Applied Pathophysiology - A Conceptual Approach 4th edition Nath Solutions Manual

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Answers to Questions in the Book, Chapter 2, Altered Cells and Tissues

Answers to Exercises in Book: Stop and Consider Questions and Practice Exam Questions

Short Answer (Stop and Consider Questions)

1. What would happen if cells did not have the ability to adapt to stressors? What are the implications in health and disease?
Answer: Cells would be injured without the ability to alter structure and function as a response to stress. Cell injury and death would result in damage to the organ or the entire system, depending on the cause of stress and cell type.

2. What are the common characteristics of the different mechanisms of cellular adaptation? What are the differences?
Answer: Common characteristics include the ability of cells to respond to varying conditions with transduction of signals resulting in a change in gene expression. Cellular adaptive changes promote the function of organs in response to stressors. Change in cell structure and function in response to stressors helps to decrease cellular metabolic needs and to provide required cell types based on specific conditions.

3. From this discussion of atrophy caused by decreased trophic signals of hormones, what other tissue types can be similarly affected?
Answer: Any cell dependent on trophic signals will undergo atrophy if the frequency or intensity of the signal is decreased. These cells may include thyroid, uterine, ovarian, adrenal, and pituitary. Lack of demand can also stimulate the development of atrophy. Tissues at risk for atrophy due to decrease in demand include muscle, renal, and bone.

4. What is the benefit of causing necrosis of the interventricular septum in the treatment of cardiac hypertrophy?
Answer: Necrosis results in loss of cells through cell death. The loss of cells translates into a loss of tissue. The remaining tissue becomes thinner, promoting function in the left ventricle. Loss of tissue in the thickened septum of the ventricle promotes improved contractility and cardiac filling. The loss of cells and tissue counters the development of hypertrophy and relieves symptoms related to impaired ventricular function.

5. Can the prevalence of high-risk types of HPV vary geographically? Why is it important to determine the most common types of high-risk HPV in a particular region or geographic area?
Answer: HPV is transmitted sexually. The subtype that is prevalent in a particular area will be the subtype that is consistently transmitted. There is a geographical distribution of particular types in different parts of the world. It is important to know which subtype is prevalent in the area where you are caring for individuals. Particular treatments, including the potential use of vaccine, are specific to virus subtypes.

6. Who is most at risk for illness related to secondhand smoke? What increases vulnerability to disease?
Answer: All individuals who are exposed to secondhand smoke are at risk for development of illness from the toxic exposure. In particular, children, people who are immunosuppressed, and individuals with respiratory disease are most vulnerable.

Multiple Choice (Practice Exam Questions)

1. The organelle that is involved in cellular respiration and is linked to the development of oxidative stress is known as the:
   a. endoplasmic reticulum.
   b. Golgi apparatus.

c. lysosome.
d. mitochondria.

Answer: d

2. Cells develop into tissues with specialized structure and function through the process of:
   a. differentiation.
   b. proliferation.
   c. endocytosis.
   d. exocytosis.

   Answer: a

3. The cell's typical response to a decrease in trophic signal is:
   a. atrophy.
   b. hypertrophy.
   c. hyperplasia.
   d. phagocytosis.

   Answer: a

4. Cell death by necrosis is:
   a. the cell's way of replacing aged cells with new cells.
   b. also known as programmed cell death.
   c. often a response to inflammation.
   d. commonly seen during the period of embryo development.

   Answer: c

5. You are caring for a female patient who has reported a noticeable decrease in breast size and muscle mass. Which of the following conditions and causes is the most likely explanation?

a. Puberty
b. Pregnancy
c. Menopause
d. Acromegaly

Answer: c

6. The changes seen in cells adapting to stressors that promote metaplasia:
   a. are irreversible.
   b. can result in cancer.
   c. change from one cell type to another.
   d. show abnormal differentiation

   Answer: c

7. Cellular atrophy results in:
   a. increase in tissue volume due to increase in cell number.
   b. increase in tissue volume due to increase in cell size.
   c. decrease in tissue volume due to decrease in cell size.
   d. no change in tissue volume.

   Answer: c

8. Treatment of chronic conditions associated with cerebral atrophy:
   a. are effective at restoring neuronal function.
   b. are targeted toward slowing neuronal injury and atrophy.
   c. are best initiated when advanced signs and symptoms are evident.
   d. are not indicated.

   Answer: b

9. Which of the following hormones is secreted from the anterior pituitary?
   a. Growth hormone

b. Somatostatin
c. Growth hormone–releasing hormone
d. Insulin-like growth factor 1

Answer: a

10. Which one of the following is a diagnostic test for cervical dysplasia?
a. Liquid-based Pap cytology
b. Conventional Pap cytology
c. Cervical punch biopsy
d. HPV testing

Answer: c

11. Which of the following reactive oxygen species is scavenged by catalase?
a. Hydroxyl radical
b. Peroxynitrite
c. Superoxide
d. Hydrogen peroxide

Answer: d

12. Which of the following terms describes cells that are enlarged, with darkened nuclei and abnormal chromatin?
a. Hyperplastic
b. Dysplastic
c. Metaplastic
d. Aplastic

Answer: b

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Vercellino M, Bezante GP, Balbi M. (2009). Contrast medium induced nephropathy: new insights into prevention and risk management. Cardiovasc Hematol Agents Med Chem, 7(2), 166-80.

