Camille Guérin: the 'G' in BCG

When I was a house surgeon at the Radcliffe Infirmary, Oxford, in 1948, tuberculosis was endemic in this country. On my wards I was very familiar with tuberculosis of the kidney, bladder and epididymis and with tuberculous glands of the neck. On my orthopaedic rotation, I saw many patients with tuberculosis of the spine, hip and other major joints. Until a year or two before tuberculous meningitis had a 100% mortality rate and the sanatoria were full of patients with pulmonary disease. We expected that one or two of each year's entry of medical students and nurses would end up in our local sanatorium, the Osier Pavilion, with either an apical lung lesion or a pleural effusion.

At least effective treatment was now available – we had streptomycin, introduced by Salman Waxman (who would gain the Nobel Prize in 1952), soon to be supplemented with para-aminosalicylic acid and isoniazid, and we were soon to see the introduction of bacille Calmette–Guérin (BCG) vaccination in this country.

Now today most laymen are familiar with the term BCG, and I expect most doctors can tell you that this stands for 'bacille Calmette–Guérin', but how many know much about these two pioneers? This year marks the 50th anniversary of the death, at the age of 89 years, of the second of them, Camille Guérin.

Camille was born in Poitiers, France, in 1872. His father, a public works contractor, died when Camille was aged 10 years. His mother married a veterinary surgeon and this shaped Guérin's future career, because he entered the École National of veterinary medicine in 1892 and qualified 4 years later. The next year, 1897, at the age of 24 years, he was recruited by Calmette, who required a veterinarian to help him with his snake antiserum work in Lille.

Albert Calmette (1863–1933) trained in medicine at the French naval medical school, studied bacteriology at the Pasteur Institute and in 1891 was sent to Saigon, in what was then French Indo-China (now Vietnam), to open a new vaccine institution. After a couple of years, Calmette returned to Paris to continue his work on the production of an anti-cobra venom serum by means of attenuating the venom.

In 1895 Calmette was promoted to found the Pasteur Institute in Lille. Here he had two principal tasks: to produce anti-diphtheria serum in horses and to continue his work on the anti-cobra venom serum. Serendipitously, 2 years later he recruited Guérin to join him for what was to prove a lifetime of research collaboration.

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The mycobacterium of tuberculosis had been discovered by Robert Koch in 1882. In 1906, Calmette and Guérin showed that bovine tuberculosis could be spread by the oral route in goats and cattle, and set out to see whether successive transfer of the organism could produce an attenuated strain that could be used for effective immunization; this occupied the next 15 years of their research. Eventually a non-pathogenic strain of the bacterium was obtained, which remained antigenic and which would protect cattle from a virulent dose of the mycobacterium.

Meantime Guérin had to bear the death of his wife in 1914, leaving him with a young family. Moreover, Lille was occupied in 1915 by the invading German army and his work at the Pasteur Institute had to be continued, during World War 1, under conditions of great difficulty. He was accused by the Germans of being a spy and using pigeons to transmit information to the Allies. Only a post-mortem on one of the pigeons, which confirmed that it was riddled with tuberculosis, could convince the German authorities that the birds were used purely for research purposes.

By 1921 an attenuated live bacillus, which was later named bacille Calmette–Guérin, had been prepared by making over 200 sub-cultures of the organism; this was safe to a wide range of animals. Newly born calves and young animals including monkeys given the vaccine were protected from a virulent strain lethal to controls.

In 1922, oral BCG started to be given to infants in at-risk families. By 1926, 5183 babies had been vaccinated with a mortality rate of 2%, while the expected death rate in infants born of mothers with tuberculosis or raised in an infected family was in the order of 25%. Later trials in New York and in Scandinavia were encouraging, but in the UK the value of BCG was a highly controversial subject. The statistics of the French study were criticized and there was the fear that the live organism might revert to its virulent form. In 1930, 72 infants in Lubeck, Germany died of tuberculosis from a locally produced BCG. A couple of years later, this tragedy was traced to contamination of the vaccine by a virulent human strain being studied in the same laboratory.

In 1948, at an international conference on BCG in Paris, it was reported that some 10 million people, mostly children, had been vaccinated worldwide. Scandinavian countries, with enthusiastic schemes, reported no deaths from tuberculous meningitis, compared with 1800 yearly deaths, and rising, in the UK. Following Medical Research Council trials, by 1954 BCG vaccination of schoolchildren by the intradermal route was adopted in this country. Nowadays, with the general low incidence of the disease, it is mostly used in areas of high immigration in children soon after birth as it is particularly effective in the prevention of tuberculous meningitis and miliary disease.

Calmette died in 1933, at the age of 70 years. Camille Guérin died on 9 June 1961, at the age of 89 years. Since the time of World War 2 he had lived in a small room in the Pasteur Institute in Paris. In 1958 he had been appointed a Grand Officer of the Legion of Honour. BJHM

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