



Discussion on the Concept of Immunity and How Human Body System Could Build Immunity against COVID 19 and It Relevance to Public Health Education

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Authors' contributions

This work was carried out in collaboration among all authors. Author AO designed the study and did the literature review with authors JOD and ONM. Authors NAO and PT wrote the protocol and wrote the first draft of the Manuscript. Authors JAD and AO edited the Manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The aim of this article is to explain different types of immunity and discuss how the human body could build immunity against COVID 19. This would also serve as a guide for public health education on immunity in this era of COVID 19 pandemic.

Keywords: *Immunity; public health; COVID 19.*

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1. INTRODUCTION

Every second of day, an enemy of aggressive pathogens (disease causing organisms) such as bacteria, fungi, and viruses crowd on our skin and we stay remarkable healthy most of the time. The body seems to have evolved a single-minded approach to such rivals- if you are not with us, you are against us. To implement that stance, it relies heavily on the two intrinsic defense systems and that act both independently and cooperatively to provide resistance or immunity against disease causing pathogens [1].

The above introduction therefore suggest that one's immune system is very vital to fight the new COVID 19 pandemic. The discussion in this article seek to explain types of immunity and their application to fight COVID 19.

2. IMMUNITY

Immunity is defined as the body's own ability to destroy pathogens or other foreign material and to prevent further cases of certain infectious diseases. This ability is of vital importance because the body is exposed to pathogens from the moment of birth. Immunity therefore means being protected from something and being unaffected or not bothered by it. Let's say you have immunity to heat - this means heat can't bother you whatsoever - walking up to hot molten lava (about 2,000 degrees F!) would be no different than walking up to a river. Our immune system protects us and helps fight off disease causing microorganisms such as virus, bacteria, fungi and others [2]. Immunity has two main components: innate immunity and adaptive immunity [3].

2.1 Innate Immunity

Innate immunity may be called nonspecific, does not create memory, and its responses are always the same irrespective of the target. The innate immune system consist of structures that defend body against infections and could be activated immediately pathogens invade the body [4]. The innate immune system is essentially made up of barriers that aim to keep viruses, bacteria, parasites, and other foreign particles out of your body or limit their ability to spread and travel throughout the body. The innate immune system consist of:

2.1.1 Physical barriers

Physical barriers that prevent entry of pathogens such as intact skin, intact the gastrointestinal tract, the intact respiratory tract including nasopharynx and cilia, eyelashes and other body hair [5].

2.1.2 Defense mechanisms

Defense mechanisms such as various secretions, mucous, bile, gastric acid, saliva, tears, and sweat.

2.1.3 General immune

General IMMUNE Responses such as inflammation, complement, and non-specific cellular responses. The inflammatory response vigorously brings immune cells to the location of an infection by increasing blood flow to the area [6].

2.1.4 Complement

Complement system is an immune response that marks pathogens for them to be destroyed and makes holes in the cell membrane of the pathogen.

The innate immune system is always general, or *nonspecific*, meaning anything that is identified as foreign or *non-self* is a target for the innate immune response. The innate immune system is stimulated by the existence of antigens and their chemical properties [3].

The innate immunity is very effective against all kinds of infections including viruses such as COVID 19. Thus people with very strong and efficient innate immune system could therefore withstand the COVID 19 infection and this explain why the young are not normally dying from the COVID 19 infection as compare to the aged. This is because the innate immune system deteriorate with ageing especially among those with comorbidity. The reason there is high morbidity and mortality with COVID 19 among the aged with comorbidity [6]. In addition to the above, the preventive measure such as face masks combined with other preventive measures, such as frequent hand-washing and social distancing, help slow the spread of the virus because they actually enforce the physical barrier provided by innate immunity [7]. Again the preventive measures help to stop the spread of the infection through people coming into contact

with defense secretion like mucus, saliva, tears, and sweat that may be used as vehicle to spread the COVID 19 from person to person.

2.2 Adaptive Immunity

Adaptive immunity is very specific as to its target, may involve antibodies, does create memory, and may become more efficient. Unlike the innate immune system, the adaptive immune system depend on fewer types of cells to carry out its responsibilities: *B cells* and *T cells*. Both B cells and T cells are lymphocytes that are produced from specific types of stem cells, called hematopoietic stem cells or tissues, in the red bone marrow. After they are production in the bone marrow, they need to mature and become stimulated [3].

When activated during an immune response, some B cells will divide many times and become plasma cells that produce antibodies to a specific foreign antigen. The mechanisms of immunity that involve T cells and B cells are specific, meaning that one foreign antigen is the target each time a mechanism is activated.

Have you ever wondered how your recovery time for the common cold, the flu, or small infections seems to get shorter after you've been exposed and successfully recovered the first time? The adaptive immune system, also called acquired immunity, uses specific antigens to strategically mount an immune response. Unlike the innate immune system, which attacks only based on the identification of general threats, the adaptive immunity is activated by exposure to pathogens, and uses an immunological memory to learn about the threat and enhance the immune response accordingly. The adaptive immune response is much slower to respond to threats and infections than the innate immune response, which is primed and ready to fight at all times [8].

