, the source of ongoing infections among in-patients, who then infected their families after discharge into the community? As infection became more widespread, it was increasingly difficult for the public to discern whether it was the community that brought the infection to the hospital, or the other way round.[573] Knights presented the official viewpoint to the lay public in 'The H-Bug Story', *Health*, December 1960:

> "H" stood for hospital and to some extent this was right, but "H" also stands for home whence the bacterium came in the first place. You see, the hospital is the gathering place for the sick people in a community and they bring their germs there…A large number of New Zealanders enter public hospitals every year…Then think of what can be done nowadays; doctors remove a lung, open a heart, remove a tumour of the brain and reconstruct a gullet. Patients would have died without such extensive operations…Debilitated people are more likely to be attacked by the staphylococcus. Then too, we did not understand at the commencement that the wide use of the lifesaving antibiotics would be killing off the sensitive bacteria and encouraging the rapid spread of those that were resistant. To save lives we have to disturb the balance of nature, for which we have to pay in other ways.[574]

[571] Editorial, Maternity Service in New Zealand, *NZMJ*, 56, 315, pp.491-493.
[572] Press Statement: Staphylococcal Cross Infection, 7 May 1958, HI 131/175, Archives New Zealand, Wellington.
[573] J.A.K. Cuningham and D.W.Beaven, 'Fatal Enterocolitis due to Antibiotics: A Report of Three Cases', *NZMJ*, 54, 1955, p.645.
[574] H.T. Knights, The "H-Bug" Story, *Health*, December 1960, pp.8-10.

Although it was widely acknowledged that 'indiscriminate' and 'excessive' antibiotic prescribing contributed to the problem of resistance, the Health Department had great difficulty influencing doctors prescribing patterns; when it confronted the profession with restrictive policies the reaction could be both 'immediate and violent'.[575] The alternative was to examine nursing techniques closely, to swab nursing staff 'from time to time' and to make visible changes in the organization of hospitals.[576]

The Introduction of Rooming-in

Rooming-in was widely quoted as an effective means of infection prevention and control in the hospital environment; 'the more the mother handles the care of her baby as in "rooming-in" the more we may expect a drop in neonatal sepsis'.[577] In the 1940s and 50s, maternity hospitals were understaffed and chronically overcrowded. The post-war 'baby boom' had stretched the available facilities beyond their capacity, so that overcrowding in nurseries and wards was commonplace. Nurses and midwives performed all baby cares, usually in communal nurseries far from the mother's bedside. Rooming-in had a number of benefits for short-staffed maternity hospitals. Early ambulation, an essential component of rooming-in, was found to reduce postpartum complications such as deep vein thrombosis and infection. Mothers could tend to their infants at any time of the day or night, reducing staffing requirements without apparently compromising the standard of care. British research, revealing that the main route of spread was from nursing staff to babies then to mothers, was subsequently confirmed in 1957, at National Women's Hospital, Auckland. [578]

Although overcrowding was seen as the most obvious cause of the Calvery Hospital deaths, the Health Department did not initially offer a solution to the problem beyond a strong recommendation to maintain a 'careful observance of maternity nursing techniques built up over years'.[579] Rooming-in of mother with baby at the bedside to

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[575] AJHR, 1960, H.31, p.66.
[576] Neil C. Begg, Circular to Plunket Nurses: Epidemiology of Staphylococcal Infections, 28 March 1961, HI 131/175, Archives New Zealand, Wellington.
[577] AJHR, 1960, H.31, p.87.
[578] National Women's Hospital Medical Committee, 'Progress Report on Staphylococcal Infections', 12 February 1957, BAGC A638/38a, Archives New Zealand, Auckland.
[579] AJHR, 1956, H.31, Appendix I, p.124.

reduce nursing contact was not seriously considered until persistent neonatal infections and breast abscesses were reported at National Women's Hospital in late 1956.[580] This move contraindicated the Department's own booklet, the 6th edition of the H.-Mt.20, that had been 'thoroughly revised [in 1955] with the intention that the principles laid down…will be followed by all midwives and maternity nurses in all training schools and maternity hospitals, both public and private, and in domiciliary practice'. [581] It signalled an end to the highly prescriptive routines that had dominated maternity care since the introduction of the H.-Mt.20 in 1926. Staphylococcal disease required a new 'hands-off' approach to maternity care that met with a mixed response from midwives and mothers.

