

IQRA NATIONAL UNIVERSITY

DEPARTMENT OF ALLIED HEALTH SCIENCES

Final-Term Examination 2020

Course Title: microbiology and pathology DPT 4th

Instructor: Dr. Imran khan

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Total Marks: 50

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Q1. What do you know about healing and repair. Explain (15)

Ans: Repair And Regeneration:

Injury to cells and tissues set in motion a series of events that contain the damage and initiate the healing process. the process can be broadly separated in to regeneration and repair.

Repair:

- Repair is the process by which lost or destroyed cell are replaced by viable cells.
- Repair begins early in information.

Two Processes:

1. Regeneration
2. Fibrosis

Regeneration:

- The replacement of the destroyed tissue by the parenchymal cells of same type is called regeneration.
- Regeneration results in the complete restitution of lost or damaged tissue.

- Repair may Restore some original structures but can cause structural derangements. In healthy tissue healing in the form of regeneration repair, occurs after any insult that causes tissue destruction and is essential for the survival of the organism.
- In mammals, whole organs and complex tissues rarely Regenerate after injury and the term is usually applied to process such as liver growth after partial resection or necrosis but these processes consist of compensatory growth rather than true regeneration.
- Tissue with high proliferation capacity such as the hematopoietic system and the epithelia of the skin and gastrointestinal tract, renew themselves continuously and can regenerate after injury, as long as the stem cells of these tissue are not destroyed.

Fibrosis:

- Replacement by fibrosis tissue (fibroplasia, scar formation)
- Both require cell growth, differentiation and cell matrix interaction.

Healing:

- Healing starts before the end of inflammation. There are three possible final outcome of acute inflammation.
 1. Complete regeneration
 2. Chronic Inflammation
 3. Fibrosis
- Healing is usually a tissue response;
 1. To a wound (Commonly in this skin)
 2. To inflammatory Processes in internal organs.
 3. To cell necrosis in organs incapable of regeneration.

Healing Stages:

The wound healing stages are made up of three basic phases:

- Inflammation.
- proliferation
- maturation

Inflammation:

The first phase of healing is inflammation, the body's natural response to trauma. After the wound has been inflicted, homeostasis begins: the blood vessels constrict and seal themselves off as the platelets create substances that form a clot and halt bleeding. Once homeostasis is achieved, the blood vessels dilate, letting nutrients, white blood cells, antibodies, enzymes, and other beneficial elements into the affected area to promote good wound healing and stave off infection.

Proliferation:

In the second wound healing stage, proliferation, the wound begins to be rebuilt with new, healthy granulation tissue. For the granulation tissue to be formed, the blood vessels must receive a sufficient supply of nutrients and oxygen. This new tissue is made up of a mixture of extracellular matrix and collagen, which allows for the development of a new network of blood vessels to replace the damaged ones.

Maturation:

Maturation, also known as remodeling, is the last stage of the wound healing process. It occurs after the wound has closed up and can take as long as two years. During this phase, the dermal tissues are overhauled to enhance their tensile strength, and non-functional fibroblasts are replaced by functional ones. Cellular activity declines with time, and the number of blood vessels in the affected area decreases and recedes.

Q2. What are hemodynamic disorders? Explain any 3 (10)

Ans: Hemodynamic Disorder:

Introduction:

The health and well-being of cells & tissues depend not only on an intact

circulation to deliver nutrients but also on normal fluid hemostasis.

3 Hemodynamic Disorders:

1. Edema

Definition: Edema is increased fluid in the interstitial tissue spaces or it is a fluid

accumulation in the body cavities in excessive amount. Depending on the site.

Mechanism of edema formation:

- Approximately 60% of the lean body weight is water, two-thirds of which is intracellular with the remainder in the extracellular compartment.
- The capillary endothelium acts as a semipermeable membrane and highly permeable to water & to almost all solutes in plasma with an exception of proteins.
- Proteins in plasma and interstitial fluid are especially important in controlling plasma & interstitial fluid volume. Normally, any outflow of fluid into the interstitium from the arteriolar end of the microcirculation is nearly balanced by inflow at the venular end. Therefore, normally, there is very little fluid in the interstitium.

