

Pasteur, rabbits and Cumberland disease



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Abstract. This article outlines the generally well known story of the attempt by Louis Pasteur to win the significant reward offered by the colonial governments of what would become Australia for biological control of the rabbit plague then infesting the continent. While the Pasteur bid, led by his nephew Adrien Loir, was not awarded the prize, there were significant flow-on benefits for agriculture in the colonies. The major benefit was the production of an effective vaccine for what the colonials called Cumberland disease (now known as anthrax). Loir also developed and/or provided vaccines for bovine pleuropneumonia and blackleg of cattle. Benefits also flowed back to France as the funds from the Cumberland disease vaccine sales to the colonial farmers helped support the newly established Pasteur Institute. The on-going controversy in the colonies and in the early days of the new nation of Australia over the use of a biological control agent (the organism we now know as *Pasteurella multocida*) is covered. This includes how a proposed biological control program using *P. multocida* became part of a class war. Finally, the irony that history continues to repeat itself – Hollywood’s recently most famous dogs (Pistol and Boo) were simply repeating the story line of Star and Chouette - is covered.

The central story

Rabbits were first introduced into Australia with the First Fleet as a food source¹. Rabbits released into the wild from those original stocks had become a problem in Tasmania by late 1820s¹. New introductions into Victoria and South Australia in the 1850s, for recreational hunting and food, added to the developing problem¹. By 1878, the rabbits had crossed the Murray River and

‘steadily and surely overran the western division of New South Wales continued their march northwards till they are now in possession of a considerable area of Queensland, and are still advancing in a north and north-westerly direction towards the Northern Territory and the Gulf of Carpentaria’². In less than three years from 1883 to 1886, the colonial New South Wales Government spent the enormous sum of £435 000 in efforts to exterminate the pest with around 8 million being killed².

The colonial governments of the time recognised the severity of the problem and the failure of the conventional control programs. Following a Rabbit Conference held in 1885, the colonial New South Wales government offered, in 1887, a prize of £25 000 (approximately today’s equivalent of A\$10 000 000) for an effective biological control agent with the judging panel being the Rabbit Commission². The prize drew the attention of Louis Pasteur who had just demonstrated the bacterium (now known as *Pasteurella multocida*) causing chicken cholera (now known as fowl cholera) was able to control a rabbit plague in the Pommeroy estate in which the rabbit burrows were threatening to undermine the famous champagne cellars³.

The Pasteur team, headed by Adrien Loir – the nephew of Pasteur – arrived in Australia in 1888. Henry Parkes, then premier of the colony of New South Wales but soon to be hailed as the ‘Father of the Federation’, supported the Pasteur team and organised for the construction of a Pasteur Institute on Rodd Island in Iron Cove at the western end of Sydney Harbour (Figure 1). The planning of the Institute was a sophisticated approach with the laboratory being supported by a ‘wash room’, a ‘gasometer’ and a ‘crematorium’, the latter three facilities all located at the far end of the laboratory building. Secure animal facilities that included concrete rabbit burrows, stalls to hold cattle and other livestock and an aviary for bird experiments were all constructed. The animal facilities were also covered with insect-proof gauze⁴.

Matters soon deteriorated between the Rabbit Commission appointed supervisor of the work (Dr Katz) and the Pasteur team. Essentially, the Commission wanted evidence that the chicken cholera agent would pose no danger to native animals or domestic livestock and that the agent could spread amongst rabbits under Australian conditions. The Pasteur team insisted that they could only perform the experiments outlined by Pasteur and would only undertake the trials originally planned



Figure 1. Views of Rodd Island (images from NSW National Parks).

by Pasteur. The Pasteur team performed the pre-planned experiments and left the island. Dr Katz obtained the Pasteur culture from the heart blood of an infected rabbit (with the approval of the Pasteur team). He continued to work and reported that the chicken cholera could infect native birds. His work was also cited as evidence of limited rabbit to rabbit transmission, although that claim is doubted⁵. By early 1889, the Rabbit Commission rejected the Pasteur proposal (on the grounds of limited transmission) and by late 1889 had rejected all submitted proposals. Loir and team departed Australia following this rejection.

