

Immune System And Vaccines Against Invading Pathogens

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Introduction

All living bodies are tailored to attack or get infected by disease- or infection-causing agents called pathogens, which are either viruses or bacteria. However, multicellular living things have a dedicated system to recognize, destroy, and stop those disease-causing agents from spreading diseases and infections. This system is known as the Immune System. (Delves, 2000) Sometimes, an immune response is slower and cannot quickly contain the infecting agent. Hence, the body is subject to being tailored to the pathogens. Therefore, the vaccination process is used for the survival of human beings in a world potentially full of dangerous invaders. This paper provides a primer on how the body responds to deadly pathogens after the vaccine and how the immune system utilizes our immune processes, including the cardiovascular and lymphatic systems, to defend the host human body against the threats of potential microbes.

How the Body Responds to Vaccine

The human body, after the vaccine, trains the immune system to recognize the certain molecules called antigens that are present in pathogens, either bacteria or viruses, to trigger an immune response. The human body gets injected with the antigens through a vaccine, which makes the immune system recognize and combat the invading pathogens and produce antibodies in return. If pathogens reappear, antigen-specific antibodies always recognize them, and antigens aggressively attack and destroy the hostile invaders before they dare to spread the disease in the human body.

Human Interconnected Systems to Combat Pathogens

The human body has numerous interconnected systems that work in coordination to balance the health of every human. Some may think that cells and tissues work opposite to each other or that the immune system is different from the human circulatory system. In the parallel universe, if this happened and every system worked in its own manner, the human body would not function properly. (Delves, 2000) The main immune response systems that work together to defend the body against pathogens are the cardiovascular and lymphatic systems.

Cardiovascular System

The immune system relies on the circulatory system as it carries immune cells with arteries and blood vessels to their destinations so that these cells can fight off pathogens that are causing threats to human health. For instance, the job of white blood cells is to fight off the microbes that enter the human body. (Miller, 2017) In this regard, the circulatory system plays its role as it circulates white blood cells along with red blood cells to ensure that they reach every part of the body. Therefore, in order to keep the immune system of the body at its best, it is also necessary to balance the circulatory system.

Lymphatic System

The circulatory system offers defence in the form of the lymphatic system, which consists of lymphocytes, which are immune cells that defend the body against microbial invaders. Lymph cells contain lymph fluid, which is a type of white blood cell that is formed when interstitial fluid enters the lymphatic vessels. These vessels then transport the APCs, which are called Antigen antigen-presenting cells, to lymph nodes. At this point, the immune response is stimulated to remove debris from cells and tissues and to combat deadly microorganisms. (Cueni, 2008)

In short, the lymphatic and cardiovascular systems, along with the immune system, comprise a conduit of lymphatic vessels that play an integral part in circulating antigens and antibodies through white blood cells in the whole body, which help combat pathogens.

Cells Functioning in Innate Immune System vs. Adaptive Immune System

The innate immune system is essentially a defence mechanism that activates immediately and reacts accordingly once a microorganism attacks. This barrier contains secretions such as mucous, saliva, gastric acid, and bile that aim to keep the foreign particles away from the body. Leukocytes, or white blood cells, are the major keys to patrolling the body against invading pathogens. The following are the essential cells in leukocytes that comprise the innate immune system:

Phagocytic Cells

They are “eating cells”, as their key role is to locate the potential threat in the body and engulf that at the site.

Mast Cells

Mast cells are present in connective tissues, which provide an inflammatory immune response to wound healing. They release histamine and cytokines that dilate blood vessels and increase the blood flow to the area of attack or infection. Cytokines act as messenger services to alert the immune cells against circulating threats.

Macrophages

This type is an efficient phagocytic cell that roams outside of the walls of capillary vessels to hunt potential invaders. Macrophages release cytokines to recruit other types of leukocytes in the area where pathogens attack.

Neutrophils

Neutrophils are the type of white blood cells and phagocytic cells that arrive first at the injection site. They contain toxic granules, which cause bacteria and fungi to die on contact.

Contrary to the innate immune system, the second line of immune defence response is the Adaptive Immune System, which is only found in vertebrates. In this line of defence, clonal expansion of lymphocytes, such as an increase of T cells and B cells (lymphocytes) originate, which fight the microbial invaders. (Miller, 2017) In summary, the innate immune response is immediate, whereas the adaptive response is not, and sometimes attacks its own cells by error, which results in an autoimmune disease called Lupus [Rheumatoid Arthritis](#).

Consequences of MMR Vaccine If Injected to an Infected Person

MMR vaccine is licensed to protect against four deadly diseases, namely mumps, measles, and rubella, in children of 12 months to 12 years of age. This vaccine is usually very safe, but for some people who are already allergic, it can have some small risks. Consequences after administering MMR vaccine to an infected person may include:

- Mild rash
- Soreness of the body part where the vaccine shot is given
- Swollen neck glands or sore throat
- Fever (Day, 2006)

However, the risk of three deadly diseases, Measles, Mumps, and Rubella, would be combated

through this vaccine, and therefore, a person can avoid serious complications beforehand.

Conclusion

All living organisms are connected in a complex network of systems and their significant relationships. In their everyday interactions in and outside of the world, humans encounter certain deadly microbial invaders called “pathogens”, which cause serious diseases. However, our innate system keeps us still able to live our lives and function correctly in routine and saves us from constantly being sick. This is because of the multilayered immune system, and if it weakens, Vaccines provide an immediate immune response that keeps the body’s functions running smoothly.

References

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