

Hello students, I'm doctor Dilecta D'Costa,

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Khandola, Goa. Today we will be studying the

concept of innate and adaptive immunity.

Outline : Introduction,

Definition of immunity.

Innate immunity and adaptive immunity.

Comparison of innate and adaptive immunity.

The mechanisms of both

types of adaptive immunity.

An interaction between innate and

adaptive immunity.

Learning outcomes.

The student will be able to

understand the concept of immunity.

Learn about the first,

second and third line.

defense mechanisms.

Differentiate between innate and adaptive immunity.

Comprehend the types of adaptive immunity.

And appreciate the interaction between

innate and adaptive immunity.

With potential pathogens ever present.

Why do we rarely succumb to

them in illness or death?

The answer is that our bodies have defenses

for resisting the attack of many pathogens.

That resistance is called immunity. Immunity.

refers to the general ability of the host

to resist a particular infection or disease.

The word immunity was derived.

from the Latin word *immunis*

meaning exemption,

and here exemption from pathogens.

The immune system is a complex but

highly evolved and adaptable system.

It defends the body against invaders

as diverse as the tiny 30 nanometers

intracellular poliovirus and as

large as the giant parasitic kidney

worm *Dioctophyme renale* which is 100

centimeters by 10 millimeters. Immunity.

also protects the body against

environmental agents such as pollen,

drugs, foods, chemicals,

and animal, dander. Innate immunity.

There are two types of immunity.

One is innate and the other one is adaptive.

So what is innate immunity?

Innate immunity refers to the

defences present at birth.

It comes to you as your birthright.

Resistance to infections that an

individual possesses by virtue of his or

her genetic and constitutional makeup.

is innate immunity.

It is the first and second line

of defence against infection.

It is also called natural immunity

or nonspecific immune response.

On the other hand, what is adaptive immunity?

A specific response to a specific microbe,

once it has breached the innate immunity

defences is called adaptive immunity.

Adaptive defenses respond to antigens

by making millions of different

antibodies each effective against.

a particular antigen.

It also involves the activation

of the lymphocytes,

specific cells of the body's immune system.

Adaptive immunity is also called acquired

immunity or specific immune response.

What are the attributes of adaptive immunity?

It is the third line of defense

and its attributes are recognition

of self versus nonself antigens.

Specificity, heterogeneity,

and memory. Adaptive immune responses

that operate in the host.

are AMI or antibody mediated immunity or

humoral immunity and the other one

is CMI or cell mediated immunity.

The comparison of innate and adaptive immunity. Innate immunity responds rapidly, whereas adaptive immunity is slow to start, it needs some time.

Then innate immunity has some specificity or maybe not so specific as compared to adaptive immunity, which is highly specific.

Innate immunity has no memory, but adaptive immunity has memory wherein memory T cells and B cells are circulating in the blood.

The cells that are involved in innate immunity are the phagocytes. That is, the Polymorphonuclear leucocytes or the body polymorpho neutrophils and macrophages.

And also the natural killer cells or the NK cells and mast cells and dendritic cells.

These are the immune cells
that help in innate immunity,
whereas in adaptive immunity only
two types of cells are involved.

That is, the T lymphocytes
and the B lymphocytes.

The molecules that are produced during
innate immunity are antimicrobial
peptides like defensins which
can selectively kill pathogens.

Then, the complement proteins,
which follow a cascade of reactions
and destroy the pathogens,
then cytokines which direct the response
of the cells that have recognized the
antigen .

Then you have chemokines which
help in cell trafficking and release
of cells with a place of action.

You also have acute phase proteins like
mannan binding lectins or C reactive

proteins which are usually seen in the plasma in acute phase of infection.

So all these molecules are

of innate immunity,

but the molecules that are designated for

adaptive immunity are the antibodies,

the cytokines and the chemokines.

Mechanisms of innate immunity.

Innate immunity includes the

following mechanisms.

First is physical barriers,

the skin and mucous membranes,

and the chemicals they secrete serve

as the biggest physical barrier for

pathogens that may wish to enter.

Chemical barriers are the antimicrobial

substances in body fluids such as saliva,

mucus,

gastric juices and the iron limitation

mechanisms wherein transferrins

are produced by the body which

sequester or bind the iron and

make it unavailable to the pathogens,

then cellular defenses.

Phagocytes which engulf the invading

micro organisms and destroy them.

Inflammation,

which is a defense mechanism wherein

the classical signs of inflammation

are reddening, swelling, and.

an increase in temperature in the

tissues at the sites of infection,

Fever, elevation of body temperature.

This is also a defense mechanism

which helps to kill invading

pathogens or inactivate their toxic

products. Molecular defenses

like interferon and complement.

Interferons do not allow viral

infection to proceed further and

they don't allow the other cells

that are not infected to get infected

by the virus. Complement is a set of

proteins that help in

destroying invading microbes.