Rooming-in was introduced piecemeal throughout New Zealand, despite the fact that there was no evidence that this approach to care actually contributed to reducing the infection rate. Making the change from communal nursery care to rooming-in did, however, demonstrate a significant and highly visible commitment to patient safety that reflected well on both politicians and hospital administrators. Vocal members of the childbearing community also responded readily to the idea of rooming-in. The concept of maternal deprivation as 'the major source of most serious mental disorder', advocated by John Bowlby, had made a deep impression on members of progressive organizations such as Parents Centre.[582] In 1959, the same year as the Federation of Parents Centre affiliated with the National Council of Women, a remit was passed 'in view of the world-wide acknowledgement that the foundations of mental health lie in the early establishment of good mother-child relationships', to ask the Minister of Health, Mr G.R. Mason, to make 'adequate rooming-in facilities available to those mothers who wish for them'.[583]

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[580] Mary Dobbie, *The Trouble with Women*, Christchurch, 1990, p.56. Professor Harvey Carey, medical director of the hospital and head of the school of obstetrics and gynaecology, had already introduced rooming-in to control infection and reduce postpartum complications on the professorial ward. His research had shown that the incidence of haemolytic streptococci in the upper vagina in women nursed according to the tenets of the H.Mt. 20 was twice that of women who got up to use the toilet. Carey claimed that breaches in aseptic technique were common, that swabbing was usually delegated to a junior nurse or trainee; Minutes of a Meeting of the National Women's Hospital Medical Committee held in the Tutorial Room at 8.00P.M 12 February 1957. BAGC A638/38a, Archives New Zealand, Auckland, p.270. 'When regard is paid to the known method of spread of staphylococcal infection the method of control likely to be effective is a reduction in the amount of handling babies receive from the nursing staff. This can be implemented only by the introduction of "rooming-in" throughout the hospital'.

[581] *The General Principles of Maternity Nursing*, H.-.Mt.20, Wellington, 1955, p.2.

[582] *Parents Centre Bulletin*, 13, 1959, p.5.

[583] ibid.

Other measures such as oiling rather than bathing babies, that were associated with a significant reduction in staphylococcal colonization rates, were not adopted or even actively promoted. Professor Carey may have done the practice a disservice when he suggested that 'dirty babies', i.e. oiled rather than bathed babies, were the 'healthiest', but baby bathing was clearly more socially acceptable than oiling.[584] 'Dry washing' babies with a 3% hexachlorophene detergent, also effective against staphylococcal colonization, was introduced promptly, promoted strongly, and accepted well.[585] The concept of a chemical baby wash was consistent with a pharmaceutical solution to the dilemma of antibiotic-resistant staphylococci, and was introduced at the same time as new penicillinase-resistant antibiotics came into clinical use. This suggests that factors, other than evidence-based research, influenced changes in professional practice at this time. Coincidental developments in medical protocols and popular culture provided an ideal opportunity for institutional change.

Public interest in the dangers of the H-Bug remained high throughout the epidemic, particularly among childbearing women and their families. In spite of official reassurances to the contrary, it is clear that women remained anxious about entering maternity hospitals, and that not all members of the community had faith in the therapy offered by their general practitioners.[586] Community concern centred on 'proper' arrangements in the delivery of maternity services. The division of obstetric and gynaecological services and a separate isolation ward in the new National Women's Hospital, became a focus for these issues between 1957 and 1964. When the new hospital was officially opened in 1964, the hospital administrators were unashamedly eager to absolve the new building from the taint of infection. Even the word isolation was considered, 'to conjure up in the minds of the uninformed (particularly lay people) something unpleasant or taboo, particularly in maternity matters'.[587]

[584] The baby's first bath' still had a special significance for women and families when I was working as a midwife in the 1990s.
[585] All babies were treated with 'pHisoHex'after birth and on subsequent days until the 1970s when it was discovered that hexachlorophene could be neurotoxic to premature infants.
[586] Margaret Pye, interviewed by Deborah Jowitt, 23 February 2003.
[587] Auckland Hospital Board Hospitals Committee minutes, 12 April 1964, HI 56/7/14/1closed no 3107, Archives New Zealand, Auckland.

