Opaque whiteness: milk regulation and the introduction of food controls in Queensland

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> Behind its veil of opaque whiteness, every quart of milk hides a potential peril to the public health.
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> Jesse D Burks, 1911

In Australia and other western societies, the dawn of the twentieth century coincided with the introduction of food and drug controls, which reflected scientific and government concerns about infectious disease, and the rise of organised public health systems.[1] Inspired by a desire to produce better infant, child and overall mortality rates, governments, including that of Queensland, used their health systems to progressively introduce rules for the ways in which noxious substances could be sold or used near humans and the ways in which foods could be manufactured, stored or sold. One of those foods was milk, especially cow's milk, which has long formed a significant part of the Western diet. On those grounds alone, milk was likely to attract regulatory attention, but it was also important because many dangers might hide within its opaque whiteness. Although it was a primary infant food, milk could be tainted or adulterated in many ways between dairy and consumer. It was also often thinned with dirty water and might carry a range of disease-causing organisms, some of which were lethal. This paper mostly relates milk problems to one such disease: bovine tuberculosis, a mycobacteria infection that probably caused a significant number of human tuberculosis infections before the age of antibiotics. First, it considers the ways in which scientific, social, racial and economic factors shaped the food and drug control activities instituted by Queensland's Department of Public Health, and then progressively shows aspects of the development of food controls in Queensland from 1901 through to the 1940s. The paper refers to wider aspects of Queensland's food and drug control activities during this time, but maintains its emphasis on milk controls. In so doing, it reveals the many flavours of milk as food and socioeconomic product and the several ways in which Queensland's food control activities set precedents for Australian food safety initiatives.

The scientific history of milk disease, and of bovine tuberculosis specifically, is one of professional rivalry, contested claims and counter-claims threaded between contrasting ideas about racial difference and misunderstandings about heredity. Claims of links between milk and disease emerged noticeably in the mid-nineteenth century as scientists showed an increasing interest in the implicit and eventually proven relationship between gastric or

[1] I wish to acknowledge James Cook University for supporting the research from which this paper is drawn. See Gillian Colclough, 'The measure of the woman: eugenics and domestic science in the 1924 sociological survey of white women in north Queensland', PhD thesis, James Cook University, 2008.

enteric illnesses and milk.[2] In regard to bovine tuberculosis, different experimental approaches, controversial findings and professional disagreement, at a time of competitive international research, were often expressed in intense personal antipathies.[3] German scientist Robert Koch isolated the tubercle bacillus in 1882. He initially thought that there were two forms, and that the bovine type could be transmitted to humans from cattle through milk, then changed his mind and argued that humans were the source of human tuberculosis.[4] Bernard Bang, a Danish veterinarian, published on bovine tuberculosis in 1886; he described what became known as the tuberculin test, in which tubercle bacilli injected into cattle produced a local reaction if they were infected.[5] American Theobold Smith identified differences between human and bovine tuberculosis bacilli in 1895. Koch still thought that the bovine form could not infect humans.[6] Characters such as these debated the matter with such fervour that it would be unsurprising if the medical professionals who read of, or witnessed, the squabbles were unsure whether *M. bovis* was a human pathogen.[7] However, in 1902 Mazÿck Ravenel provided irrefutable evidence of its zoonotic nature.[8]

The intense international research that followed discovered an epidemic of *M. bovis* in Europe and the United States, where an estimated 10 percent of tuberculosis cases in 1901

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[2] Villemin demonstrated a link in 1865. See Peter Swan, 'The pure food laws and regulations: burdensome laws in search of meaningful objectives?', CIS Policy Monographs 13, Sydney, The Centre for Independent Studies, 1987, p. 146. For more on early ideas about milk risks, see Peter Atkins, 'White poison?: The social consequences of milk consumption, 1850–1930', *Social History of Medicine*, 1992, vol. 5, p. 217; see also p. 216 for a list of diseases that can be caught from milk. For the development of diagnostic tests and some assumptions about disease in the late nineteenth century, see DS Lamb, 'The deadly microbe and its destruction', *American Anthropologist*, vol. 6, no. 1, 1893, pp. 15–28. Bovine tuberculosis offers a diagnostic challenge: most laboratories today use Löwenstein–Jensen culture medium with glycerol, which reveals *M. tuberculosis* but does not promote *M. bovis* growth. See PJ Quinn, ME Carter, B Markey and GR Carter, *Clinical Veterinary Microbiology*, London, Wolfe, 1994, p. 161.

[3] There are also ongoing disputes about the ancient origin of bovine tuberculosis, with argument centred on whether humans gave the disease to animals, or vice versa (e.g. after the domestication of cattle, c. 7000–6000 BCE). See George A Clark, Marc A Kelley, John M Grange and M Cassandra Hill, 'The evolution of mycobacterial disease in human populations. A re-evaluation', *Current Anthropology*, vol. 28, no. 1, 1987, pp. 45–62.

[4] Since laboratory animals seemed not to acquire human tuberculosis, he decided that *M. bovis* would not travel to humans. See Peter Atkins and P Brassley, 'Mad cow and the Englishmen (animal–human pathological links in the United Kingdom)', *History Today*, vol. 46, no. 9, September 1996, p. 14.

[5] Andrew Hunt Gordon and Calvin Schwabe, *The quick and the dead: biomedical theory in ancient Egypt (Egyptological Memoirs)*, Boston, Brill, 2004, p. 70.

[6] Lester S King, 'Dr Koch's postulates', *Journal of the History of Medicine and Allied Sciences*, vol. 7, no. 4, 1952, pp. 350–61.

[7] WT Hubbert, HV Hagstad, E Spangler, MH Hinton and KL Hughes, *Food safety and quality assurance: foods of animal origin*, Ames, Iowa State University Press, 2nd edition, 1996, p. 9. See also Georgina D Feldberg, *Disease and class: tuberculosis and the shaping of modern north American society*, New Brunswick, Rutgers University Press, 1995, and John M Barry, *The great influenza: the epic story of the greatest plague in history*, New York, Viking Penguin, 2004.