The adaptive immune system is exactly that - it's adaptive, meaning it can adapt to a specific threat, or antigen. For example, if the opposing team brings in a substitute, the entire team can adapt to that new substitute's unique threat. However, the adaptive immune system takes time to develop; there's a lag of sorts, meaning the trainer of the team needs to coach his players on how to adapt to an antigen, or the recognizable and visible aspect of a threat, like a bacterium's surface receptors. The good thing is once the players are trained well enough, they

develop a good memory with respect to that threat. This means that whenever they encounter that substitute, or specific antigen or threat, again, they will know exactly what to do with it and will not have to waste time training for it. Basically, the delay is only really significant the first time around, not as much thereafter. All of this is in contrast to the innate immune system, which suffers no delay, has no memory and isn't trained to respond to a specific threat; it goes after everything that moves [9].

This means that for one to get immunity against COVID 19, the individual should be exposed to the virus first before the body is stimulated to produce antibodies against it. This may require the person being infected with the virus and after recovery the person produce antibodies for subsequent infections of COVID 19. On the other hand, one could also produce antibodies through COVID 19 vaccination after which could build resistance against the virus.

3. TYPES OF IMMUNITY BASED SOURCE OF IMMUNITY

If we consider the source of immunity, that is, where it comes from, we can begin with two major categories: genetic immunity and acquired immunity (Adaptive immunity) [10].

3.1 Genetic Immunity

Genetic immunity does not involve antibodies or the immune system but conferred by our DNA; it is the result of our genetic makeup. What this means is that some pathogens cause disease in certain host species but not in others [11]. Dogs and cats, for example, have genetic immunity to the measles virus, which is a pathogen only for human. On the other hand, Mouse Leukemia viruses affect only mice and not human; thus human have genetic immunity to these viruses [12]. This is not because human have antibodies against these mouse viruses, but rather we have genes that are the codes for proteins that make it impossible for such pathogens to reproduce in the human cells and tissues. Monkeys have similar protective genes and proteins for the human AIDS virus and therefore HIV does not cause disease in these monkeys. Because this is a genetic characteristic programmed in DNA, genetic immunity always lasts a lifetime [10].

The above explanation means that some group of people may have this type of immunity which could make them build some resistance to the

COVID 19. The reasons black people in Africa and for that matter Ghana are perhaps recording low mortality from COVID 19.

3.2 Acquired Immunity

Acquired immunity does involve antibodies and consist of Passive immunity and active immunity. Acquired immunity is developed or acquired by natural or artificial means.

3.3 Passive Immunity

There are two types passive immunity which are Naturally Acquired Passive Immunity and Artificially acquired passive immunity.

3.3.1 Naturally acquired passive immunity

It means that the antibodies are from another source but naturally transmitted. One type of naturally acquired passive immunity is the placental transmission of antibodies (IgG) from maternal blood to fetal circulation [10]. This means a pregnant woman could transmit antibodies of COVID 19 to fetus before the baby is born. Such a child would be born immunity against COVID 19. The baby will then be born temporarily immune to the diseases (COVID 19) that the mother is immune to. Such passive immunity may be prolonged by breast-feeding, because breast milk also contains maternal antibodies (IgA).

3.3.2 Artificially acquired passive immunity

It immunization induced by the transfer of antibodies is obtained by the injection of immune globulins (gamma globulins or preformed antibodies) after presumed exposure to a particular pathogen. Such immune globulins are available for German measles, hepatitis A and B, tetanus and botulism (anti-toxins), and rabies. These are not vaccines; they do not stimulate immune mechanisms, but rather provide immediate antibody protection. Passive immunity is always temporary, lasting a few weeks to a few months, because antibodies from another source eventually break down [13].

With this type of immunity means that scientist would have develop immunoglobins to fight COVID 19 which may be quiet expensive.

3.4 Active Immunity

Acquired immunity is the production of one's own antibodies and may be stimulated by natural or

artificial means. Active immunity means that the individual produces his own antibodies [14].

3.4.1 Naturally acquired active immunity

It means that a person has recovered from a disease and now has antibodies and memory cells specific for that pathogen. Naturally acquired active immunity occurs when a person is exposed to a live pathogen and develops a primary immune response, which leads to immunological memory [14]. This type of immunity is "natural" because deliberate exposure does not induce it. The COVID 19 patients who have been recovered from the virus could acquire this type of immunity and therefore may build resistance against subsequent infections of COVID 19.

3.4.2 Artificially acquired active immunity

It is the result of a vaccine that has stimulated production of antibodies and memory cells [15]. Artificially acquired active immunity can be induced by a vaccine, a substance that contains antigen. A vaccine stimulates a primary response against the antigen without causing symptoms of the disease [16].

For this immunity be acquired against COVID 19, there is the need to develop vaccine that could be administered after people have tested negative to the COVID 19.

It should be noted that, no general statement can be made about the duration of active immunity. Recovering from plague, for example, confers lifelong immunity, but the plague vaccine does not. Duration of active immunity, therefore, varies with the particular disease or vaccine [17].

4. CONCLUSION

From the above discussions it is clear that there are different dimensions to immunity and therefore various means of acquiring each of the immunity explained. This could be used by health professionals to educate the public on the prevention of the spread of COVID 19.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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