Restrictions on Antibiotic Prescribing

The Pharmaceutical Benefits Scheme introduced in 1941 under the 1938 Social Security Act, identified doctors as the 'gatekeepers' of medicines and all other health benefits. Under the scheme the Minister of Health paid from the Social Security Fund for medicines listed on the schedule. While the scheme allowed doctors to prescribe without consideration of cost to the patient, they were under no obligation to the Health Department to prescribe in any particular way.[588] It proved extremely difficult for the department to exert any influence over the way in which doctors prescribed; escalating pharmaceutical costs and 'excessive' antibiotic prescribing proved impossible to control under the existing regime. Antibiotics soon dominated among the total drugs prescribed in New Zealand.

No formal training in the use of antibiotics was given to doctors already registered by 1945, although Howard Florey visited New Zealand in 1944 to instruct 'medical men' on the use of the penicillin.[589] New Zealanders serving abroad were introduced to the 'miraculous' effects of antibiotics during World War II, and in the post-war years, the Otago Medical School included teaching about penicillin and subsequent antibiotics in the pharmaceutical training for student doctors.[590] Pharmaceutical companies 'assisted' by providing educational sessions for practising GPs. It is unlikely that the prospect of antibiotic resistance was emphasized during these sessions; nor do doctors interviewed recall that the potential for antimicrobial resistance was taught during their medical training 1947-1953.[591]

Once antibiotics became freely available in 1948, doctors were subject to a number of competing pressures to prescribe. Patient demands for the new therapy, the freedom from cost provided the drugs were included on the 'Fund', pharmaceutical marketing, the close association between the new drugs, and progressive practice, as well as the

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[588] Astrid Baker, Setting the Rules: Pharmaceutical Benefits and the Welfare State, in *For Health or Profit*, Peter Davis, ed, Auckland, 1992, p.27.
[589] Memorandum for the Minister of External Affairs from the High Commissioner for New Zealand in Australia, *Penicillin*, 20 September 1944, 15/183 Archives New Zealand, Wellington.
[590] Dr Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003. '…it was regarded as so infallible that I think that possibly some other forms of treatment weren't emphasized enough because you could just rely on penicillin – magic!'
[591] Dr Keitha Farmer, interviewed by Deborah Jowitt, 6 December 2002. 'There was (no appreciation of the impact that antibiotic resistance was going to have) – none whatsoever that I can remember. Penicillin was THE thing'.

marvellous effectiveness of antibiotics all conspired to increase, rather than inhibit antibiotic prescribing. There was no expectation that medical practitioners would seek advice from colleagues or laboratory bacteriologists when prescribing; policies to restrict antimicrobial prescribing in New Zealand hospitals were not introduced until the 1980s.[592]

Differences in Professional Perspective

Doctors gained considerable experience and expertise treating staphylococcal infections during this period, however, the H-Bug epidemic appeared to have had less impact on medical practitioners than their nursing and midwifery colleagues. One reason for this may be that doctors compared the relative severity of staphylococcal infection with other more serious illnesses, for example streptococcal sepsis in the puerperium and pneumococcal pneumonia.[593] The other may be that doctors were usually dealing with a broad demographic and a wide range of illness in their daily work, whereas maternity nurses and midwives were focused on their role within the maternity services. The midwives interviewed stated that the epidemic had a profound and lasting effect on their approach to practice. 'In those times most doctors weren't in maternity hospitals. They were to-ing and fro-ing…The specialists were on call and the GPs you called in for their patients…The ones who were there were the nurses and midwives'. [594]

In the absence of permanent medical staff in many maternity homes and units, midwives often took sole professional responsibility for the women and babies under their care. A deep sense of involvement in women's physical and emotional well-being appears to have been characteristic of midwifery and maternity nursing.[595] The stigma of staphylococcal carriage was worse during outbreaks when the Health Department was called in to investigate, screen and identify positive staff. [596]

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[592] Dr Charles Howden, interviewed by Deborah Jowitt, 6 April 2003. 'They (clinicians) didn't have to refer to us (in infectious diseases). I think in those days, clinicians using antibiotics were pretty much autonomous'; Dr Rod Ellis-Pegler, interviewed by Deborah Jowitt, 1 April 2003

[593] Dr Fred McConnell and Dr Charles Howden, general practitioners in the 1950s, commented that staphylococcal disease was not as severe as either of these diseases.