[8] An animal disease transmissible to humans is a zoonose. See Alan Olmstead and Paul Rhode, 'An impossible undertaking: the eradication of bovine tuberculosis in the United States', *Journal of Economic History*, vol. 64, no. 3, 2004, p. 3. See also Atkins and Brassley, 'Mad cow and the Englishmen', pp. 14–18.

were of the bovine form.[9] In London, late nineteenth-century post-mortems had found that 30–40 percent of children died of tuberculosis: now it seemed that the bovine form might have been responsible for many of those deaths too.[10] However, even without the bovine tuberculosis debate, scientists had produced compelling evidence about the perils of milk, and the intellectual atmosphere was such that, when Swithinbank and Newman published *Bacteriology of Milk* in 1903, their claims about its many dangers were not challenged.[11] Accordingly, whether or not they accepted the risks of bovine tuberculosis, states inevitably referred to the problem of milk-borne disease as they introduced or refined food regulations.[12] In this way, food controls reflect the junction of scientific and government concerns about infectious disease and the rise of organised systems of public health.[13]

Milk's social position is equally important. In the late nineteenth and early twentieth centuries, milk-borne diseases affected middle-class families more than their social and economic inferiors, because they could afford, and used, more milk.[14] Middle-class families were racially as well as economically important: we need not look far to find instances where members of the middle-class died tragically or heroically from tuberculosis, let alone less romantic diseases carried by milk. Sufferers such as Keats and Elizabeth Barrett Browning died of tuberculosis in the nineteenth century; Dylan Thomas and George Orwell did similarly in the twentieth century; but thousands also died who never came to such prominence, and many of those were young. Milk-borne disease struck hardest at children, who were also most sensitive to chemicals added to it. Yet, despite the dangers, milk was an economical provider of proteins that health authorities wanted to make accessible to the working class and the poor.

Food controls also signify concerns about national and racial wellbeing, expressed by supporters of ideas such as eugenics that the unwell might contaminate the well and in the related xenophobic notion that migrants or non-white residents might carry and spread disease. Eugenicists and other social and medical activists in Australia and overseas urged

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[9] Atkins and Brassley, 'Mad cow and the Englishmen', p. 1.

[10] Scientists had difficulty in distinguishing between pathogens until the development of Gram staining techniques in the 1880s. For progressive discoveries, see Joseph Lister, 'On the early stages of inflammation', *Philosophical Transactions of the Royal Society of London*, vol. 148, 1858, pp. 645–702; CC Pode and E Ray Lankester, 'Experiments on the development of bacteria in organic infusions', *Proceedings of the Royal Society of London*, vol. 21, 1872, pp. 348–58; CC Merriman, 'The preparation and mounting of double stainings', *Proceedings of the American Society of Microscopists*, vol. 1, 1878, pp. 71–3.

[11] Atkins, 'White poison?', p. 217; Harold Swithinbank and George Newman, *Bacteriology of milk. With special chapters also by Dr Newman on the spread of disease by milk and the control of the milk supply*, London, J Murray, 1903.

[12] See Atkins, 'White poison', pp. 207–27.

[13] For the internationalisation of public health, see Alison Bashford and Carolyn Strange, 'Thinking historically about public health', *Journal of Medical Ethics; Medical Humanities*, vol. 33, 2007, pp. 87–92.

[14] Jesse Burks, 'Clean milk and public health', *Annals of the American Academy of Political and Social Science*, vol. 37, no. 2, 1911, pp. 92–206 and p. 196.

broader food and drug controls in the early twentieth century because they saw in them an opportunity to avert racial degeneration and promote racial health by improving public health overall. Because of its lethal potential, English scientist Caleb Saleeby included milk among items he described as 'racial poisons'; his was one of many voices that called for increased legislation to protect the public from lead, arsenic and other contaminants.[15] The White Australia Policy's early years consequently coincided with global initiatives to improve health and an enthusiastic nationalism that, in the case of the Western empires and states, directed many of its concerns into debates about racial futures.[16] This was certainly the case in Queensland, where politicians and many members of the white public supported racially discriminative policies and practices, in health and other areas, in the belief that they did so for the better of the nation and Queensland.

The Western fondness for milk also ensured its economic significance. Established late in the nineteenth century, commercial dairies soon became part of Queensland's rural character.[17] However, reluctant to discard traditional dairy methods and suffer the costs of additional processing, many producers resisted attempts to impose controls on their products. The government viewed dairying as an important part of the economy, but legislation to regulate it was sometimes hollow because of the prohibitive costs of enforcing the rules. Regardless, it was determined to develop a safe dairy industry.

Like governments elsewhere, it was also determined to protect its children.[18] The infant death rate in Queensland at the turn of the century was significant: more than 14,000 babies were born here in 1900, but within the year 10 percent of them had died, many from what were broadly termed gastric or enteric diseases.[19] Enteric infections are often caused by the salmonella bacterium, which might be expressed in two serious conditions: salmonellosis (enteric fever or typhoid) and acute gastroenteritis.[20] These illnesses were difficult to

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[15] Caleb Saleeby, *Woman and womanhood. A search for principles,* New York, Mitchell Kennerly, 1909, p. 24.

[16] There are strong arguments for connections between national development and racially biased or xenophobic ideas. See particularly Gerard Delanty, 'Beyond the nation-state: national identity and citizenship in a multicultural society – a response to Rex', *Sociological Research Online*, vol. 1, no. 3, 1996, http://www.socresonline.org.uk/socresonline/1/3/1.html.

[17] For more on Queensland dairies, see Anne Statham, *The fight for a fair go: a history of the Queensland Dairyfarmers' Organisation*, Brisbane, The Organisation, 1995, and Vincent Cottell, 'Queensland dairy farming 1885–1985 – technological impact and social change', M.Sc. thesis, Griffith University, 1987.

[18] In Europe and the United States, 20 percent of children died within a year of birth. See Robert Millward and Frances Bell, 'Infant mortality in Victorian Britain: an economic and social analysis', *University of Manchester – Working Papers in Economic and Social History*, no. 41, 1999, p. 1.

[19] There were 14,801 births. *Queensland Parliamentary Papers* (hereafter *QPP*), Registrar-General's Report, 1901, p. xxi.

