Resistence of the body to infection

Immunity

is the capability of the human body to resist almost all types of organisms and toxins that tend to damage the tissues and organs. So, it’s a protective mechanism. Immunity is divided into two types:

1) Innate immunity:
   results from general processes rather than from processes directed at specific disease organisms (present already in human body). It includes the following:
   - Phagocytosis: of bacteria and other invaders by WBCs and macrophages
   - Destruction: of swallowed organisms by digestive enzyme and acid secretions from stomach
   - Resistance of skin to invasion by organisms
   - Chemicals in the blood: lysozyme, basic polypeptides, complement complex (a system of 20 proteins that can be activated in various ways to destroy bacteria), natural killer lymphocytes.

2) Acquired (adaptive) immunity:
   Extremely powerful specific immunity against individual invading agents. Caused by a special immune system that develops antibodies and/or activated lymphocytes that attack and destroy the specific invading organism or toxin. It is divided into:
   - Circulating antibodies (humoral immunity)(B cell immunity): which are globin molecules in the blood plasma that are capable of attacking the invading agent. Antibodies are produced by B cells which get matured in bone marrow.
   - Cell mediated immunity(T cell immunity): is the formation of large numbers of T lymphocytes which get matured in thymus.

Both types of acquired antibodies are initiated by antigens:

Because acquired immunity doesn’t develop until after invasion by a foreign organism or toxin, the body must have a mechanism for recognizing this invasion. Each toxin or each type of organism almost always contains one or more specific chemical compounds (ANTIGENS) in its makeup that are different from all other compounds. THEREFORE, T and B lymphocyte react highly specifically against specific antigen.

Clone: different lymphocytes capable of forming one specific of antibody or T cell.

Memory cells and secondary response:

A few of the lymphoblasts formed by activation of a clone of B lymphocytes don’t go on to form plasma cells but instead form moderate number of memory cells. These memory cells remain dormant until activated once again by a new quantity of the same antigen. This response is called secondary response which is much more rapid and much more potent than the primary response, because there are many memory cells than there were original B lymphocytes of the specific clone.
**Antibodies:**

IgG → the most common antibody, 75%
IgE → mainly found in allergy
IgM
IgA
IgD

collected in MAGED name (to facilitate the memorizing).

**Mechanism of action:**

1) **Direct action:**

   The antibodies can inactivate the invading agent in one of several ways, as follows:
   - **agglutination:** in which multiple large particles with antigens on their surfaces such as bacteria or red cells are bound together into a clump.
   - **precipitation:** in which the molecular complex of soluble antigen (such as a tetanus toxin) and antibody becomes so large that it is rendered insoluble and precipitates.
   - **neutralization:** in which the antibody cover the toxic sites of the antigenic agent.
   - **lysis:** in which some potent antibodies are occasionally capable of directly attacking membranes of cellular agents and thereby cause rupture of the agent.

Ps: these definitions were not mentioned by the doctor but they are written in the book and I mentioned them to clarify the idea.

2) **Activation of complement system:**

   20 proteins, many of them are enzyme precursor which are not active, but they can be activated by classic pathway.

   Classic pathway: is initiated by an antigen-antibody reaction. Phagocytes, lysis, agglutination, neutralization, chemotaxis, activation of mast cell and basophil.

**Failure of the tolerance mechanism causes autoimmune disease:**

It usually occurs after destruction of some of the body's own tissues, which release considerable quantities of self-antigens that circulate in the body and presumably cause acquired immunity. Autoimmune disease develop inside the human body against a part of it, they are not easy to treat the protection mechanism is not found any more. Ex of disease: RH fever, glomerulonephritis (inflammation of the basement membranes of glomeruli), Myasthenia gravis (a disease that affect muscles in which the patient can't breath normally because respiratory muscles are very weak), Lupus erythematosus (in which the person becomes immunized against many different body tissues at the same time, a disease that causes extensive damage and rapid death.

**IMMUNITY BY INJECTION**
1-Passive by inject antibody
2-Injected of antigen (active immunity ) (vaccination)
A-Dead organism like Diphtheria , Whooping cough, Typhoid fever
B-Toxin treated like tetanus
C-Attenuated live organism like polio, measles, smallbox and many other viral disease

Attenuated antigens : are antigens that are not active to cause the disease but they can stimulate the formation of antibodies.

ALLERGY AND HYPERSENSITIVITY

1-Delay reaction allergy: By activated T cell not antibody with repeat exposure ,T cell will release many toxic substances and invocation of tissue by mcarophage. Tissue damage will develop where the antigen present like skin , lungs (lung edema) and Asthma.

2-Allergy in person who has excess IgE antibodies (Atopic allergies). Genetic type,
Cause antigen antibody reaction as Anaphylactic shock, Urticaria , hay fever, and asthma.
The second type is more dangerous and develop mainly in an allergic person, such as apetient who has penicillin allergy.
Basophils and mast cells release histamin and heparin which inturn cause blood vessels dilation and increasing the permeability of capillaries which cause loss of fluids into the tissues and reduced blood volume \(\rightarrow\) edema and anaphylactic shock.

Never doubt the power of just getting started, one step forward in the right direction

Could change your life forever

Best wishes 😊