[594] Ann Nightingale, interviewed by Deborah Jowitt, 21 February 2003.

[595] Janet McCalman, *Sex and Suffering: Women's Health and a Woman's Hospital*, Melbourne, 1998, p.230.

[596] Bunty Graham, interviewed by Deborah Jowitt, 9 December 2003. Bunty Graham recalled the deeply unpleasant nature of her illness; 'At the time you're infected you feel really dirty. There was green gunk pouring out…even when they put the anesthetic in my arm before they lanced it, there was pus oozing out. It was foul'.

Midwifery practice and training was heavily disrupted by the presence of nosocomial staphylococcal infection in maternity hospitals. 'It was quite tragic for staff because they just spent half their lives, being positive, staying off work for x number of weeks, getting clear, coming back, getting re-colonized and having to go off again…'[597] The serious impact of this regular surveillance and exclusion from duty cannot be underestimated. In 1955 ten maternity hospitals had closed down due to staff shortage; 'the shortage of maternity nurses is one of the most serious problems in the whole sphere of our maternity services'.[598] Doctors by comparison were not subject to regular swabbing. Even when a community GP with a large maternity practice was found to be positive, there did not appear to be any emphasis placed on treatment or exclusion from practice.[599]

After the Epidemic

The 80/81staphylococcal strain regressed with the introduction of the penicillinase-resistant penicillins in the early 1960s. The new antibiotics exerted a selective pressure on the bacterial population in hospitals; '…a simple rule that seems to hold true is that strains sensitive to an antibiotic can hardly maintain or gain a dominating epidemic position in environments in which this antibiotic is extensively used'.[600] Gram-negative bacilli began to gain ascendancy as the primary source of hospital-acquired infection at this time. Outbreaks of fatal staphylococcal infection in neonates occurred in 1963 and 1964, but these were isolated cases representing the last instances of an eight-year long nation-wide epidemic.[601] The obvious success of the new antibiotics boosted confidence in a pharmaceutical solution to infectious disease, generating a shared sense of optimism in scientific achievement that completely overshadowed the 'troublesome infections' of the previous decade.

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[597] Sue Paviour, interviewed by Deborah Jowitt, 21 November 2002.

[598] AJHR, 1955, H.31, p.66.

[599] Dr Anne McKinnon, interviewed by Deborah Jowitt, 6 January 2003.

[600] Ove Jesson, Kirsten Rosendal, Per Bulow, Viggo Faber and Knud Riewerts Eriksen, 'Changing Staphylococci and Staphylococcal Infections: A Ten-Year Study of Bacteria and Cases of Bacteremia', *New England Journal of Medicine*, 281, 12, 1969, pp.627-635.

[601] H.T.Knights, 'Neonatal Staphylococcal Sepsis in a Small Maternity Unit Involving the Death of Three Babies', *NZMJ*, 63,13,1964, pp.13-17.

The large numbers of nosocomial staphylococcal infections over the previous two decades had stimulated extensive international microbiological, epidemiological and pharmaceutical research.[602] While outbreak investigation continued to be managed in New Zealand by medical officers of the Department of Health and the National Health Institute, in the USA and the UK, the roles of the hospital epidemiologist and the infection control nurse were established in the 1950s. Systematic surveillance of nosocomial infections was initiated along with active prevention of cross-infection through staff education and isolation policies and procedures. In 1955, Colebrook proposed that every major British hospital should 'appoint a whole-time infection control officer with a wide range of bacteriological and epidemiological duties…Suitable candidates for such posts would be found as happened in earlier years when the need arose for anaesthetists and radiologists'.[603]

