ISSN:2249-5347
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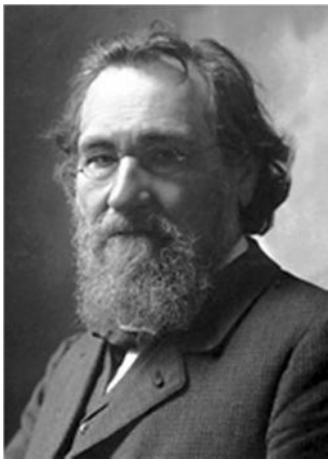
International Journal of Science Innovations and Discoveries
An International peer Review Journal for Science

Nobel Prize in Medicine 1908



Ilya Ilyich Mechnikov

Paul Ehrlich

The Nobel Prize in Physiology or Medicine 1908 was awarded jointly to Ilya Ilyich Mechnikov and Paul Ehrlich *"in recognition of their work on immunity"*

RESEARCH INFORMATION:

Some time ago in this place a short description was given of the development of medicine. In it it was emphasized that medical science today has set itself the task of attempting to prevent disease. In order to achieve this aim one must attempt, on the one hand to find the disease germ and destroy it, and on the other hand to give the body the strength to resist attack. As regards the latter, the possibility of obtaining protection against certain diseases has long been known, for the observation has been made that in many cases organisms which have gone through an infectious disease will acquire protection against being attacked by the same disease again. We then say that the organism has acquired immunity against the disease in question.

In scientific development, however, there is a very big step between this observation and a real knowledge of the changes which have taken place in the organism through immunization, and it is also a very big step from the same observation to the ability, consciously and without the danger attendant upon the course of the illness, to give

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the organism such powers of resistance. It was, therefore, rightly considered to be an epoch-making and blessed moment in the history of medicine when Edward Jenner introduced, more than a hundred years ago, protective vaccination with cow-pox substance which can give immunity against a disease, namely smallpox, the ravages of which the present generation can hardly imagine. Great though the practical importance of Jenner's discovery was, it did not advance the development of the study of immunity in respect of other diseases or permit of any deep penetration into the problem of immunity generally. The prerequisites for a successful scientific elaboration of the study of immunity were still missing. The first and most important condition for making the problem of immunity the subject of real scientific research was namely to establish the cause of disease. It was the revolutionary work of Pasteur and Koch which was done during approximately three quarters of a century after Jenner's discovery which laid the necessary foundation for the present important development of the study of immunity. Elie Metchnikoff was the first to take up consciously and purposefully, by means of experiments, the study of the question so fundamental to the question of immunity; by what means does the organism vanquish the disease-bearing microbes attacking the organism in which they have succeeded in establishing themselves and developing? At first his experiments were restricted to the lower animals. This was the case in his important work concerning a kind of infection in certain microscopic aquatic animals, the so-called water fleas. If the guiding principles behind these investigations were not known they could appear to be remote from any medical interest. They were, however, the first links in a chain of investigations leading to phenomena of immunity, also in mammals and in humans. These investigations opened the way for Metchnikoff's theory of phagocytosis. According to this theory, the microorganisms are destroyed by the activity of cells in the organism. Certain kinds of cells in the bodies of humans and animals, namely, are supposed to have, in addition to other functions, the task of catching and destroying disease-producing microbes which have succeeded in penetrating the organism, and also of rendering certain bacterial poisons harmless.

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I cannot here give a report on the comprehensive work and valuable observations which go to make up this theory of phagocytosis. But an important aspect of this research is that it makes a special study of certain types of cells, and that first of all the importance of the cells for the phenomena of immunity is emphasized. One can safely predict that even if other features are of more immediate importance in this doctrine, nevertheless the abundant actual observations which have been made with regard to the importance of the cells to the problem of immunity will always remain of great and permanent value. In the doctrine of immunity, as in other provinces of biology, the activity of the cells, which are considered as being the focus of organic life, remains a factor of the highest importance. The research of recent years into the question of immunity has thrown the importance of Metchnikoff's work into strong relief. As a recognition of Metchnikoff's accomplishment in initiating modern research into the question of immunity, the direction and development of which, particularly in its early stages, he profoundly influenced, the Caroline Institute wishes to honour him with this year's Nobel Prize.

Like other biological processes, the phenomena of immunity are of a very complicated nature and provide a field of research of almost unlimited extent. It is obvious, therefore, that this field can be approached from various directions. Recently other comprehensive and equally successful research into immunity has been conducted, only certain parts of which touch upon the theory of phagocytosis. I will attempt to explain this in a few words.

It has been shown that protection against disease can be of two kinds. It can consist in the ability to destroy microbes or to inhibit their further development. This is a bacteria-destroying immunity. But there is also a protection of another kind, one which acts against the bacteria products. The damage which the disease-producing microorganisms cause, namely, is conditioned by the poisons which these organisms produce and which are distributed by the body fluids. A certain kind of immunity occurs against this danger as well, namely the so-called poison immunity. The best known example of this is the use of anti-diphtheria serum, when, through serum injection, substances are introduced into the

organism which act as antitoxins against the diphtheria poison. It has been discovered that poisons which are produced by bacteria have the property, as have many other substances also, of causing the production of elements in the organism which have an antagonistic effect especially and exclusively directed against the substance which caused the production of the elements. This we call the formation of antibodies. After immunity has been achieved, such antibodies are found in the humors of the organism. Furthermore, it has been possible to show that these antibodies are of great importance, not only as regards protection against disease-producing microorganisms themselves, but also, above all, as regards protection against the toxic products of these organisms.

An endless series of questions now arises: Why are antibodies only built up against some substances and not against all substances which are foreign to the organism? Where are the antibodies formed? By what process are they formed? What is the nature and constitution of these antibodies? How do they react on the microorganisms and their poisons? And various other questions which are important as regards the development and practical utilization of the theory of immunity. It is also a matter of great interest that connecting links have been found between the theory of immunity and the normal physiological processes.

A great deal of intensive and very fruitful work has been devoted to these questions in the last one and a half decades. A large number of research scientists have served the cause of science well by their discoveries and achievements. It is not possible here to report on the extent to which the questions have been answered, neither is it possible to describe the separate accomplishments of individual scientists in this field.

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