Edema factors:

- 1) Hydrostatic pressure
- 2) Oncotic pressure
- 3) Vascular permeability
- 4) Lymphatic channels

5) Sodium and water retention

2. Hyperemia and Congestion:

Definition: Both of them can be defined as a local increase in volume of blood in a particular tissue.

Hypermia (active):

Is an active process resulting from an increased inflow of blood into a tissue because of arteriolar vasodilation. commonly occurs in exercising skeletal muscle or acute inflammation. Affected tissue becomes red as there is engorgement with oxygenated blood.

Congestion (passive):

Is a passive process resulting from impaired outflow of blood from a tissue occurs systemically as in cardiac failure or locally as in isolated venous obstruction.

Affected tissue appears blue-red due to accumulation of deoxygenated blood. It may be acute or chronic.

In long-standing congestion (also called chronic passive congestion states), poorly oxygenated blood causes hypoxia results in parenchymal cell degeneration or cell death.

3. Hemorrhage:

Definition: Hemorrhage is extravasation of blood outside the blood vessel.

Causes:

- Physical trauma (Stabbing)

-Atherosclerosis

- Vasculitis
- Gunshot
- Motor vehicle accident

Inadequacies in blood clotting which can be due to:

- Too few or poorly functioning platelets (i.e. qualitative & quantitative defect of platelets)
- Missing or low amount of clotting factors
- **Example:** Low levels of prothrombin, fibrinogen & other precursors. Inadequate vitamin K leads to clotting factor deficiency because this vitamin is important in the synthesis of the clotting factors by the liver.

Q3. What is renewal and regeneration? (10)

Ans: **RENEWAL AND REGENERATION:**

Cell or tissue renewal and regeneration are the two main developmental requirements of adult organisms. Both processes have as starting point a population of stem cells, normally located in a specific environment called the “niche” which provides them the required signals to maintain the stemness properties, or to differentiate to the required different cell types.

Cell renewal:

Cell Renewal. (cell biology) it is the replacement of cells, for example those in the skin, by the proliferative activity of basal stem cells.

Fast renewal tissues can be recognized by a higher mitotic activity. Conversely, slow renewal tissues contain less mitosis, and may not be easily recognized from non-renewing areas which may also present

some mitosis . The fate decisions of stem cells during proliferation directly influence tissue renewal and homeostasis.

Cell renewal cycle of skin cells:

Our skin has its cell renewal own cycle during which the epithelial cells regenerate from the epidermis deepest layer to replace those that form skin surface.

As we age, cell renewal slows down more and more, causing a significant change in the epidermis structure, the skinmost superficial part.

Indeed, with each passing day our skin replaces the older epithelial cells, now become inefficient, with new cells that allow an epithelial tissue renovation.

Cellular renewal: process time at a young age, cell renewal process is completed in about 28 days.

There is an optimal production of collagen and elastin; i.e. production of proteins that help to support dermis structure, making the skin smooth, toned and compact.

After turning 30, however, this process tends to slow down, requiring more and more days to complete cell replacement path, with a natural consequence of skin aging.

And after turning 40:

The collagen and elastin production decreases further, going to undermine the skin structure with three main effects:

- loss of tone and firmness of the skin,
- gradual skin thickening,
- a more pronounced expression of wrinkles and skin lines.

Regeneration:

- Regeneration replaces lost structures.
- Regeneration in human is the regrowth of lost tissues or organs in response to injury.
- This is constant to wound healing, or partial regeneration, which involves closing up the injury site with some gradation of scar tissue. Some tissues such as skin, the vas deferens and large organs including the liver can regrow quite readily.
- Skin tissue can be regenerate in vivo and in vitro. Other organs and body parts have been procured to regenerate, include: penis, fats and a scaled down human heart.