Nursing roles were conceived as an effective way of managing infectious cases; 'Experience has shown that quite complex investigations…can be carried out with the assistance of an energetic infection control sister'.[604] In 1956, an infection control nurse was employed at Jefferson Medical College Hospital, Philadelphia, funded by a three-year grant from the National Institutes of Health to help support 'a study of the epidemiology, pathogenesis and management of staphylococcal infections'.[605] Mary Ann Anderson was an 'outstanding success'; a trail-blazer for the new profession of infection control nurse practitioner in the USA. In September 1958, the U.S. Public Health Service, the Centre for Disease Control (CDC), and the National Academy of Sciences-National Research Council sponsored the first National Conference on Hospital-Acquired Staphylococcal Disease. Less than twenty years later, in March 1976, 42% of U.S. hospitals had an infection control nurse, and 87% of hospitals had practiced some form of infection surveillance, with half reporting very active programmes.[606]

602 Robert I. Wise, Elizabeth A. Ossman, and Dwight R. Littlefield, Personal Reflections on Nosocomial Staphylococcal Infections and the Development of Hospital Surveillance, *Reviews of Infectious Diseases*, 2, 6, 1989, p.1005.
603 A.M.N. Gardner, 'The Infection Control Sister', *Lancet*, 6 October 1962, pp.710-711.
604 ibid., p.711.
605 Wise et al, 1989, p.1011.
606 Robert W. Haley and Richard H. Shachtman, 'The Emergence of Infection Surveillance and Control Programs in US Hospitals: An Assessment, 1976', *American Journal of Epidemiology*, 111, 1980, pp.574-591.

In New Zealand, by contrast, there were no discernible moves towards establishing similar roles in the hospital services. 'It was not until 1974 that the Department of Health in a directive to all hospital boards, recommended that Nosocomial Infection Committees be established with the appointment of an Infection Control Officer to undertake surveillance activities. At this time no mention was made of a nursing position'.[607] The funding was not necessarily used for this purpose; the Auckland Hospital Board employed Dr Rod Ellis-Pegler as an infectious diseases physician in 1975, 'on money set aside for an infection control medical officer. In fact it wasn't my role but it was where the money to pay me came from…Someone had budgeted for it and no one had ever filled the position.'[608] The first New Zealand infection control nurse, Berenice Bird, was appointed at Palmerston North Hospital in 1976. She relied on, '…extensive reading of overseas textbooks and journals. There were few guidelines for this avant-garde position, each day bringing a new challenge'.[609]

From 1955-1963, New Zealand experienced an increase in the incidence of antibiotic-resistant staphylococcal infections. Resistant strains were sustained in hospitals as a result of the widespread, sometimes 'indiscriminate', use of antibiotics and the colonisation of hospital staff that then transferred the epidemic strains to newly hospitalised patients. Inappropriate prescribing for non-bacterial infections and the limited appreciation of the unique ability of *Staphylococcus aureus* to acquire resistance to many antibiotics, contributed to the problem.

Many Western nations had been aware of this phenomenon since the mid-1940s so that there was extensive research literature available to inform and direct the efforts of the Health Department and medical profession once it became obvious that pathogenic antibiotic-resistant staphylococci were present in New Zealand hospitals. The deaths of eight babies, delivered at Calvary Hospital in Christchurch, drew the attention of the public to the issue of hospital-acquired staphylococcal infection. Maternity hospitals

[607] Berenice Bird, 'A Historical Perspective on Infection Control Nursing in New Zealand', Paper Presented at the 9th Annual Infection Control Conference, July 1990.
[608] Dr Rod Ellis-Pegler, interviewed by Deborah Jowitt, 1 April 2003.
[609] Berenice Bird, 'A Historical Perspective on Infection Control Nursing in New Zealand', Paper Presented at the 9th Annual Infection Control Conference, July 1990.

were already a concern; short staffing had forced the closure of ten hospitals in 1955, and overcrowding was a feature of many maternity facilities.

