

Reflections

History

Smallpox vaccination, colonial Sydney and serendipity

Accidental discovery of an 1841 smallpox vaccine specimen prompts consideration of its historical context — and extreme caution

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A parcel is delivered to the local Public Health Unit from the New South Wales State Records Authority. It contains copies of letters written in May 1841, between the then New South Wales Governor, Sir George Gipps, and Dr J V Thompson, Deputy Inspector General of Hospitals. Enclosed is a small package containing two glass slides, sealed together, guarding vaccine material crucial in protecting the young colony from the scourge of smallpox.

In the same week, the world mourns the death of Sir Frank Fenner, celebrated champion in the global eradication of smallpox, who had stood before the World Health Assembly some 30 years earlier and declared that the dreadful disease was extinct.

In May 1841, Sydney's fledgling colony had a population of over 30 000,¹ and ships carrying hundreds of immigrants arrived frequently. Sir George Gipps had been governing for 4 years, his tenure beset by challenges, including squatters' rights and economic depression. However, Gipps's sense of social justice, revealed 2 years earlier in the conviction of stockmen and convicts responsible for the infamous Myall Creek massacre, was well recognised.²

New South Wales boasted a significant medical fraternity — an inspector general of hospitals, four surgeons, 10 assistant surgeons and 173 qualified medical practitioners.³ Despite this, illness abounded. Gipps was concerned about the health of the populace and, on 6 May 1841, requested that Dr Thompson provide a medical report detailing the "prevalence of sickness . . . in the town of Sydney; and whether . . . anything could be done by the Government for its prevention".⁴

Thompson's report noted the "unusual amount" of sickness and death, and the usual issues affecting the health of the community, including an adequate water supply, waste removal and overcrowding.⁴ The report stressed the importance of strict quarantine regulations, noting that smallpox (variola virus) was "prevailing to a great extent" on Mauritius, and concluded that:

... at the present time there are no means of affording the inhabitants of the Colony the protecting advantages of vaccination; ... the introduction of the Small Pox ... would be much more serious in its consequences, and ... attended by a much larger amount of mortality, than that which has accompanied the existing, or any previous disease.⁴

Kathryn M Weston
BSc (Hons), PhD,
Senior Lecturer, Public Health¹

Wendy C Gallagher
BSc (Hons),
GradDipA (Lib&InfoSc),
Archivist²

James M Branley
MB BS, FRACP, FRCPA,
Head of Microbiology and
Infectious Diseases,³ and
Adjunct Associate
Professor,⁴

¹ Graduate School of
Medicine, University
of Wollongong,
Wollongong, NSW.

² State Records Authority
of New South Wales,
Sydney, NSW.

³ Pathology West,
Nepean Hospital,
Sydney, NSW.

⁴ University of Sydney,
Sydney, NSW.

kathw@uow.edu.au

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Alarmed, Gipps requested clarification, believing the report indicated that Sydney currently held no smallpox vaccine.⁵ Thompson replied that his comments referred only to the lack of a "Vaccine Establishment" for ensuring supply.⁵ The Governor's persistent enquiries, however, prompted Thompson to send the aforementioned small package on 21 May, declaring reassuringly that "the Vaccine Virus is not lost, as will be best attested perhaps by the enclosed packet taken at the Female Factory on the 19th inst".⁶

In 1798, 43 years earlier, Edward Jenner had published his work on smallpox vaccination, describing the protection afforded through inoculation with cowpox pustules.⁷ Although Jenner initially faced resistance, vaccination was soon widely accepted. The colony, despite its isolation, was progressive in attempting vaccination. Only 5 years after Jenner's publication, Mr John Savage, assistant surgeon, attempted to vaccinate orphans, although his "experiment of Inoculating for the Cow Pock" initially lacked success.⁸ Within a year, however, the colonial surgeons declared that "the Cow Pox is completely established in this Colony".⁹

Vaccine viability was maintained by inoculating unvaccinated people and transferring the "lymph" between individuals through arm-to-arm transfer; children were serially inoculated on long voyages for this purpose.¹⁰ The process was not without risks, including co-transmission of syphilis.¹¹ In Sydney in 1841, Dr Thompson maintained a supply of vaccine by inoculating women from the Female Factory — located on the current Cumberland Hospital site in Parramatta — "the only Convict Establishment in which . . . there exists a sufficient field to keep it up";⁶ that is, enough unvaccinated subjects to allow a continual supply of viable vaccine material.

In May 1841, smallpox was "raging with much violence" in Mauritius.¹² The disease had reportedly progressed during the previous 2 years "from India to the Cape of Good Hope; from the Cape to the Mauritius; from the Mauritius to Otaheite [Tahiti]; from Otaheite to South America".¹³ These ports were in frequent shipping contact with Sydney, and Governor Gipps repeated his proclamation of free vaccination "to avert the calamities which must necessarily follow if the smallpox is introduced into the Colony, and to keep up a constant supply of vaccine lymph".¹⁴ He directed that a shilling be charged for vaccination, to be returned upon re-presentation of the

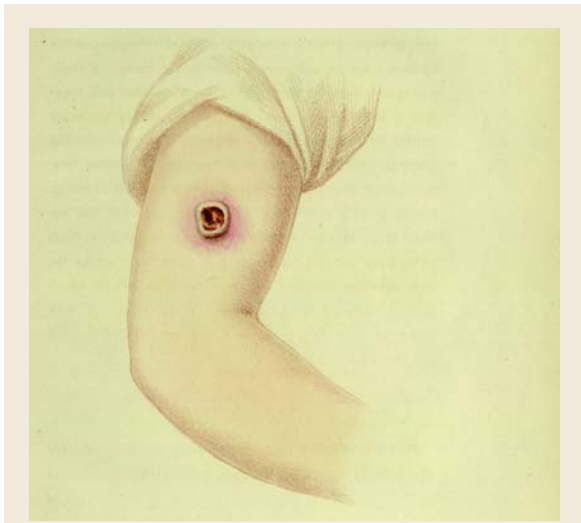


Image from: Jenner E. *An inquiry into the causes and effects of the variolæ vaccinae*.⁷ Image supplied by Rare Books and Special Collections, Fisher Library, University of Sydney.