Cumberland disease (and other diseases)

While working on the rabbit problem, Loir also investigated a disease of cattle and sheep then sweeping the Cumberland district around Leppington. Loir was able to isolate a bacterium (*Bacillus anthracis*), which on the basis of microscopic appearance and the disease caused in experimentally infected rabbits, he confirmed as the same agent as that causing charbon (the French name) or anthrax (the English name)⁶. Loir then produced a vaccine according to the Pasteur method and demonstrated a high level of protection in vaccinated sheep and cattle exposed to an artificial challenge involving the injection of blood from a sheep that had died of Cumberland disease. All 20 sheep and four cattle given the Pasteur vaccine survived the challenge: all 19 control sheep and one of the two control cattle died within 60 hours (Figure 2)⁶. The farmers were convinced of the efficacy of the Pasteur approach and the colonial NSW government asked Loir to produce the vaccine on an on-going basis.

With approval from Pasteur, Loir did return to Australia and the Rodd Island laboratory complex in 1890. Over the following eight years, Loir and his team vaccinated some 3 million sheep and 50 000 cattle against anthrax (<https://www.asap.unimelb.edu.au/bsparcs/exhib/pasteur/pasteur.htm>). As well, Loir worked

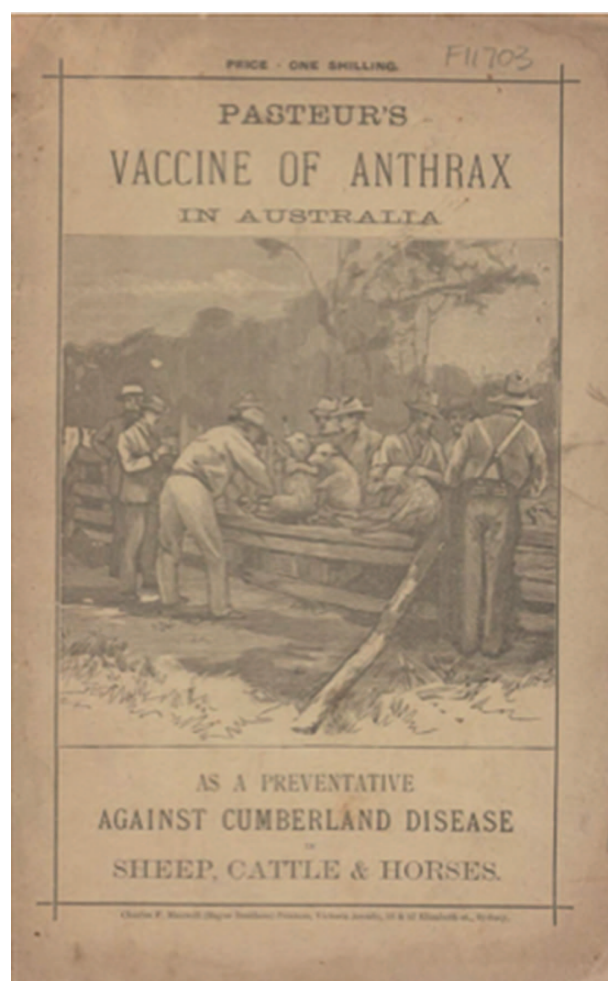


Figure 2. Cover page of the 1891 report by Loir on Pasteur's Anthrax Vaccine.

closely with the colonial government in Queensland and developed a bovine pleuropneumonia vaccine (causative agent – *Mycoplasma pleuropneumoniae*) and introduced the use of the Pasteur blackleg vaccine (causative agent – *Clostridium chauvoei*)⁵. Considerable funds flowed back to France from these activities – some 450 000 francs from the sales of the anthrax vaccine and 250 000 francs from the grateful Queensland government for the work on bovine pleuropneumonia. These returns at least matched the original rabbit control prize,

