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IMMUNIZATION (VACCINATION)

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Immunization, or immunisation, is the process by which an individual's immune system becomes fortified against an agent (known as the immunogen).

When this system is exposed to molecules that are foreign to the body, called non-self, it will orchestrate an immune response, and it will also develop the ability to quickly respond to a subsequent encounter because of immunological memory. This is a function of the adaptive immune system. Therefore, by exposing an animal to an immunogen in a controlled way, its body can learn to protect itself: this is called active immunization.

The most important elements of the immune system that are improved by immunization are the T cells, B cells, and the antibodies B cells produce. Memory B cells and memory T cells are responsible for a swift response to a second encounter with a foreign molecule. Passive immunization is direct introduction of these elements into the body, instead of production of these elements by the body itself.

Immunization is done through various techniques, most commonly vaccination. Vaccines against microorganisms that cause diseases can prepare the body's immune system, thus helping to fight or prevent an infection. The fact that mutations can cause cancer cells to produce proteins or other molecules that are known to the body forms the theoretical basis for therapeutic cancer vaccines. Other molecules can be used for immunization as well, for example in experimental vaccines against nicotine (NicVAX) or the hormone ghrelin in experiments to create an obesity vaccine

Passive and active immunization

Immunization can be achieved in an active or passive manner: vaccination is an active form of immunization.

Active immunization: Active immunity

Active immunization can occur naturally when a person comes in contact with, for example, a microbe. The immune system will eventually create antibodies and other defenses against the microbe. The next time, the immune response against this microbe can be very efficient; this is the case in many of the childhood infections that a person only contracts once, but then is immune.

Artificial active immunization is where the microbe, or parts of it, are injected into the person before they are able to take it in naturally. If whole microbes are used, they are pre-treated.

The importance of immunization is so great that the American Centers for Disease Control and Prevention has named it one of the "Ten Great Public Health Achievements in the 20th Century".[5] Live attenuated vaccines have decreased pathogenicity. Their effectiveness depends on the immune systems ability to replicate and elicits a response similar to natural infection. It is usually effective with a single dose. Examples of live, attenuated vaccines include measles, mumps, rubella, MMR, yellow fever, varicella, rotavirus, and influenza (LAIV).

Passive immunization: Passive immunity

Passive immunization is where pre-synthesized elements of the immune system are transferred to a person so that the body does not need to produce these elements itself. Currently, antibodies can be used for passive immunization. This method of immunization begins to work very quickly, but it is short lasting, because the antibodies are naturally broken down, and if there are no B cells to produce more antibodies, they will disappear.

Passive immunization occurs physiologically, when antibodies are transferred from mother to fetus during pregnancy, to protect the fetus before and shortly after birth.

Artificial passive immunization is normally administered by injection and is used if there has been a recent outbreak of a particular disease or as an emergency treatment for toxicity, as in for tetanus. The antibodies can be produced in animals, called "serum therapy," although there is a high chance of anaphylactic shock because of immunity against animal serum itself. Thus, humanized antibodies produced in vitro by cell culture are used instead if available.

Socially Optimal Outcome

Having private marginal benefits lower than social marginal benefits will always lead to an under-consumption of any good. The size of the disparity is determined by the value that society places on each different immunization. Many times, immunizations do not reach a socially optimum quantity high enough to eradicate the antigen.

Internalizing the Externality

In order to internalize the positive externality imposed by immunizations payments equal to the marginal benefit must be made. Outside of government intervention through subsidies, non profit organizations can also move a society towards the socially optimal outcome by providing free immunizations to developing regions.

THANK YOU