“
one of the most
loathsome
diseases that
flesh is heir to
”

child displaying the vital scab to prove the vaccine had “taken effect”, and presumably to harvest the fresh vaccine material.¹⁴

Newspapers, as the colonies’ predominant form of social media, published letters to the editor describing storage of vaccine scabs and reconstitution of material. One writer claimed:

I was never without a supply of that valuable remedy against one of the most loathsome diseases that flesh is heir to ... I general pitched upon some stout healthy child, whose parents were also of sound constitution — watched narrowly the progress of the pustules ... ; if well formed and shewing all the characteristic marks of genuine cowpox, I have ordered a soft bandage to be applied ... to remain till they had subsided, and hard dry eschars had formed and dropped off, which I immediately put into a phial well corked and sealed. Cowpox matter preserved in this way, will, I am convinced, (from 24 years experience) keep well for at least six months even in this Colony. (Verax, Windsor, 24 Apr, 1839)¹⁵

Similarly,

I took a well-formed scab, after falling off a child’s arm that I had vaccinated, rolled it up in a clean piece of paper, and put it into a well-corked vial. Last week I took the same *scab*, (after it had been in the vial for upwards of six months), made it into a pulp with a little warm water ... and to my great satisfaction it produced the *vaccine pustule* as well defined as if the lymph had been ever so recently procured. (Alex Cook, Surgeon, Parramatta-street, 3 Mar, 1843)¹⁶

In 1818, church and state allied to promote vaccination, and the Governor directed that an address, “framed and recommended by the Jennerian Society”, a royal society formed specifically for the extermination of smallpox, be delivered by clergymen at baptisms.¹⁷ It directed:

... as you value the life of your infant, and the safety of your neighbourhood, you will immediately avail yourselves of the advantage offered to you; for doubly poignant must be your sorrow, if, by neglecting

so to do, your child should perish, or be materially injured by the small pox.¹⁷

Local physicians, military hospitals and colonial medical officers all contributed to vaccination, using material from arm-to-arm inoculations, or obtained from the Jennerian Society or nearby colonies and, according to one doctor, from his own cow. In response to Thompson’s medical report, a Dr Duigan published this public notice:

DOCTOR DUIGAN will ... Vaccinate the children of the Poor, at his residence, Victoria Cottage ... He obtained a valuable supply of genuine vaccine matter from a cow in his possession, and ... is now in possession of the virus as obtained from a most perfect development of the disease in the human subject.¹⁸

In Britain, vaccine production using arm-to-arm transfer predominated from 1798 until 1896, when it was replaced by animal production. Arm-to-arm vaccination was banned in Britain in 1898.¹⁹ Calves had been used for vaccine passage in Italy since the early 1800s, but this practice was not initiated in Britain until 1881.¹⁹ The extent to which animal vaccine production occurred in colonial Sydney is unknown. There was a brief period in the 1840s when “calf-lymph” was used in Britain,²⁰ and Duigan’s advertisement may reflect this practice.

The fervour of government and the medical fraternity in protecting the population against smallpox is undoubted. Outbreaks in Sydney in the 1880s influenced the establishment of a public health authority in New South Wales,²¹ and exploitation of vaccination effectively subdued the disease in many countries.²² However, despite this proactivity, it took 180 years for the World Health Organization to finally declare it to be extinct.²³

Given that vaccine scabs were frequently stored and transported, such biological material is likely to be unearthed occasionally. In 2011, a “Bizarre Bits” exhibition by the Virginia Historical Society contained a smallpox vaccine scab pinned to a letter written in 1876.²⁴ The US Centers for Disease Control and Prevention (CDC), alerted to the potential public health risk, sent staff wearing personal protective equipment to remove the specimen, causing considerable media interest. Earlier, in 2003, an envelope labelled “scabs from vaccination of WB Yarrington’s children” was found inside an 1888 American medical book at the College of Santa Fe’s Fogelson Library.²⁵ The librarian dispatched the envelope, unopened, to the safety of the CDC.

The Sydney vaccine specimen, discovered in the state archives, was sealed between two glass slides, a method of vaccine transport used in the early 1800s.¹⁰ It underwent testing to exclude variola virus using polymerase chain reaction and conditions, primers and controls recommended by the CDC’s Laboratory Response Network. While smallpox vaccine material is presumably less dangerous than smallpox virus itself, uncertainty about the specimens’ contents justifies the extreme caution in their handling.

These historic specimens are valuable. It is widely acknowledged that Jenner lost his original vaccine material and that later sources of vaccine were not cowpox virus.²⁶ Analysis and comparison of vaccine specimens with

provenance closer in time to Jenner's original material may shed light on the vaccine's history.

This episode demonstrates the inescapable serendipity which is part of medical science. Had Jenner not been a country doctor, he may never have had cause to reflect on how milkmaids largely evaded smallpox infection, and the disease may have wreaked havoc for years. Our narrative is not without its own coincidences. The colonial vaccine specimen now resides in a biohazard facility at Westmead Hospital which overlooks the historic Parramatta buildings that were once the Female Factory — home to the convicts from whom the specimen was almost certainly derived. Further, Frank Fenner's death in the same week as the discovery of the specimen serves as a timely reminder of the dedication of those committed to the pursuit of health and the protection of many.

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