[20] These and a number of other salmonella are from the family Enterobacteriaceae, to which E. coli (*Escherichia coli*) also belongs. Kenneth Todar, University of Wisconsin–Madison (Department of Bacteriology), 2005, *Todar's online textbook of bacteriology*, http://textbookofbacteriology.net/salmonella.html (viewed April 2007).

diagnose at the turn of the century because of the similarities between enteric bacteria; symptoms such as fever and diarrhœa also overlapped in the early stages of an infection. When the number of deaths from enteritis or gastric illness and diarrhœa are combined, they make up almost 30 percent of infant deaths in 1901, while '*Tabes Mesenterica*' (which indicated inferred abdominal tuberculosis) was the 10th deadliest problem listed.[21] However, a child who survived its first year was by no means safe: children remained susceptible to enteric illnesses in their first five years and up to 24 of every 1,000 might die before their sixth birthday. Many of these deaths would have been related to the quality of home sanitation overall, but even in a dirty house the simple act of boiling milk before feeding it to children might have saved lives.

Indicative of the commitment with which Queensland launched its post-Federation public health activities, physician Jefferis Turner represented the state at the international Tuberculosis Congress in London in1901, where he reported that the disease caused 'about one-twelfth' of Australian deaths.[22] For reasons like these, the Home Secretary's Department introduced the Infectious Diseases Regulations of 1901 under the guidance of its first Commissioner of Public Health, B Burnett (Bertie) Ham.[23] It also produced the Report of the Commissioner of Public Health upon Food Preservatives and Adulterated and Unwholesome Food. Presentation and acceptance of the Report's recommendations allowed Ham to note that Queensland now 'led the van in the matter of the prevention of food adulteration'.[24] This was true: it was the first Australian state to issue food regulations.[25]

Ham faced practical as well as ideological challenges in regard to spoilable food. The English contributors to the Queensland Report worried about food storage in Queensland,

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[21] Of the one-year-olds, 282 were diagnosed with enteritis; 198 died as a result of premature birth and 143 deaths were attributed to diarrhoea. Convulsions and pneumonia were the third and fourth causes of death. They were followed by 'whooping cough and dentition', 'want of breast milk', bronchitis, diphtheria, 'inflammation of the brain or its membranes', and '*Tabes Mesenterica*'. *QPP*, Attributed causes of death in children under five years in Queensland in 1900, Registrar-General's Report, Vital Statistics, 1901. The 1906 Report found that almost 12 in every 1,000 children might die before they were two, 6 in every 1,000 before they were three, 3 in every 1,000 before they were four and another 3 in every 1,000 before the age of five. See *QPP*, Report of the Government Statistician, 1906, p. xx. These figures were 11.67, 5.74, 3.19 and 2.99 per 1,000 respectively.

[22] *QPP*, Report on the Proceedings of the International Congress for the Prevention of Tuberculosis, held in London in the year 1901, Report of the Commissioner of Public Health, 1902. Statistically, tubercular infections accounted for around 10 percent of deaths in Queensland between 1896 and 1900, but such a rate probably owed a great deal to diagnostic disparity and haphazard reporting.

[23] It did so under the power bestowed on the Commissioner in *The Health Act 1900*. The new regulations rescinded the rules formerly operating under *The Health Act 1884*. *QPP*, Executive Council Minutes and Despatches, The Infectious Diseases Regulations of 1901.

[24] It was based on one produced in 1900 by a London Local Government Board investigation. *QPP*, Executive Council Minutes and Despatches, Report of the Commissioner of Public Health upon Food Preservatives and Adulterated and Unwholesome Food. For more on Burnett Ham, see MJ Thearle, 'Dr B Burnett Ham. Father of Queensland's Department of Health', *Medical Journal of Australia*, vol. 161, no. 1, 1994, pp. 55–7.

[25] It was also the first after 1901 to instigate compulsory disease notification.

where domestic food cooling at this time was generally restricted to ice-chests.[26] Nonetheless, butter and milk stayed fairly cool when stood in a bowl of water covered with a wet cloth, and even householders in the hot tropics used this method.[27] Considering that the risks that bovine tuberculosis presented to humans were still disputed in 1901, storage was the least of the food problems identified: similar to English research findings, adulteration became more of a concern for milk and many other foods. Adulteration began from the practice of adding preservatives to food in order to prolong its usable life. By the twentieth century, producers had developed a catalogue of chemicals that, at best, lengthened product life by retarding bacterial action, and at worst masked deterioration. For authorities in New York and France, pressured by hygienists who wanted to see only fresh (unadulterated) milk sold, any changes were unacceptable: they prohibited additives in milk but allowed some in other foods. Germany forbade any antiseptic in food, while Belgium, Spain, Italy and Holland forbade the addition of any preservative.[28]

Ham was cautious about a complete ban. English researchers found that the preservatives mostly used there included chalk, which was used to 'freshen' sour milk, while other additives (e.g. salicylic, benzoic or boracic acids and formalin) were intended to disinfect.[29] Although some scientists argued that manufacturers had no reason to exceed safety limits, others disagreed. For example, formalin might preserve milk, but it adversely affected juvenile mucous membranes; its addition also 'tended to obviate the necessity for cleanliness in the dairy'.[30] However, Ham argued that purveyors had a vested interest in delivering fresh food. Consequently, rather than forbid all additives, he initially chose to prohibit some and regulate the use of others.

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[26] Large businesses might have generators and refrigeration at this time, but domestic power was not available in many of the towns of Queensland until the mid-1920s; kerosene refrigerators appeared at about the same time but were expensive. One farming woman described a chiller made using wet charcoal stacked around a trunk; the *Australian Woman's Mirror* still suggested this practice for homes without electricity in 1928. See James Cook University, North Queensland Oral History Project, ID140, CD 351-3; *Australian Woman's Mirror*, vol. 4, no. 16, 13 March 1928, p. 21.

[27] And still did so in the 1920s: at least 98 of 123 women surveyed in Cairns in 1924 covered their perishables, and just four reported 'gastric' problems even though half had no ice-chests and 27 no meat-safes. See National Australian Archives, Institute of Tropical Medicine, SP1063/1, 277, 'Report on House To House Visitation etc. Sociological Unit', p. 6.

