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Herd immunity an immunity to stop covid-19 spread

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ABSTRACT
Heard immunity is referred to the overall level of immunity in a community and is relevant in the control of pandemic diseases. When herd immunity is low, pandemics are likely to occur on introduction of suitable pathogens. The terms herd immunity means that a large proportion of individual in a community are immune to pathogens.
KEY WORDS: immunity, resistance, pathogens, community

I. INTRODUCTION

The resistance offered by the host to the harmful effects of pathogenic microbial infection is called immunity. Lack of power of the body to resist infection is called susceptibility. The study of immunity is called immunology and the preparation used to produce immunity is called immunological preparations. Immunological mechanisms are involved in the production of the body against infectious agents but they can also cause damage periodically. The immune system protects an individual against an invasion by foreign bodies especially microbial agents and their toxic products. The activities of this system are not always useful to the body. The immune defence may have pathological consequences because of the phenomenon of allergies, inflammatory tissue damage, autoimmune disease and reactions to grafts.

Types of immunity
Immunity against infectious diseases is mainly classified into two types
Innate or natural immunity
Acquired immunity
Innate or natural immunity
Innate or native or natural immunity is the resistance to infectious which an individual possesses by virtue of his genetic and constitutional make up.It may be non-specific, when it indicates a degree of resistance to infections in general or specific when resistance to a particular pathogen is concerned. It results in differences between species, races and individuals
Acquired immunity
Natural immunity is inadequate for protection against many microbial diseases and during the lifetime additional immunity is acquired either actively or passively. Acquired or adaptive immunity is classified into two types active immunity and passive immunity
(A)Active immunity
Active immunity is the resistance developed by an individual as a result of an antigenic stimulus.This involves the active functioning of the persons immune apparatus leading to the synthesis of antibodies or the production immunologically active cells. Active immunity may be classified as naturally acquired active immunity and artificially stimulated active immunity.
1. Naturally acquired active immunity
Naturally acquired active immunity results from natural infection by pathogens which may or may not produce a clinically recognisable disease.
Following clinical infection
When a patient recovers from a certain disease he is left with a high degree of immunity. A person who has recovered from an attack of measles develops natural active immunity. The large majority of adults possess natural active immunity to poliomyelitis due to repeated in apparent infections with the polioviruses during childhood. Some infections like mumps, chicken pox, whoophing cough and diphtheria induce long lasting immunity. In other such as common cold, pneumonia and influenza, the immunity appears to be shortlisted.
After sub-clinical infection

Some invading micro-organisms do not cause clearly distinguishable signs of the disease, children from slum areas more frequently exposed to sub-infection and develop immunity to a variety of diseases more quickly than children in more affluent areas.

II. ARTIFICIALLY STIMULATED ACTIVE IMMUNITY

This is the resistance induced by vaccines which are preparations of live killed micro-organisms or their products e.g. TAB vaccine, BCG vaccine, diphtheria toxoid, MMR vaccine.

(B)Passive immunity

The immunity that is transferred to a recipient in a ready-made form is known as passive immunity. In this immunity, a subject is immuninized by prepared antibodies and body cells do not take any active part in the production of immunity. The main advantage of passive immunization is that it is immediate in action and hence it is employed when instant immunity is desired. Like active immunity, passive immunity can be classified as naturally acquired immunity and artificially produced passive immunity.

1. Naturally acquired passive immunity

Naturally acquired passive immunity is the resistance passively transferred from the mother to the baby.I_gG antibodies can cross the placental barrier to reach the foetus. After birth, immunoglobulins are passed to the new born through breast milk. Babies shows high resistance to chickenpox, measle, diphtheria and tetanus but usually this is lost by the time the child becomes six months old.

2. Artificially produced passive immunity

This is the immunity transferred passively to the recipients by administration of antibodies e.g.tetatus antitoxin, human normal immunoglobulin injection which contains antibodies (rubella, measles etc) antibotulinum sera, antivenoms etc.

Cellular and humoral immunity

The lymphocyte is the basic cell responsible for both cellular and humoral immunity. Lymphocytes are found in high concentrations in the lymph nodes, spleen and at the sites where they are manufactured and processed (bone marrow and thymus).lymphoid organs contain lymphocytes at various stages of development and are classified as primary or central lymphoid organs (thymus, bone marrow) and secondary or peripheral lymphoid organs(lymph nodes, spleen, adenoids,tonsils,appendix etc) the bone marrow hemopoietic stem cells are the ultimate origin of erythrocytes and all leukocytes including the lymphocytes at various stages of development and are classified as primary or central lymphoid organ (thymus, bone marrow) and secondary or peripheral lymphoid organs (lymph nodes, spleen, adenoids,tonsils,appendix etc) the bone marrow hemopoietic stem cells are the ultimate origin of erythrocytes and all leukocytes including the lymphocytes .Many lymphocytes pass through the thymus where they become processed by lymph hormonal microenvironment prior to release. The lymphocytes are now called thymus-derived lymphocytes or T–lymphocytes. The majority of the bone-marrow derived lymphocytes which do not enter or become processed by the thymus are called B cells cellular and humoral immunity is mediated by two distinct types of lymphocytes.B-lymphocytes respond to antigens by differentiated into antibody producing plasma cells while T-lymphocytes are responsible for cell mediated immunity. Difference between T-cells and B-cells.