Regeneration in cell:

- Regeneration in the processes of renewal, restoration and growth that make genomes, cells, organisms, and ecosystem resilient to natural function or cause disturbance or damage, their cells become activated and restore the organs back to their pre-existing state.

What tissue can regenerate:

- Skeletal muscles have ability to regenerate and form new muscle tissue, while cardiac muscle cells do not regenerate. Cardiac stem cells may be coaxed in to regenerating cardiac muscle with new medical strategies. Smooth muscle cells have the greatest ability to regenerate.

Examples:

- Liver regeneration after partial hepatectomy.
- Superficial skin wounds.
- Resorption of exudate in lobar pneumonia.

Q4. Write a detailed note on staphylococcus and streptococcus (15)

Ans: Staphylococcus:

- Bacteria is a genus Staphylococcus are pathogens of man and other mammals. Traditionally they were divided into two groups on the basis of their ability to clot blood plasma.
- The coagulase positive Staphylococci constitute the most pathogenic species.
- **S aureus** expresses a variety of Extracellular protein polysaccharide Some of which are correlated with virulence. Virulence results from the combined effect of many factors expressed during infection.

Structure:

- Staphylococci are Gram positive cocci about 0.5-1.0 in diameter.
- They grow in clusters pairs and occasionally in short chains. The clusters arise because Staphylococci divide in two planes.
- The configuration of the cocci helps to distinguish micrococci and Staphylococci from streptococci, which usually grow in chains.

Natural habitat:

- *S aureus* colonized the nasal passage and axillae. *S epidermis* is a common human skin commensal. Other species of Staphylococci are infrequent human commensals. Some are commensals of other animals.

Pathogenesis:

- *S aureus* expresses many potential virulence factor.
 1. Surface proteins that promote colonization of host tissues.
 2. Factor that probably inhibit phagocytosis.
 3. Toxins that damage host tissues and cause disease symptoms.

Treatment:

- Infection acquired outside hospitals can usually be treated with penicillinase resistant beta lactams. Hospital acquired infection is often cause by antibiotic resistant strains and can only be treated with vancomycin.

Diagnosis:

- Diagnosis is based on performing tests and colonies. test for clumping factor, coagulase, hemolysins and thermostable deoxyribonuclease are routinely used to identify *A aureus*.
- Commercial latex agglutination tests are available. Identification of *S epidermis* is confirmed by commercial biotyping kits.

Streptococcus:

- Streptococcus are Gram positive aerobic organisms that cause many disorders.
- Symptoms vary with the organ infected.

Classification of Streptococci:

Three different types of Streptococci are initially differentiated by their appearance when they are grown on sheep blood agar

- Beta hemolytic streptococci produce zones of clear hemolysis around each colony.
- Alpha hemolytic streptococci are surrounded by green discoloration resulting from incomplete hemolysis.
- Gamma hemolysis streptococci are nonhemolytic.

Virulence factors:

- Many streptococci elaborate virulence factors including;
 1. Streptolysins
 2. DNAases
 3. Hyaluronidase
- They contribute to tissue destruction and spread of infection.

Streptococcal Skin Infection:

Skin infections include

- **Impetigo:** is a superficial skin infection that causes crusting or bullae.
- **Erysipelas:** is a superficial cellulitis that also involves the lymphatics.
- **Cellulitis:** involves the deeper layers of skin and may spread rapidly because of the numerous lytic enzymes and toxins produced mainly by group A streptococci.

Diagnosis:

- Culture
- Sometimes rapid antigen tests or antibody titers

- Streptococci are rapidly identified by culture on the sheep blood Agar plate.

Treatment:

- **Penicillin** is the drug of choice for pharyngeal infection. No isolate of GABHS has shown penicillin resistance clinically. However, some streptococcal strains appear to have in vitro tolerance to penicillin.