[28] Barbara Orland, 'Cow's milk and human disease. Bovine tuberculosis and the difficulties involved in combating animal diseases', *Food & History*, vol. 1, no. 1, 2003, p. 179.

[29] *QPP*, Report of the Commissioner of Public Health Upon Food Preservatives and Adulterated and Unwholesome Food, 1901, p. 3. Salicylic acid is salt; benzoic acid is still used as a food preservative and colourant and is useful as a fungicide. Boracic acid is used in insecticides, fungicides and as a lubricant; it is used to make LCD television screens and can slow the rate of nuclear fission. Lethal in large quantities, formalin is still used as a preservative. See Louis Goodman, Alfred Gilman, Laurence Brunton, John Lazo and Keith Parker, *Goodman & Gilman's The pharmacological basis of therapeutics*, New York, McGraw-Hill, 2006.

[30] *QPP*, Report of the Commissioner of Public Health upon Food Preservatives and Adulterated and Unwholesome Food, 1901, p. 1.

The regulatory process was thorough. Rules for dairy produce standards encompassed fat and water levels as well as additives: milk itself was defined, as were cream and cheese, so that dairies had clear benchmarks.[31] The government similarly regulated and monitored additives to non-dairy foods, from alcohol to meats and breads; many such regulations operated in Queensland prior to Federation, and required little later amendment.[32] Punitive measures were considered and adopted: the government analyst evaluated samples and regularly prosecuted for non-compliance. However, standards formed just one part of the food health picture: infection control made up the other. In this regard, Queensland's dairies were subject to scrutiny from 1899, when the Home Secretary's Department had appointed an Inspector of Dairies responsible for shire and council operations via local health officers who were also often local medical practitioners, some of whom may have preferred others to tramp about the streets, farms and dairies. In 1902 an inspector complained that 'one or two cows' often 'masked small-scale commercial operations' so that 'increased vigilance would take time to have a real effect, and much depended upon staffing'.[33] Staffing, however, depended upon budgets, and for reasons such as this the government struggled to enforce its regulations in the early days. Since milk could be obtained from such small operators as well as the larger (regulated) dairies, the health flaws identified added urgency to incentives for even more careful monitoring at the manufacture level, and continued public education.

At this time it seemed to Ham that municipal authorities could do more, and he complained that some local authorities were not being stringent enough in meeting their sanitary responsibilities or administering punishment. For example, management of tubercular cattle was as important to community health as other essential sanitary measures, and in the former regard some local inspectors also failed to meet the new standards. Bearing in mind that they had clear criteria, Ham noted that local inspectors had 'no excuse in this connection for their neglect of duty' but 'little or nothing has been done by the Local Authorities to procure samples and prosecute offenders'.[34] This was a serious failing in the food regulation system, with grave local implications, but there were others. Ham added that it had come to his attention that 'a large number of tuberculous cattle have lately been sold and slaughtered' for the local market; conversely, '[a]ll the meat for export trade' was 'strictly examined by expert inspectors'.[35] Unsurprisingly, once he conveyed his displeasure, Ham

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[31] As, for example, under the *Dairy Produce Act 1904*, which was amended as required. See Herman Cohen, WF Craies, Edward Manson, CJ Zichy-Woinarski, W Harrison Moore, A Buchanan, RW Lee and Godfrey R Benson, 'Review of legislation, 1904, British Empire, Australasia', *Journal of the Society of Comparative Legislation*, New Series, vol. 7, no. 1, 1906, p. 115.
[32] Two acts dealt with public health; one of those allowed for a Commissioner of Public Health. See WF Craies, 'Review of Legislation, 1900, British Empire, Australasia', *Journal of the Society of Comparative Legislation*, New Series, vol. 3, no. 2, 1901, pp. 353-4.
[33] *QPP*, Report of Commissioner of Public Health, 1902.
[34] ibid.
[35] ibid.

obtained the 'prompt and cordial cooperation' of the chief inspector of the Stock Department.[36] Oversights of this nature are rarely reported over the next few years: the control of animal disease was as important as that of humans, and there were many scientific intersections between those engaged in human or animal research. Such cooperative relationships seem to have been mutually productive and appreciated.

Legislation became more specialised as it developed over the years. Honest labelling of foods occupied a good deal of the department's time: concerned about the 'flooding of the local markets with cheap and nasty foodstuffs manufactured in the southern States' and supported by enabling powers, the department's actions in this regard were crucial in developing public preference for foods that were precisely what their marketing suggested.[37] However, dairy matters remained important and legislators often reshaped the rules to remedy weaknesses. For example, the *Health Act 1900* had made no provision for the imposition of dairy standards except as an outcome of municipal inspection: this deficit was addressed under the *Dairy Produce Act 1904*.[38] Another amendment established a 'minimum standard of butterfat in cream' and prohibited the sale of substandard cream, or its purchase by a dairy for butter manufacture.[39] More importantly, the 1905 Report revealed Ham's concerns about tuberculosis, particularly the bovine form.

The 1905 Report introduced phthisis statistics for the first time, noting that since 1904 it had become (at Ham's insistence) a notifiable disease in the broader sense of being reported in the living rather than, as previously, just in the dead. Consequently, it recorded 162 new phthisis cases for 1904, mostly in the Brisbane area.[40] The terms 'phthisis', 'pulmonary consumption' and 'tuberculosis' were used interchangeably at this time; Ham noted that he had issued '[r]ules for the prevention of tuberculosis ... in circular form in October' of 1904.[41] Further in the Report, Ham referred to an appendix to the Report by 'Dr Baxter-Tyrie, Health Officer to the Department' on bovine tuberculosis and its transmission to children by cow's milk.[42]

In his Report, Baxter-Tyrie argued that 'it is a matter of common knowledge, based on the results of post-mortem examinations, that at least 95 percent of the population have at some