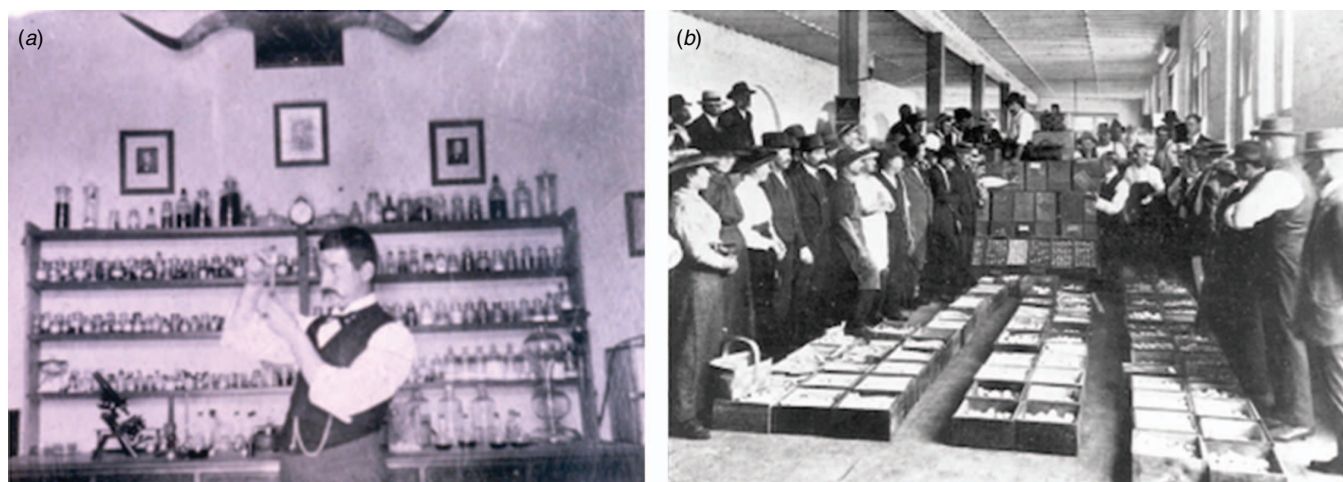


Figure 3. (a) CJ Pound at work in his laboratory at the Stock Institute in Brisbane. (b) CJ Pound talking to farmers about chicken cholera and the possibility of using that disease as a control for the rabbit plague.

although Pasteur himself remained bitter and upset with the colonial New South Wales government⁵. Rodd Island ceased to be a vaccine facility in 1894 and the laboratory and animal facilities were removed. The living quarters of the original Pasteur Institute remain on Rodd Island, which is now a popular NSW National Park.

On-going biological control attempts

While Loir left Australia permanently in 1893 for family reasons (his young French bride never adapted to life on Rodd Island), interest continued in biological control of the rabbit problem. The colonial Queensland government had been so impressed with the work of Loir that they had offered him the Directorship of the first Australian veterinary diagnostic/research institute, the newly established Stock Institute. The offer was declined and CJ Pound was appointed⁷. CJ Pound was an active supporter of the Pasteur proposal for rabbit control (Figure 3). Pound⁸ definitively proved that fowl cholera was present in poultry in Australia, dismissing the belief that fowl cholera was not present in Australia. As well, in trials performed at the Stock Institute and 'large scale natural conditions in open country' (around Thargomindah), Pound showed that 'pollard soaked with half-a-pint of *P. multocida*' can 'infect with certainty at least 1,000 rabbits'⁹. Remarkably, Pound also reported that the bacterium can be 'injected into and taken internally by human beings, horses, cattle, sheep, pigs, or in fact almost any domesticated or wild animals (excluding birds and rabbits), without producing the slightest harm or inconvenience'⁹. While current molecular studies support the possibility of host specificity for *P. multocida*¹⁰, no modern research team would have a chance to confirm the cited findings about avian or leporine isolates of Pound⁹ due to animal and human ethical concerns. Indeed, the

claim by Pound stands in contrast to the fact that until recent times mouse inoculation (via the intra-peritoneal route) was a preferred means of recovering *P. multocida* from a range of contaminated environments¹¹.