Local and Herd Immunity

Local immunity has importance in infections which are either localised or where it is operative in combating infection at the site of the primary entry of pathogen. In case of poliomyelitis, parenteral vaccine provides systemic immunity. The antibodies neutralise virus only after blood invasion. It does not prevent multiplication of the virus at the site of entry (the gut mucosa).however, when live oral vaccine is given it leads to local immunity. Similarly live influenza vaccine administrated intranasal provides local immunity. A special class of immunoglobulins (I_gA) forms the major component of local immunity.

Herd immunity is referred to the overall level of immunity in a community and is relevant in the control of epidemic disease. When herd immunity is low, epidemics are likely to occur on introduction of suitable pathogens. The term herd immunity means that a large proportion of individual in a community are immune to pathogens.

Why is herd immunity important?

Herd immunity occurs when a large portion of a community (the herd) becomes immune to a disease, making the spread of disease from person to person unlikely. As a result, the whole community becomes protected — not just those who are immune.

Often, a percentage of the population must be capable of getting a disease in order for it to spread. This is called a threshold proportion. If the proportion of the population that is immune to the disease is greater than this threshold, the spread of the disease will decline. This is known as the herd immunity threshold.

What percentage of a community needs to be immune in order to achieve herd immunity, it varies from disease to disease. The more contagious a disease is, the greater the proportion of the population that needs to be immune to the disease to stop its spread. For example, the measles is a highly contagious illness. It's estimated that 94% of the population must be immune to interrupt the chain of transmission.

How is herd immunity achieved?

There are two paths to herd immunity for COVID-19 — vaccines and infection.

Vaccines

A vaccine for the virus that causes COVID-19 would be an ideal approach to achieving herd immunity. Vaccines create immunity without causing illness or resulting complications. Herd immunity makes it possible to protect the population from a disease, including those who can't be vaccinated, such as newborns or those who have compromised immune systems. Using the concept of herd immunity, vaccines have successfully controlled deadly contagious diseases such as smallpox, polio, diphtheria, rubella and many others.

Reaching herd immunity through vaccination sometimes has drawbacks, though. Protection from some vaccines can wane over time, requiring revaccination. Sometimes people don't get all of the shots that they need to be completely protected from a disease.

In addition, some people may object to vaccines because of religious objections, fears about the possible risks or scepticism about the benefits. People who object to vaccines often live in the same neighbourhoods or attend the same religious services or schools. If the proportion of vaccinated people in a community falls below the herd immunity threshold, exposure to a contagious disease could result in the disease quickly spreading. Measles has recently resurged in several parts of the world with relatively low vaccination rates, including the United States. Opposition to vaccines can pose a real challenge to herd immunity.

Natural infection

Herd immunity can also be reached when a sufficient number of people in the population have recovered from a disease and have developed antibodies against future infection. For example, those who survived the 1918 flu (influenza) pandemic were later immune to infection with the H1N1 flu, a subtype of influenza A. During the 2009-10 flu season, H1N1 caused the respiratory infection in humans that was commonly referred to as swine flu.

However, there are some major problems with relying on community infection to create herd immunity to the virus that causes COVID-19. First, it isn't yet clear if infection with the COVID-19 virus makes a person immune to future infection.

Research suggests that after infection with some corona viruses, reinfection with the same virus — though usually mild and only happening in a fraction of people — is possible after a period of months or years. Further research is needed to determine the protective effect of antibodies to the virus in those who have been infected.

Even if infection with the COVID-19 virus creates long-lasting immunity, a large number of people would have to become infected to reach the herd immunity threshold. Experts estimate that in the U.S., 70% of the population — more than 200 million people — would have to recover from COVID-19 to halt the epidemic. If many people become sick with COVID-19 at once, the health care system could quickly become overwhelmed. This amount of infection could also lead to serious complications and millions of deaths, especially among older people and those who have chronic conditions.

III. CONCLUSION

Until a COVID-19 vaccine is developed, it's crucial to slow the spread of the COVID-19 virus and protect individuals at increased risk of severe illness, including older adults and people of any age with underlying health conditions. To reduce the risk of infection:

- Avoid large events and mass gatherings.
- Avoid close contact (within about 6 feet, or 2 meters) with anyone who is sick or has symptoms.
- Stay home as much as possible and keep distance between yourself and others (within about 6 feet, or 2 meters) if COVID-19 is spreading in your community, especially if you have a higher risk of serious illness. Keep in mind some people may have the COVID-19 virus and spread it to others, even if they don't have symptoms or don't know they have COVID-19.
- Wash your hands often with soap and water for at least 20 seconds, or use an alcohol-based hand sanitizer that contains at least 60% alcohol.

- Wear a cloth face covering in public spaces, such as the grocery store, where it's difficult to avoid close contact with others, especially if you're in an area with ongoing community spread. Only use nonmedical cloth masks — surgical masks and N95 respirators should be reserved for health care providers.
- Cover your mouth and nose with your elbow or a tissue when you cough or sneeze. Throw away the used tissue.
- Avoid touching your eyes, nose and mouth.
- Avoid sharing dishes, glasses, bedding and other household items if you're sick.
- Clean and disinfect high-touch surfaces, such as doorknobs, light switches, electronics and counters, daily.
- Stay home from work, school and public areas if you're sick, unless you're going to get medical care. Avoid public transportation, taxis and ride-sharing

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