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History of vaccinations

Further reading

In the second half of the 19th century, the bacteria causing infectious diseases were discovered at a fast pace. You'll find below the history on the discovery of the vaccines against the two diseases diphteria and tuberculosis.

Diphteria

In 1890, vaccines for diphteria (and tetanus) were developed in the laboratory of Koch by Shibasaburo Kitasato (1852-1931) and Emil von Behring (1854-1917). They produced an 'antiserum' in animals, which could be injected or infused into patients. With this new approach, the lives of many children were saved. Behring was awarded the first Nobel Prize in Medicine for his achievements in 1901. However, the other side of the medal of 'antitoxins' soon became apparent: the transfer of other diseases due to insufficiently purified vaccines, the lack of an effect because the doses were not standardized, and finally, the appearing of unexpected symptoms and reactions in repeatedly treated individuals. It was suspected that the immune system did contribute to these unpredictable reactions, although the mechanisms were unknown. In 1896, Robert Langerhans (1859-1904) a well-known pathologist in Berlin, injected diphteria antitoxin to his 2 years old child for prophylaxis. Within seven minutes, the child died in front of the eyes of his helpless father. Within 15 years, another 41 deaths were reported from such antiserum injections – but many more lives were saved. Indeed, animal-derived antitoxins commonly induced side effects such as serum sickness and allergic reactions including anaphylaxis. Serum sickness has become a rare disease, because less and less animal-derived antibodies were used.

Tuberculosis

In other diseases – including tuberculosis – the attempts to develop vaccines were less successful. Emil von Behring tried to apply methods developed in the study of diphtheria as he was looking for a tuberculosis antitoxin. This search was fruitless because *Mycobacterium tuberculosis* causes symptoms by directly reproducing and inducing tubercles in many different organs and not by excretion of a single toxin. Therefore, antibodies are ineffective and specific T cells or macrophages are needed to detain or eradicate the disease. The French researcher Albert Calmette (1863-1933) and Jean-Marie Camille Guérin (1872-1961) used an animal strain of tuberculosis, *Mycobacterium bovis*, which they isolated from the milk of infected cows. They started to attenuate – that means to weaken – this bacteria strain (that it would not be able to elicit the disease in a guinea pig anymore). A bacterium causing the disease in cattles was used for this purpose. They called the attenuated strain Bacille (bacterium) Calmette- Guérin, or short BCG. More than 10 years later, in 1921 only, they were able to start their first successful human trials. Until today, BCG is the only effective protective vaccine to prevent severe tuberculosis.