Louis Pasteur and Rabies: a brief note

The almost universal fatality in victims of untreated human rabies surrounds the disease with understandable terror. The word comes from the Latin rabere to rage or rave. It was known as canine madness, or hydrophobia, a terrifying disease of dogs.

Hydrophobia presents as a "hydrophobic" or "spastic" form and a "trembling" or "paralytic" (rabies without hydrophobia) form, the latter with an ascending progression of bulbar, respiratory, and encephalitic symptoms. The history of dog bite is often unclear if it has occurred some months earlier. Symptoms usually develop, however, 10 to 50 days after exposure; death ensues within about 10 days. In Great Britain rigid quarantine laws on importation of all livestock led to its virtual eradication.

In 1804, Georg Gottfried Zinke first transmitted rabies from a rabid dog to a normal one, and from dog to a rabid and a hen, by injection of saliva. This proved that the disease was infectious. By 1826, Franz Christian Karl Krugelstein (1779–1864) wrote a full account of rabies, with a bibliography of 300 items. However, virulence was serially increased by passing rabid saliva intravenously. This did not produce the disease but interestingly, produced virulent saliva.

Pasteur showed that specific microorganisms or ferments were in the air, a word comes from the Latin fermentum, or brewhouse, meaning a ferment or a putrefaction. The (invisible) germs or ferments were in the air; the virulence gradually diminished with time. Thus, Pasteur produced an attenuated vaccine, and successfully immunised 50 inoculated dogs.

On Monday 6 July 1885, Joseph Meister, aged nine, was brought to him from Alsace having been bitten by a rabid dog on 4 July. With some reluctance, Pasteur was persuaded by Drs Vulpian and Grancher of the Académie de Médecine to give Dr Grancher the suspension from the cord of a rabid dog that had died of rabies on 21 June, and had been kept in dry air for 15 days. The child was given 13 further inoculations in 10 days with portions of the cord that were progressively fresher (more virulent), until after three months and three days he announced that the child's life was now out of danger and his health appeared excellent. On 20 October, he successfully treated another patient infected by a mad dog six days earlier. By 1886, he had treated 350 patients from all over Europe, Russia, and America.

This is considered his greatest triumph. Microscopic diagnosis was later made possible by Aldeche Negri's discovery of the Negri body (1903–5). Fermi used phenol treatment of rabid tissue to prepare the Fermi vaccine in 1908. Webster and Clow first grew the virus in tissue culture in 1936, which led to human tissue culture vaccine, diploid cell vaccine in 1978.

A French chemist, Louis Pasteur (1822–95), was often called the founder of microbiology. In 1863, the Emperor Napoleon III instructed him to investigate diseases affecting wines. He successfully investigated pébrine and flacherie, diseases of silkworms in the 1860s and by enforcing isolation of infected silkworms controlled the illness that was destroying silk production.

His early studies on fermentation that showed that yeast acts as microorganisms that convert sugar into alcohol and not as chemical enzymes, as was believed by Liebig and others. He also claimed a specific ferment that soured milk. Just as a specific microorganism, or "germ" causes each type of fermentation, many diseases are also caused by specific ferments (Memoire sur la fermentation appelée la pébrine, 1858). Fermentation resembled the observed putrefaction of wounds. The (invisible) germs or ferments were in the air, a notion that caused disdain amongst critics of his germ theory of disease. His proof that diseases could be caused by "germs" was a novel and major discovery.

Pasteur showed that the virulence of infected blood was dependent on temperature and oxygen, so that blood with their high body temperature resisted inoculation with anthrax. Following Koch's work on anthrax spores in 1876, Pasteur established that a culture grown at high temperature was less virulent and induced only a mild illness in sheep: an attenuated "anthrax vaccine". This was akin to Edward Jenner's vaccination with cowpox to immunise against smallpox.

In 1854, he became professor of chemistry and was elected as a member of the French Academy of Medicine, a singular honour. The University of Bonn conferred the MD, honoris causa in 1868, which he returned in 1871. In his own time, Pasteur achieved great celebrity, culminating in a public subscription of two and a half million francs that made feasible the creation of the Pasteur Institute, in Paris. Despite a stroke at the age of 46, he continued researches undaunted until 1888. He died on 28 September 1895 at Garches, Seine-et-Oise.

JMS Pearce
304 Beverley Road, Anlaby, Hull HU10 7BG, UK; JMS Pearce@freenet.co.uk