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[36] ibid.
[37] ibid., p. 11.
[38] ibid.
[39] WF Craies, 'Review of Legislation, 1905, Queensland', *Journal of the Society of Comparative Legislation*, vol. 7, no. 2, 1906, p. 439.
[40] *QPP*, Report of Commissioner of Public Health, 1905, p. 52.
[41] ibid.
[42] ibid., p. 71. This may have been Charles Campbell Baxter-Tyrie, a 'plague specialist' who attended the Maryborough plague outbreak. See Dell York, 'The plague in Maryborough', *Hammer*, no. 28, 2005, http://archive.amol.org.au/hmm/pdfs/ hmm28.pdf, and CC Baxter-Tyrie, 'Report of an outbreak of plague in Queensland during the first six months of 1904', *Journal of Hygiene*, vol. 5, no. 3, 1905, pp. 311–32.

time suffered from tuberculosis'.[43] While he attributed most of these infections to poor hygiene and pulmonary tuberculosis, Baxter-Tyrie added that '[t]he transmission of tuberculosis ... by cow's milk demands urgent attention'.[44] Tubercular infections in the alimentary tract, he said, were:

> generally conveyed in the milk of tubercular cows. It is chiefly infants and young children that are affected. This source of infection is of great importance in a country such as this, where a large proportion of the infants are bottle-fed ... It is, therefore, patent that no scheme for the prevention of human tuberculosis can be complete that does not take cognisance of the risks that children run of infection by milk from tubercular cows.[45]

Arguing that '[n]o dairyman should be allowed to supply milk for consumption from cows' that had not been tested for tuberculosis', Baxter-Tyrie pointed out that tuberculin-testing of cows was compulsory in Denmark, 'several other European countries and many towns in Great Britain'.[46] Compulsory testing rules did not apply in Queensland, where the Agriculture Department (by this time responsible for animal health) conducted tests only with the consent of owners. Consequently, only 59 cows were tested in 1900 and 1901. In 1904 there were 3,769 cows in milk in the Brisbane metropolitan area; 'routine testing' was still not conducted and cattle were only destroyed when tubercular lesions became apparent.[47] Noting that '[t]he appalling mortality of infants is now receiving attention in Parliament', Baxter-Tyrie urged that 'every cow supplying milk be regularly tested' and all dairy cattle be 'frequently and rigidly inspected for tuberculosis'.[48] This suggestion was not adopted for over 40 years; the cost of inaction would be ongoing new infections with bovine tuberculosis. It is interesting that some tests were made because of infections in nearby piggeries: it seems that pig farmers commonly fed their animals with dairy swill.[49]

Alongside their attention to milk hygiene, health authorities at this time were urging better overall domestic sanitation as a means to reduce enteric infections, thus placing a significant part of the onus for child health on the home, but more specifically on the mother; this was a pressure that would increase noticeably over the next two decades. In their work on the commercial front, health officials continued to fret about the commercial custom of adding water to milk. '[T]he watering of milk', Ham reported, was:

> looked upon as rather a harmless lapse from the paths of rectitude than a serious offence. The danger of starving children or infants dependent upon a milk diet ... requires to be more strongly brought home to the judicial as well as to the lay mind.[50]

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[43] *QPP*, Report of Commissioner of Public Health, 1905, Appendix C, Prevention of Consumption, p. 18.
[44] ibid.
[45] ibid.
[46] ibid.
[47] ibid., p. 19.
[48] ibid.
[49] As shown in *QPP*, Report of the Director of Veterinary Services, 1940, p. 251.
[50] *QPP*, Report of Commissioner of Public Health, 1905, p. 11.

There was profit in watering, and water was regularly added at up to 25 percent of the milk volume. Milk in a good or non-drought season might naturally include 10 percent of water: where milk, as it often did, had a volume of 35 percent water, a producer could achieve as much income from their water as their milk; but milk was not the only food product with which manufacturers meddled.[51]

In 1905 the government analyst (Brownlie Henderson) noted cream of tartar that was actually just superphosphate of lime, schnapps from a South Brisbane hotel 'adulterated with 280 grains of sulphuric acid per gallon' and a sample of oatmeal inexplicably containing .157 percent arsenic.[52] Coal tar was often used for colouring cordials and confectionary, other plants were substituted for tea leaves, pepper might be given extra volume by the addition of starch, and one bottle of tomato sauce contained no tomato at all.[53] It seemed outwardly that little but the vigilance had changed by 1909, when inspectors found coal-tar dye in wheat starch and baking powder; salt turned out to be the only component of a 'digestive table salt' that claimed to have additives to aid the digestion; a 'rat cake' intended to poison rats contained no poison at all; a 'salad oil' was just cotton-seed oil, and one sauce contained 12 per cent alcohol.[54] Prosecutions for this type of food and poison misrepresentation and adulteration would continue, and stringent inspection and analysis remained important to public health as well as to consumer pockets.

Tuberculosis also remained topical. In 1909 Ham remarked on the growing popularity of the Darling Downs and Stanthorpe as places that provided 'excellent climates' for tuberculosis recovery, but worried about the practice of letting cottages to consumptives without scrutiny and disinfection afterward.[55] He sounded a more cheering note in reporting the opening of the Lady Chelmsford Pure Milk Institute in Brisbane, adding that the free milk offered there would soon be pasteurised, and that commercial pasteurisation was becoming more popular.[56] As he left Queensland to take up a position as head of Victoria's Public Health department, Ham also recommended that Queensland form a separate Department of Health with a Minister of Health as its head and foresaw a national health body. He urged again that local authorities and the Health Office collaborate in public health activities, because, while they meant well, he said, 'their achievements usually fall short of the ideal'.[57]

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[51] ibid.
[52] 'This oatmeal had caused poisoning, but no satisfactory explanation was obtained as to how the arsenic got into the meal.' *QPP*, Report of Commissioner of Public Health, 1905, p. 17.
[53] *QPP*, Report of Commissioner of Public Health, 1905, p. 17.
[54] *QPP*, Report of Commissioner of Public Health, 1909, p. 9.
[55] ibid., p. 32.
[56] ibid.
[57] ibid.