The H-Bug epidemic had considerable impact on the organization and delivery of maternity care in New Zealand. Prescriptive practices, introduced in 1926 to prevent streptococcal infection in maternity hospitals, were discarded in favour of measures to reduce staff contact with babies. Research at National Women's Hospital in 1956, confirmed that nurses and midwives, who performed all infant cares, had high rates of carriage with pathogenic antibiotic-resistant staphylococcal strains. Changes were introduced to encourage mothers to care for their own infants and to shorten their hospital stay. Rooming-in had been adopted in the USA in the 1950s to reduce staphylococcal cross-infection. The Health Department recommended that this radically different form of postpartum care be introduced in New Zealand, despite the unsuitability of the architecture of most existing maternity hospitals, and a lack of professional enthusiasm for abandoning the nursery in favour of a cot at the bedside. The plans for the new National Women's Hospital were altered in 1957 to conform to the '"rooming-in" principle', and little by little, hospitals around the country introduced rooming-in. This remains the accepted form of maternity care; postpartum hospital stays have dramatically decreased in 2004, but it is still expected that the mother nurse the baby at the bedside unless illness or distress require that he or she be removed to a nursery. The 'hands-off' approach by the midwifery and nursing staff initiated in the 1950s, still remains.

Epidemiological research was encouraged by the necessity to investigate cross-infection and conditions in hospitals across the country. Although relatively little was spent on medical research during the 1950s, the need to provide a phage-typing service to hospitals enhanced the role of the laboratories of the National Health Institute and of the principal investigator, H.T. Knights. Hospital administrators and clinicians took a renewed interest in infection prevention and control. The persistent cross-infections emphasised the importance of aseptic technique and isolation procedures in hospital practice, however, there were no moves to establish specialised infection control roles in New Zealand hospitals during this time.

The considerable morbidity and mortality associated with the H-Bug infections left a variable impression on New Zealanders. Doctors regarded this period as one of many challenges in their professional careers, whereas midwives and nurses working during the period, were deeply affected by the ill women and babies they cared for. Women who developed infections or whose babies or children were infected, recalled the events with great clarity - the experience impacted negatively on their childbearing and child raising experiences, but did not necessarily affect their lives subsequently.

The H-Bug epidemic provided clear evidence that microbial resistance would accompany the widespread use of antibiotics, but in the complacent decades that followed, this message was largely ignored. Until the 1980s, the introduction of new, more effective antibiotics contributed to general confidence that bacterial infection would always succumb to medical science.[610] Since that time, the emergence of new antibiotic-resistant pathogens has raised fears that we may face a post-antibiotic future – a time when we will lack the means to treat severe infectious disease. Controlling current and emerging resistant bacteria is one of the most important and difficult challenges facing healthcare professionals today.

[610] The Financial Page, No Profit, No Cure, *New Yorker*, November 5 2001, p. 46. In 1967, the U.S. Surgeon General, William Stewart, declared, "The time has come to close the book on infectious diseases. We have basically wiped out infection in the United States"'.

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Appendix 1 – Ethics Committee Approval

MEMORANDUM

Academic Registry – Academic Services

To: Lynne Giddings
From: **Madeline Banda**
Date: 24 October 2002
Subject: 02/114 The H-bug: The impact of penicillin resistance on New Zealand society and health during the 1950s and early 1960s

Dear Lynne

Your application for ethics approval was considered by AUTEC at their meeting on 14/10/02.
Your application was approved for a period of two years until 14/10/04.
You are required to submit the following to AUTEC:

- A brief annual progress report indicating compliance with the ethical approval given.
- A brief statement on the status of the project at the end of the period of approval or on completion of the project, whichever comes sooner.
- A request for renewal of approval if the project has not been completed by the end of the period of approval.

Please note that the Committee grants ethical approval only. If management approval from an institution/organisation is required, it is your responsibility to obtain this.
The Committee wishes you well with your research.

Please include the application number and study title in all correspondence and telephone queries.

Yours sincerely

Madeline Banda
Executive Secretary
AUTEC

Appendix 2 – Consent Form for Participants

Consent to Participation in Research

Title of Project:	**The H-Bug: The impact of antimicrobial resistance on New Zealand society and health in the 1950s and early 1960s.**
Project Supervisors:	**Associate Professor Lynne Giddings**
	Associate Professor Linda Bryder
Researcher:	**Deborah Jowitt**

- I have read and understood the information provided about this research project.
- I have had an opportunity to ask questions and to have them answered.
- I understand that the interview will be audio-taped and transcribed.
- I understand that as this is historical research my name may be used with my permission within the thesis and in subsequent publications. Consent for this will be negotiated toward the end of the project.
- I understand that I can choose to use a pseudonym rather than use my own name for the purposes of this research.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of research, without being disadvantaged in any way. If I withdraw from the project, I understand that all relevant tapes and transcripts will be destroyed.
- I agree to take part in this research.

