Basic Concepts of Disease Processes

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Cellular Adaptation – Atrophy
Refers to a decrease in the size of the cells; Common causes are reduced use of the tissue, insufficient nutrition and aging. Examples are lack of exercise during an illness or a limb that has been in a cast for a period of time.

Hypertrophy
Refers to an increase in cell size; Can be due to additional demand/work by the tissue. An example is cardiac hypertrophy due to increasing demand on the heart.

Metaplasia
Occurs when one cell type is replaced by another; Can be an adaptive response or due to a deficiency in vitamin A.

Dysplasia
This is a term applied to tissue in which the cells vary in size and shape with increased mitosis. It is significant as that dysplasia is often associated with the development of cancer, in particular, cervical cancer.

Anaplasia
Refers to cells that are undifferentiated; It is associated with malignancy and is the basis for grading tumors.

Neoplasm
New growth Benign; Less serious, and does not spread. Problems occur with displacement or pressure on organs. Malignant – cancerous.

Inflammation
The body’s response to tissue injury; Associated with many different types of tissue injury – direct damage, chemicals, ischemia, necrosis, allergic reactions, foreign bodies, etc. Local effects include: redness and warmth, swelling and edema, pain, loss of function (possible), and pus (possible).

Systemic effects of Inflammation
Includes fatigue, headache, and anorexia (remember anorexia is the loss of appetite).

The Process of Acquiring Immunity
Natural immunity is species specific. Human are not susceptible to infections common in other animals. Innate immunity is gene specific, and is controlled by such factors as race.
The Immune Response

**Primary Immune response** occurs when the person is first exposed to the antigen. The antigen is recognized and processed and antibodies are developed. This process can take several days or weeks.

**Secondary Immune response** is repeat exposure to the same antigen. Memory cells are activated and a large number of antibodies are manufactured.

Four Ways to Acquire Immunity:
1. **Active natural immunity** – May be acquired by direct exposure to an antigen.

2. **Active artificial immunity** – Develops when a specific antigen is introduced into the body. A vaccine is a solution containing dead or weakened organisms; it stimulates the immune response without producing disease.

3. **Passive natural immunity** – Occurs when IgG is transmitted from mother to fetus; can happen across the placenta or though breast milk.

4. **Passive artificial immunity** – Is the result of the injection of antibodies from a person or animal into a second person; Rabies antiserum administration is an example.

Hypersensitivities

**Type 1 – Allergies**
These are very common and take many forms such as hay fever, rashes. *Anaphylaxis or Anaphylactic Shock* is a severe, life threatening allergic reaction. It can be caused by insect stings, nuts, shellfish, and penicillin. There is systemic vasodilation, decrease in blood pressure, and edema of the lungs and mucosa, which can cause constriction of the bronchioles, obstructing air flow.

Treatment is prevention, identifying specific antigens through skin tests. Emergency treatments include immediate injections of epinephrine (EpiPen), administration of oxygen, or treatment of shock and CPR, if necessary.

**Type II – Cytotoxic Hypersensitivity**
Causes destruction of the cell; an example is the response to an incompatible blood transfusion. If a Type B receives Type A blood, the antigen-antibody reaction will destroy the red blood cells (hemolysis) in the type A blood.

**Type III – Immune Complex Hypersensitivity**
The antigen combines with the antibody; will cause inflammation and tissue destruction.
Type IV – Cell Mediated or Delayed Hypersensitivity
Involves a delayed response; Contact dermatitis or an allergic skin rash is one kind of a Type IV reaction to direct contact with a chemical or causative substance. Reactions to latex or poison ivy are common Type IV reactions.

AIDS – Acquired Immunodeficiency Syndrome
This is the most widely recognized secondary immunodeficiency; first recognized in 1981. The causative organism is the Human immunodeficiency virus or HIV. A patient is considered positive when the viruses subsequent antibodies are known to be present in the blood.

AIDS is the stage of active infection with marked clinical manifestations and multiple complications. HIV is a retrovirus, containing RNA. The virus primarily infects the T-helper lymphocyte, leading to a decrease in function and number of the cells that play an essential role the in immune response.

Transmission
The virus is transmitted in body fluids consisting of blood, semen, and vaginal secretions. Other means of transmission, such as saliva, which show trace amounts of the virus, have not been proven. Healthcare workers are at risk for transmission.

This risk is negated by practicing “universal precautions.” Healthcare workers are at a higher risk of being exposed to Hepatitis B than to HIV. Those at highest risk include IV drug users, multiple sexual partners, and unprotected sex with an infected partner.

The HIV virus is fragile and cannot survive outside the body. It is also easily destroyed by household bleach and alcohol. It is not transmitted by casual contact – touching, kissing, sneezing, or coughing; nor is it transmitted by fomites or insect bites.

There is a “window period” when the infected person may transmit the disease but not has produced enough antibodies to test positive. This period can span from two weeks until six months.

HIV encephalopathy is a generalized brain dysfunction, sometimes referred to as AIDS dementia; it is the result of direct infection of the brain cells by HIV.

Secondary infections are common with AIDS. They usually are the primary cause of death. These infections include Pneumocystis Carinii which causes pneumonia, herpes simplex can cause cold sores and Candida can infect the mouth and extend into the esophagus. The incidence of Tuberculosis in AIDS patients is quite high.

The development of cancer is also prevalent in those with AIDS. The most common is Kaposi’s sarcoma, with Non-Hodgkin’s lymphoma common as well.
Treatment
Antiviral drugs can reduce the replication of the virus. The primary focus of treatment is on minimizing the effects of complications. While current therapeutics has improved the prognosis in that HIV infected individuals are living longer, there is no cure.

Neoplasms

Benign
New growths of differentiated cells; usually encapsulated and does not spread.

Malignant
Cells do not adhere; spreads easily, causes infection and inflammation.

Grading
Grading of tumors is based upon the degree of differentiation of the malignant cells:
Grade I – not too bad...Grade IV – really bad.

The Warning Signs of Cancer
- Unusual bleeding
- Changes in bowel habits
- Changes in a wart or mole
- A sore that does not heal
- Unexplained weight loss
- Persistent anemia
- Persistent cough or hoarseness
- A lump anywhere on the body

Therapies
- Surgery – Involves the removal of the tumor;
- Radiation – Destroys more rapidly dividing cells;
- Chemotherapy – Reduces adverse effects and be more effective in the cell cycle.

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