Class wars and science

Throughout the work investigating the biological control of rabbits by Loir and others, there was always considerable heated public debate. One of the most unusual of these debates occurred when work was undertaken in 1906 by a Dr Danysz (from the Pasteur Institute) who claimed to have a 'new' rabbit specific strain of *P. multocida* that could not infect other animals¹². Danysz was given facilities on Broughton Island, near Newcastle. While Danysz felt his experiments proved his theory of host specificity, a Government Commission concluded that the work was simply inconclusive¹³.

The public debate on this matter was encouraged when several staff had to be evacuated from Broughton Island because of ill health. While the public debate focussed on the possibility of a laboratory acquired infection, the formal conclusion was that the research team had, embarrassingly for a bacteriology research unit, suffered from 'ptomaine poisoning'¹³. The public debate also focussed on a class war argument¹. In this argument, the work on Broughton Island was characterised as 'the abominable, filthy disease cultivated by Dr Danysz'¹. The argument was that the control of rabbits by disease was 'capitalist-class' action with the working man being denied a means of obtaining cheap food and income, the latter via the sale of rabbit pelts¹. The suggestion was that an export trade of rabbit meat based on 'freezing-houses' in regional areas would ensure a viable income for the working man and control the plague¹.

History repeats itself

Many will remember the saga of Pistol and Boo, two dogs smuggled into Australia by a high-profile Hollywood couple during filming on the Gold Coast¹⁴. However, this was simply an example of history repeating itself. Rodd Island starred as a centre of a quarantine row when Sarah Bernhardt, a French actress who was described as the world's most famous woman, arrived in Sydney in 1891 with two dogs (Star and Chouette) as part of a tour of Australia. Ever the gentleman, Loir offered Rodd Island as a quarantine facility to prevent the forced return of the dogs to France. Bernhardt and Loir developed a relationship that resulted in a cancellation of the Brisbane leg of the tour to allow Bernhardt to spend a week on Rodd Island¹⁴. While the details are now hazy with time, the stories circulating at the time include long nights of celebration on Rodd Island following performances by Bernhardt in Sydney, including champagne parties on the roof of the laboratory!

Conclusion

Biological control of the rabbit plague in Australia remained a dream for many years till myxoma virus was introduced after World War II and supported by the pioneering work of Frank Fenner and colleagues¹⁵.

Conflicts of interest

The author declares no conflicts of interest.

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Biography

Pat Blackall is a bacteriologist working at the Queensland Alliance for Food and Agriculture Innovation at the University of Queensland. Pat has spent most of his career at the Animal Research Institute, the institute that replaced the Stock Institute founded by CJ Pound. Pat has had a long and continuing research interest in *Pasteurella multocida* and the diseases associated with the organism in both domestic livestock as well as Australian native animals.

Presidential viral exchanges

Donald Trump is not the first US President to be involved in a potentially deadly viral exchange with his personal staff. President Abraham Lincoln was struck down with smallpox hours after delivering his Gettysburg address on 19 November 1893. His famous, albeit very short speech, was given during the American Civil war at the dedication of the Soldiers National Cemetery in Gettysburg Pennsylvania, 4.5 months after the defeat of the Confederate armies by those of the Union. Smallpox was spreading rapidly through Washington at the time.

Bedridden with head and neck pain, Lincoln was cared for by his body man or valet, William H Johnson, a black man from Illinois, whose main task was to hold a cold towel to Lincoln's head. Lincoln recovered in a few weeks but Johnson did not - he died the following January. The president did not think he had infected Johnson, but subsequent historians believe he did. Whatever the case, the president ensured his loyal carer's debts were paid, his family provided for, and that he was buried in Arlington National Cemetery in Section 32, alongside the 1500 US Coloured Troops who fought for the Union.

In 1980 the WHO declared smallpox eradicated, solely through vaccination.