Participant signature:

Participant name:

Date:

Project Supervisors Contact Details:
Dr Lynne Giddings, Auckland University of Technology, lynne.giddings@aut.ac.nz, ph 917 9999 ext 7013
Dr Linda Bryder, Associate Professor History Department, Auckland University, l.bryder@auckland.ac.nz , ph 373 7599 ext 7319

Approved by the Auckland University of Technology Ethics Committee on 20 November 2002

Appendix 3 – Participant Information Sheet

AUT
AUCKLAND UNIVERSITY OF TECHNOLOGY
TE WĀNANGA ARONUI O TAMAKI MAKAU RAU

PARTICIPANT INFORMATION SHEET

Research study: *The H-Bug Epidemic: The impact of antibiotic resistant organisms on New Zealand society and health in the 1950s and 60s.*

You are invited to take part in research exploring the effects of the H-Bug epidemic on health professionals and ordinary New Zealanders.

My name is Deborah Jowitt. I am a midwife and nurse currently working as an Infection Control Nurse Specialist at Auckland District Health Board. I am also doing a part-time Masters in Health Science at Auckland University of Technology.

The study will record the recollections and insights of health professionals and individuals affected by or associated with the H-Bug. It will create a historical record of the impact of the H-Bug epidemic on New Zealand society and health during the 1950s and early 1960s.

This research is about professional practice as well as the experience of ordinary people affected by penicillin resistant infections. I am hopeful that at least one paediatrician, a microbiologist, an infectious diseases physician, a general practitioner, a midwife and nurse working during that period as well as several individuals who were directly affected by the impact of penicillin resistant infection will agree to participate.

If I decide to participate what will it involve?
It will involve one/two interviews lasting approximately one – two hours. The interviews will be conducted at a place that is private, convenient and agreed upon by the two of us.

In the interview (s) we will explore the circumstances that led to your involvement, either professional or personal, with the H-Bug. You will be asked to tell me about your experience of how your professional or personal life was affected by penicillin-resistant infection(s). Questions will also be asked about how you think practice or life overall was affected by impact of the H-Bug.

The interview will be audio taped and later transcribed. These tapes and transcripts will remain confidential to my typist, my thesis supervisors and myself until the thesis is published. A pseudonym can be used on your tapes, transcripts and reports to protect your identity, if you choose not to identify yourself.

I do not anticipate any risks to you from the study however, at times in such interviews sharing your thoughts, insights and personal recollections can be uncomfortable. You do not have to answer all the questions and you may stop the interview at any time.

While it is unlikely that there will be direct benefits to you, many people who have participated in similar research feel that it is very worthwhile contributing to collective historical knowledge by sharing their unique perspective and understanding of past events and experiences.

What will happen to the results of this study?
The final result will be published as a Masters thesis that will be available in the Auckland University of Technology library. Short articles relating to the research may be published in relevant professional journals and presented at conferences and seminars.

Your participation in this research is entirely voluntary. You do not have to take part. If you do agree to take part you are free to withdraw from the study, including withdrawal of any information, until the research is complete. If you choose to withdraw you do not have to give a reason.

This study has received ethical approval from the Auckland University of Technology's ethics committee. Any concerns regarding the nature of this project should be made in the first instance to the Project Supervisor Dr Lynne Giddings 09 917 9999 ext 7013. Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEC, Madeleine Banda, madeline.banda@aut.ac.nz
09 9179999 ext 8044.

Thank you
Thank you for taking the time to read this information. If you have any further questions about the study or would like to participate please feel free to contact me.
If you do wish to participate you will also need to sign the attached consent form.

Researcher:

Deborah Jowitt
Auckland Hospital
deborahj@adhb.govt.nz
09 307 4949 ext 4671
Home: 6233364

Research Supervisors:
Dr Lynne Giddings
Auckland University of Technology
lynne.giddings@aut.ac.nz
09 917 9999 ext 7013
Dr Linda Bryder
History Department
Auckland University
l.bryder@auckland.ac.nz
09 373 7599 ext 7319