Nonetheless, his 'pure food crusade' continued under the guidance of the new Commissioner, John Irwin (JI) Moore, with some of Ham's ideals realised in the short term.[58]

In 1910 representatives from all states except Western Australia met at a Sydney conference with the intention of 'securing uniformity of food and drug standards of the principal manufactured products sold in the Commonwealth'.[59] The outcome was an agreement that provided consistency in a number of food and drug production and labelling standards. Actions such as these surely helped to emphasise regulatory commitment to the maintenance of good food standards but did not guarantee local compliance. For example, the State Analyst found that 23 percent of milk samples contained an average 7.9 percent of added water.[60] Apart from the ongoing consumer exploitation, the adulteration was a concern because the water was mostly drawn from creeks: few of the dairies that supplied Brisbane had access to pure water and many were in close proximity to abattoirs and piggeries as well as broader farming operations. Run-off from such operations undoubtedly fouled the creeks.

The penalties for supplying impure milk had become more severe by 1913, by which time the Commissioner had the power to 'publish the name and offence of the offender, and to post these particulars up on the offender's place of business for 21 days'; moreover, newspapers were free to publish offenders' details.[61] Generally, local traders seemed to have begun to accept the economic benefits of food standard regulation, with local goods competitive against those from interstate subject to less stringent controls. Hence, Moore argued that '[t]he food inspector is now regarded by traders in the light of a business friend who will willingly post them up with information', but another incentive probably lay in the promise that inferior goods would be destroyed, as were 150 tons (about 136 tonnes) of foods in 1912–13 and 25 tons (about 23 tonnes) in 1913–14.[62]

Business friends or not, the Department continued to find inferior products during its inspections. The early twentieth-century emphasis on public health had made personal health marketable, and technical, industrial or scientific terminology was also used to enhance product appeal. Prosecutions addressed 'barefaced swindles' such as that of marketing a water filter as an 'electric filter' when in fact it could not filter even small particles and its only claim to being an electric device came from a low-voltage electric current running through it.[63] It was more likely to give the user a shock than clean water.

There was another canny but later sorry individual in 1914:

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[58] John Simpson (Chief Inspector) in *QPP*, Report of Commissioner of Public Health, 1909, p. 92.
[59] *Yearbook Australia*, vol. 6, 1913, p. 1092. The conference was held on 8 June 1910.
[60] J Brownlie Henderson in *QPP*, Report of the Director, Laboratory of Microbiology and Pathology, Report of the Commissioner of Public Health, Brisbane, 1910, Appendix Two.
[61] '[w]ithout risk of action': *Yearbook Australia*, vol. 6, 1913, pp. 1090–1.
[62] *QPP*, Report of Commissioner of Public Health, 1914, p. 9.
[63] ibid., p. 47.

> The vendor of Malt Coffee, against whom a conviction was recorded and a fine of £5 imposed, described his product as 'The Healthiest Food-Drink in the World'. This point was not argued, but, owing to the fact that the compound contained neither coffee nor malt, it was considered to be falsely described and adulterated within the meaning of the Acts.[64]

As this shows, the Food Acts had expanded to provide increased penalties and the concept of adulteration had been extended.[65] Nonetheless, some milk vendors continued to adulterate their products or practice poor hygiene. Ninety-six of 493 milk samples in 1914 failed various tests, mostly for water content. Frustration seems evident in John Simpson's Report, where he complained that magistrates 'on the whole' did not inflict adequate punishment and suggested that a second conviction for milk adulteration should carry 'imprisonment with hard labour' so that 'the practice ... should be likely to fall into disrepute'.[66] However, these failures might be argued as less important than that of maintaining clean milk. Simpson also noted the 'ancient but exceedingly insanitary practice' of using rags to cover milk cans; it was one, he said, 'that dies hard'.[67] Humans died hard too: in that year, almost 6 percent of Queensland deaths were attributed to tuberculosis, and there were 471 new notifications of phthisis.[68] The rate of bovine tuberculosis infections was probably higher: in about 10 percent of cases, bovine tuberculosis contracted in childhood can appear to be healed but reactivate some years later, at which time it often appears as a pulmonary infection; as is the case with *M. tuberculosis*, the symptoms may include fever, cough, chest pain, cavities in the lung that appear in x-rays and the coughing up of blood.[69]

Five years later, Australia was recovering from two tragic events: war and an influenza epidemic. Health and quarantine plans were tested severely and found capable at this time, but resources were stretched because of influenza and the absence of experienced inspection staff on AIF service. Phthisis maintained its presence, with 410 diagnoses, of which 55 were found as a result of chest x-rays or other examinations for military service; altogether, the figures showed a decrease of 50 cases since 1918.[70] Nine new infections were in immigrants from undisclosed places overseas, and there might have been more were it not for international travel restrictions due to influenza. Milk prosecutions had continued despite the staff shortage, with two ice-cream vendors charged with selling ice-cream with 'an excessive bacterial count'.[71] Considering the challenges, Queensland coped well; but while international research into milk diseases had continued during the war, it

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[64] ibid., p. 43.
[65] ibid.
[66] ibid., p. 40.
[67] ibid., p. 43.
[68] The figure was 5.69. *QPP*, Report of Commissioner of Public Health, 1914, p. 8 and p. 70.
[69] JM Grange, 'Mycobacterium bovis infection in human beings', *Tuberculosis*, 2001, vol. 81, no. 1/2, p. 71. See also Center for Food Security & Public Health, Iowa State University, http://www.cfsph.iastate.edu/Factsheets/pdfs/bovine_tuberculosis.pdf.
[70] *QPP*, Report of Commissioner of Public Health, 1919, p. 4.
[71] ibid., p. 15.

would only be in the aftermath of another that successful treatments for tubercular illnesses emerged.[72]

Legislative amendments designed to increase dairy product safety continued in the interim. For example, the *Dairy Produce Act 1920* protected producers in their dealings with dairies, introduced grades for cream and butter, forbade the addition of 'putrescent cream' to butter and encompassed labelling of dairy produce packages.[73] Such an ongoing level of concern ensured that milk remained the most tested of all Queensland foods, but food inspections were thorough overall. By 1926 annual reports concerning food inspections covered up to ten pages. Inspectors watched for the 'promiscuous distribution of dangerous poisons' which might inadvertently contaminate food containers, interested themselves in the quality of bread and the preservatives used in its manufacture, monitored food handling standards in the bakeries themselves, and tested alcoholic spirits at hotels.[74] They were responsible for enforcement of 'the provisions of Part VI of the Health Acts (Food and Drugs), the Food and Drug Regulations, Milk-sellers Regulations, Fish Supply Regulations, Footwear Regulations, and Poisons Regulations'.[75] Inspector Hiddins of Brisbane conducted 'regular and systematic supervision over fish supplies at the State Fish Markets'; additionally, he 'examined all consignments of cured fish arriving in the port from overseas', with the outcome that over 61 tons of fish were condemned and destroyed.[76] It is impossible to feel pity for importers who may have lost large amounts of money but might also have been responsible for large-scale illness.

