Edwin Klebs: discoverer of the bacillus of diphtheria

This year marks the 100th anniversary of the death of Edwin Klebs, a distinguished bacteriologist and pathologist, who died in 1913. Despite having many achievements in a remarkably wide range of pathologies, he is best remembered today as the discoverer of the causative organism of diphtheria, perpetuated by its eponymous name, the Klebs–Loeffler bacillus.

Few, if any, of the readers of this article are likely to have seen a patient with diphtheria. As a clinical student at the Radcliffe Infirmary in Oxford in 1947, I was told to go along to the Slade Isolation Hospital as quickly as possible with my fellow students to see a patient with the typical diphtheritic membrane in his throat as this was likely the last chance we would have of seeing such a case – and it was.

Diphtheria is spread by airborne droplet infection. The human being is the only natural host of the Gram-positive aerobic bacillus, the *Corynebacterium diphtheriae*.

The disease has an incubation period of 2–7 days. The onset is insidious with tachycardia and a low-grade fever. Then a marked tonsillar and pharyngeal inflammation takes place with the formation of a greyish yellow membrane made up of fibrin, epithelial cells and bacteria. This may extend into the nose and larynx with cough, dyspnoea and cyanosis. Many lives were saved in former times by the surgeon or GP performing an emergency tracheostomy or laryngeal intubation on an asphyxiating child. In addition to these local effects, the organism produces an exotoxin, which may cause myocarditis (usually fatal) around the tenth day or later neurological involvement with cranial palsies and neuropathy.

Thanks to the immunization programme in infancy, the disease is now extremely rare in this country, but it is still seen where childhood immunization is not widespread.

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Edwin Klebs was born in Koningsberg in East Prussia in 1834. After studying under Rudolf Virchow, regarded as a founder of modern cellular pathology, when he was Professor of Pathology in Würzburg, he became Virchow's assistant. When Virchow became the foundation Professor of Pathology in Berlin in 1861, Klebs moved with him. From Berlin, Klebs was appointed Professor of Pathology at Berne in Switzerland in 1866. His academic career became peripatetic – he held, in succession, chairs of pathology at Wurzburg, Prague and Zurich and then worked in Carlsruhe, Chicago at Rush Medical College, Hanover, Berlin and Luasanne. He produced two massive textbooks of pathology in 1869 and 1887, which became standard works of the time and contained many original observations. He trained numerous eminent pathologists from America, Japan and Europe, including England.

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Klebs had a restless but brilliant mind. He is remembered today for his description of the bacillus of diphtheria in 1883. His other investigations include his observation of the typhoid bacillus before its full description by Carl Eberth in 1880. He devised solid culture plates for bacteria before their widespread use by Robert Koch. His experimental study of the contagion of syphilis in 1878 contains colour plates showing inoculations of monkeys with syphilitic material, which preceded the better known studies of Elie Metchnikoff and Emile Roux by many years. He experimented on the production of tuberculosis by feeding animals with infected milk (1873) and investigated the bacteriology of gunshot wounds during the Franco-Prussian war of 1870.

It may be wondered why the work of such a brilliant investigator today is all but forgotten. Apart from his work in morbid anatomy, which lead to his, at the time, well-known textbooks, he completed none of his other fields of investigation. He would pick up a topic that interested him, make fascinating original observations, which often preceded other workers by many years, and like a butterfly, he would flit to another interesting area of study. Unlike his teacher, Virchow, who stressed the importance of the autopsy, Klebs emphasized the fact that the postmortem findings, after all, are only the end results of the disease and that the true causation of infectious diseases is to be sought in the study of parasitic agents coming from the outside world. It is true that he was sometimes completely led astray; for example, in his monograph on endemic cretinism in Austria, published in 1877, he ascribed a completely unjustified aetiological role to micro-organisms.

Edwin Klebs died at his home in Berne, Switzerland on 23 October 1913 at the age of 79 years.

And what of Friedrich Loeffler, the bacteriologist whose name is paired with that of Klebs? Loeffler was born in Frankfurt, Germany in 1852. After serving in the Franco-Prussian war of 1870, he qualified in medicine in Berlin in 1874 and worked as assistant to Robert Koch from 1879 to 1884. He was then appointed to the staff of the Kaiser Friedrich Wilhelm Institute in Berlin in 1888, became professor of pathology at the University of Greifswald and then Director of the Institute for Infectious Diseases in Berlin. He introduced many technical advances into bacteriology and recognized that the virus of foot and mouth disease was filterable. He developed the use of coagulated blood serum for bacterial culture and was able to culture the corynebacterium of diphtheria in 1884, the year after its description by Klebs, hence the Klebs–Loeffler bacillus.

Loeffler died in Berlin in 1915. **BJHM**

Conflict of interest: none.

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