So the summary of innate and adaptive

Immunity. Innate immunity makes up

the first line and second line of

defence. In the first line of defense.

We have seen intact skin, mucous membranes

and their secretions and normal microbiota.

Normal microbiota it there's a

competition between normal

microbiota organisms for space

and nutrients with that

of pathogens and second line of

defense is the phagocytes,

such as neutrophils,

eosinophils, dendritic cells and

macrophages.

Fever and anti microbial substances.

In adaptive immunity which is

the third line of defense.

You have specialized lymphocytes that is

the T cells and

the B cells in turn which make the

antibodies that bind to the

antigens and destroy the antigens.

So immunity is broadly classified

into innate and adaptive.

In turn adaptive immunity

is of various types.

It is again further classified into

active immunity and passive immunity.

In active immunity,

the body makes its own antibodies,

whereas in passive immunity,

the body is supplied with

ready made antibodies.

Each of these is further classified

into natural and artificial.

So in active immunity,

you have natural active immunity,

an artificial immunity and passive.

Also, there is natural and

artificial passive immunity.

So active

immunity is acquired actively

when a person is exposed to

microorganisms or foreign substances.

and the immune system responds to it.

Immunity is acquired passively when antibodies are

transferred from one person to another.

So in active immunity,

the body is actively involved

in conferring immunity,

whereas in passive immunity

the body is dormant,

naturally acquired active immunity develops

when a person is exposed to antigens,

becomes ill,

and then recovers once acquired,

immunity is lifelong.

For example some diseases, such as measles.

Artificially acquired active immunity

is the result of vaccination.

So what is a vaccine?

A vaccine is an attenuated strain of a pathogen which, when introduced into the body, confers immunity.

So when I mean attenuation, the pathogenicity part of the pathogen is inactivated and only the antigenicity part is retained.

So that is why it helps in immunization.

Vaccination, also called immunization, introduces vaccines into the body and these antigens just killed or living microorganisms.

Or it could even be an inactivated bacterial toxin, which is known as a toxoid because many diseases like tetanus, diphtheria, the disease is due to the toxin that is produced,

so the target is to inactivate the
toxin and retain the antigenicity part
and this can be used as a toxoid to.

Confer immunity naturally

Acquired passive immunity.

involves the natural transfer of
antibodies from a mother to her infant.

Antibodies in a pregnant woman

cross the placenta to the fetus

through transplacental transfer,

so the fetus in utero is protected

because of the maternal antibodies which

belong to a class of antibodies called IG.

G.

Certain antibodies are also

passed from the mother to the

nursing infant in breast milk,

especially in the first

secretions called colostrum.

That gives us the significance of

breastfeeding in the first six months

after birth and the antibodies in breast milk are usually of the IgA class.

Artificially acquired passive immunity involves the injection of antibodies into the body.

These antibodies come from an animal or person who is already immune to the disease.

Immuno competent T cells can be transferred from an immunized host to a susceptible person where the cell mediated immunity response is required for elimination of the pathogen.

And this type of immunity is called adoptive immunity.

This type of immunization is done in case there is an emergency or if a particular community is susceptible to epidemics.

Comparison between active and

Passive immunity. active immunity.

There's exposure to antigen

immunity achieved by injecting

antigen or through infection.

Where as in passive,

there is no exposure to the antigen.

Immunity is achieved by injecting

antibodies or antigen reactive T cells

In active, specific immune response made

by individual achieving immunity.

Whereas in passive.

the specific immune responses made by the

donor of antibodies or T cells. Immunity

activated by the antigen and immune

memory in effect in active immunity.

Whereas no immune system activation and

no immune memory in passive immunity.

In active immunity can be maintained

via stimulation of memory cells.

That is why we need to take booster

doses after the initial vaccine,
whereas in passive immunity, immunity
cannot be maintained and decays rapidly.

Immunity develops over a period
of weeks in active immunity
and it develops immediately in
passive immunity and last of all,
active immunity is not applicable
in the immunodeficient,
whereas it is applicable in
the immunodeficient.

The interaction between innate
and adaptive immunity,
though they are two different
types of immunity,
yet they are in sync with each other,
so macrophages are phagocytic
but produce important cytokines
that induce adaptive immunity.

So macrophages belong to innate immunity,
but they produce chemicals that

relate to adaptive immunity.

Cytotoxic T cells kill virus infected

cells which have to be cleared from the

body by phagocytic cells and phagocytic cells are of the innate immunity,

whereas cytotoxic T cells are of adaptive.

Immunity. Complement components

of innate immune system can

be activated directly by microbes

but can also be activated by antibodies,

which are molecules of the adaptive system.

So this shows how both the innate and

adaptive immunity interact with each other.

These are my references.

Thank you.