Formerly a source of pride, Queensland's infant mortality rate had become worse than those of Victoria and South Australia by 1926; at the same time, the number of its tuberculosis infections had risen.[77] By 1927 sanatoria were operating at Brisbane, Stanthorpe, Rockhampton, Dalby, Dunwich and Ipswich to deal with 408 new infections as well as those already known.[78] A Federal Health Council was formed in 1927, with JI Moore a member, and at its first meeting members decided to ask the Commonwealth Department of Health to develop a coordinated tuberculosis program.[79] This was an important step in the battle against tuberculosis, but there were important local developments in the late 1920s as well, for the public and milk processors were finally developing an interest in pasteurised milk.

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[72] As shown, for example, in John Waddell, 'Milk, sanitary and otherwise', *The Scientific Monthly*, vol. 4, no. 2, 1917, pp. 155–64, and Leo F Rettger, 'Some of the newer conceptions of milk in its relation to health', *The Scientific Monthly*, vol. 5, no. 1, 1917, pp. 64–79.
[73] LE Groom and JF Gamble, 'Review of Legislation, 1920, Queensland', *Journal of Comparative Legislation and International Law*, Third Series, vol. 3, no. 2, 1921, pp. 45–102.
[74] *QPP*, Report of Commissioner for Health, 1926, p. 18.
[75] ibid., p. 17.
[76] ibid.
[77] Figures revealed a rate of 22.58 deaths per 1,000 births as opposed to Victoria's 20.84 and South Australia's 20.55. *QPP*, Report of Commissioner of Public Health, 1927, p. 1.
[78] *QPP*, Report of Commissioner of Public Health, 1927, pp. 4–5.
[79] *QPP*, Report of Commissioner of Public Health, 1928, p. 34.

Before the 1930s, pasteurisation processes were not as effective as at present: for the method known as the Holder Process, dairy factories needed two sets of cumbersome and often inefficient equipment. One set heated and held the milk for at least 30 minutes (hence 'Holder' process) and the other cooled it.[80] Time and care were critical to the process.[81] Pasteurisation affects milk taste less than sterilisation, but the process could be rendered worthless if the milk was not evenly mixed while in the heater or not held there long enough. Furthermore, if the pipes carrying milk to the cooler had been inadequately cleaned or did not cool the milk quickly, it might be contaminated from an earlier failed process. In milk tests at three dairies, one that was pasteurising still showed a high bacteria count until its machinery and processes were adjusted; another produced excellent results and a third was found to not be pasteurising at all, probably because of 'gross carelessness in regard to the cleanliness of vat, cooler and pipes'.[82] There were also several incidences where bottled milk was marked as pasteurised by outside vendors but investigations revealed it had not been, and prosecution followed because the department now had the right to prosecute vendors for selling 'milk below the bacteriological standard requirement'.[83]

Discoveries at the immediate level began to reduce bacterial contamination as well, for it was found that the first jets of milk from the teat ducts carried the highest number of bacteria. When the first three jets were omitted from milk pails, the bacterial counts were reduced.[84] Pasteurisation remedied the problem of milk-borne illness for humans, but the problem of bacterial infection in cows still needed to be addressed. Another enquiry revealed that some growers were leaving the 'strippings' (the rich portion of milk left in the udders after dairy milking) to calves. Strippings often contained high bacterial loads: milking the cows dry was more likely to produce an honest bacteria count and indicate whether treatment for cow and calf was required.[85] Such simple measures were so effective that in 1928 Moore could argue comfortably that 'high bacteria counts are the result of neglect'.[86]

Most importantly, by 1928, as these examples show, government analysts had begun to focus more on bacteria counts than on water content. The latter remained an important

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[80] Atkins and Brassley, 'Mad cow and the Englishmen', p. 14. See also Orland, 'Cow's milk and human disease', p. 181 and pp. 186–7.

[81] In 1926 Edinburgh University's Hermima Jenkins had found that, while commercial pasteurisation processes were 'theoretically sufficient to destroy pathogenic organisms such as the tubercle bacillus', heating variations and human error made the 'margin of safety between the thermal death point of these organisms and the temperature of pasteurisation ... a narrow one'. See Hermima Jenkins, 'Experiments on the pasteurisation of milk, with reference to the efficiency of commercial pasteurisation', *The Journal of Hygiene*, vol. 25, no. 3, 1926, p. 273.

[82] *QPP*, Report of Commissioner of Public Health, 1928, p. 18. The latter company closed shortly after a visit by the Chief Inspector.

[83] *QPP*, Report of Commissioner of Public Health, 1928, p. 19.

[84] John Simpson in *QPP*, Report of Commissioner of Public Health, 1927, p. 17.

[85] As, for example, in Paul Gustav Heinemann, *Milk*, Philadelphia and London, WB Saunders Co., 1919, p. 272.

[86] *QPP*, Report of Commissioner of Public Health, 1928, pp. 20–1.

deterrent of fraudulent practice, but it was the former that brought most attention to the bacterial contamination of dairy products. In regard to watering, standards had improved in some previous trouble spots: for example, for the first time since testing began, producers at Warwick provided samples free of impurities.[87] Downstream, it was no longer permissible for milk deliverers to carry water on their carts, and Brisbane milk standards, although not yet ideal, were better than ever. There was also a broader shift towards professionalism within the dairy: inspectors noted approvingly that vendors were becoming particular in their approach to milk safety, and that staff had begun to wear special clothes in processing areas. There was some ongoing industry resistance to pasteurisation, but inspectors predicted that the public demand for pasteurised milk would continue to increase, as it did during the early 1930s.[88] Tuberculosis infections persisted regardless, and some of these were undoubtedly of the bovine form. Person-to-person spread of bovine tuberculosis, such as through coughing, seems to be rare but may occur when a person within aerosol range is already unwell.[89] However, the risk of new infection with bovine tuberculosis continued while any milk or dairy products were available unpasteurised: most bovine tuberculosis infections are conveyed through milk.

In 1935 the office of Commissioner of Public Health was abolished and Raphael Cilento became the Director General of Health and Medical Services. An important development under Cilento's control was that of the 1937 inauguration of the State Nutritional Advisory Board, which assumed responsibility for setting food standards; it acted in tandem with the Commonwealth Advisory Council on Nutrition and, while inactive during World War II, was the first tangible step towards Ham's dream of a national body for food and drug standards.[90]

Another significant development during Cilento's time was an unexpected consequence of war, with a considerable increase in tuberculosis testing of dairy and beef herds. The situation prior to this was that herds were compulsorily tested only after humans or animals contracted tuberculosis after drinking raw milk or consuming untreated dairy products; grower consent was waived on such occasions. Not all dairy or beef industry members opposed testing: it could be done at an owner's request, and in 1940 HR Seddon (Director of Veterinary Services) commented on the growing industry interest in achieving a 'tubercle

[87] ibid., p. 22.
[88] ibid., p. 17.
[89] People with compromised immune systems seem vulnerable. See 'Human-to-human transmission can spread bovine TB', *The Lancet*, 2007, vol. 369, pp. 1,270–6. See also World Health Organisation, Food and Agriculture Organisation, 'Zoonotic tuberculosis (*Mycobacterium bovis*): memorandum from a WHO meeting (with) the participation of FAO', *Bulletin of the World Health Organisation*, vol. 72, no. 6, 1994, pp. 851–8.
[90] Ham's vision was eventually realised in the National Food Authority and finally Food Standards Australia New Zealand (FSANZ) in 1991. See 'A short history of NFA/ANZFA/FSANZ', http://www.foodstandards.gov.au/aboutfsanz/historyoffsanz.cfm.

free herd' in the future.[91] Accelerated testing, however, came to pass earlier because of the influx of US Army personnel into Brisbane in 1942. As Hubbert notes, the US Army refused to allow its personnel to drink milk from untested cattle: the veterinary and medical professions were happy to help, and dairies had to comply if they wanted to take advantage of the wartime market boost.[92] In 1942 agriculture department officers conducted 25,613 tests and returned 1,710 positive results.[93] There was a real commitment to the idea of a tubercle-free herd by that time: regularly tested herds could be listed as tuberculosis free once no fresh infections were found. Seventy-four herds were listed in 1942, with 45 accredited.[94] With industry compliance, voluntary testing eventually became a routine part of cattle operations in Queensland.

Tuberculosis remained a cause for concern in Queensland and elsewhere until after the war: antibiotics changed that, at least until recently, and also facilitated the treatment of cows and humans for other infections.[95] Queensland recorded its last new case of animal infection with bovine tuberculosis in 2000, a century after Burnett Ham's dream of clean milk began.[96] All Australian states were declared free of bovine tuberculosis in 2003.[97] Few countries enjoy such status: the number of human bovine tuberculosis infections in the under-developed world is increasing as dairy products become more popular, and the disease is present in many animals that share their environment with domesticated stock in developed countries such as the United Kingdom, New Zealand, the United States and Canada.[98] The consumption of unpasteurised raw milk or milk products is still allowed in many parts of Europe. For countries such as these, milk continues to hide many potential perils to the public health.

Milk controls provide a significant model of the motivations and activities involved in the development and application of safe food and drug programs in Queensland during the early twentieth century. That milk had been so potentially harmful at a time of disturbing infant and

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[91] *QPP*, Report of the Director of Veterinary Services, 1940, pp. 26–7 and p. 251.
[92] Hubbert, Hagstad, Spangler, Hinton and Hughes, *Food Safety and Quality Assurance*, p. 270.
[93] *QPP*, Report of the Director of Veterinary Services, 1942, p. 17.
[94] ibid.
[95] Present tuberculosis therapy is complex, as infections require a multi-drug regime. Globalisation has contributed to a fresh rise in infection as well as the development of antibiotic resistance. Disease outbreaks and prevention programs are overseen by the World Health Organisation's Veterinary Public Health unit (VPH) which pays particular attention to contamination of human food of animal origin. See World Health Organisation, 'Zoonotic tuberculosis (Mycobacterium bovis): memorandum from a WHO meeting (with) the participation of FAO', pp. 851–8. See also *WHO Report 2009*, 'Global Tuberculosis Control. Epidemiology, Strategy, Financing', http://www.who.int/tb/publications/global_report/2009/pdf/report_without_annexes.pdf.
[96] Animal Health Australia, 'Bovine tuberculosis', 2007. http://www.animalhealthaustralia.com.au/programs/adsp/nahis/diseases/btb.cfm.
[97] DV Cousins and JL Roberts, 'Australia's campaign to eradicate bovine tuberculosis: the battle for freedom and beyond', *Tuberculosis*, vol. 81, no. 1/2, 2001, pp. 5–15.
[98] LAL Corner, 'Bovine tuberculosis control in Australia, New Zealand and Ireland: wild animals and the epidemiology of tuberculosis in domestic animals', *Cattle Practice*, vol. 15, February 2007, pp. 3–12.

child mortality rates brought attention to the introduction of dairy controls, brought milk into the realms of science and provided an impetus for the introduction of wider food and drug controls in Queensland. Frustrated by fraudsters and the thoughtless, inhibited or encouraged by the state of science and technology, health officials worked to overcome resistance to their incentives at many levels but eventually established collaborative relationships between scientists, industry, health administrators and the public. Health authorities, such as Burnett Ham, had longed for a situation where human disease became abnormal rather than normal, and effective food and drug controls contributed powerfully to the improvement of public health. The Queensland government's efforts in milk regulation stand as an indicator of its achievements in the development and application of safe food and drug rules overall, for the sake of the race, the state and its children.