Additional Exercises for the Instructor's Resource: Brownstone Test Generator (25-30 questions), Additional Case Studies (1-3), Additional Learning Activities (worksheets or other application exercises)

Multiple Choice

1. This is defined as fully differentiated body parts with specialized functions.
a. Cell
b. Organ
c. Tissue
d. System

Answer: b

2. Which of the following is characteristic of the plasma membrane?
a. Contains a single layer of lipids with polar heads
b. Contains a single layer of lipids with nonpolar heads
c. Contains a bilayer of lipids with polar heads
d. Contains a bilayer of lipids with nonpolar heads

Answer: c

3. Receptors that project into either the intracellular or the extracellular environments are known as:
a. transmembrane proteins.
b. integral proteins.

c. peripheral proteins.
d. channel proteins.

Answer: c

4. The organelle responsible for synthesis of proteins by bound ribosomes is called the:
a. rough endoplasmic reticulum.
b. smooth endoplasmic reticulum.
c. Golgi apparatus.
d. proteasome.

Answer: a

5. Which one of the following is part of the cellular cytoskeleton?
a. Mitochondria
b. Gene
c. Cytoplasm
d. Actin

Answer: d

6. The transport mechanism requiring energy is:
a. diffusion.
b. osmosis.
c. facilitated diffusion.
d. primary active transport.

Answer: d

7. Phagocytosis is an example of which type of cellular function?
a. Ingestion
b. Respiration

c. Communication
d. Reproduction

Answer: a

8. Which form of signal transduction resulting from ligand–receptor binding has thepotential to produce effects in the entire body system?
a. Endocrine
b. Paracrine
c. Autocrine
d. Local mediation

Answer: a

9. What is the process that makes cells with the same genetic material develop intospecific cell types?
a. Reproduction
b. Differentiation
c. Prophase
d. Meiosis

Answer: b

10. Reduction in functional demand leads to cellular:
a. atrophy.
b. hypertrophy.
c. hyperplasia.
d. dysplasia.

Answer: a

11. Increase in functional demand resulting in increased cell size is:
a. atrophy.

b. hypertrophy.
c. hyperplasia.
d. dysplasia.

Answer: b

12. Increase in functional demand resulting in increased cell number is:
a. atrophy.
b. hypertrophy.
c. hyperplasia.
d. dysplasia.

Answer: c

13. Due to a persistent stressor, columnar cells may turn into squamous cells as a method of adaptation. This process is known as:
a. metaplasia.
b. dysplasia.
c. anaplasia.
d. hyperplasia.

Answer: a

14. Cell death associated with inflammation is known as:
a. mitosis.
b. dysplasia.
c. apoptosis.
d. necrosis.

Answer: d

15. Damage to cells resulting from frostbite is classified as which type of injury?

a. Mechanical
b. Thermal
c. Chemical
d. Endogenous

Answer: b

16. The permanent cessation of menses is known as:
a. perimenopause.
b. climacteric.
c. menopause.
d. menarche.

Answer: c

Short Answer

17. Identify the factor that differentiates gigantism from acromegaly.
Answer: Gigantism is due to hormone-stimulated excessive growth before epiphyseal growth plate closure. Acromegaly is due to hormone-stimulated excessive growth afterepiphyseal growth plate closure.

18. What are the similarities and differences between mitosis and meiosis?
Answer: Mitosis is the process of somatic cell division leading to the production of two genetically identical daughter cells containing 23 pairs of chromosomes. Meiosis is the process of the division of gametes, producing genetically variable cells each containing 23 single chromosomes.

19. Distinguish the differences between typical patterns of altered menstruation seenduring the gradual transition to menopause.
Answer: Menorrhagia is excessive flow or prolonged duration of flow; metrorrhagia is irregular menstrual intervals; metromenorrhagia is a

shortened menstrual interval accompanied by heavy bleeding; polymenorrhea refers to shortened menstrual interval.

20. List the three criteria used in the treatment of menopausal symptoms.
Answer: Severity of symptoms; short-term treatment duration; lowest effective dosage ofpharmacologic treatment.

21. Distinguish between primary and secondary forms of cardiac hypertrophiccardiomyopathy. What are the similarities? What are the differences?
Answer: Primary hypertrophic cardiomyopathy results from an inherited genetic autosomal dominant trait. Secondary hypertrophic cardiomyopathy is due to an underlying condition, such as hypertension. Both conditions promote hypertrophy ofcells in the left ventricle due to increased workload. Primary hypertrophic cardiomyopathy most often causes manifestations in young individuals. Secondary hypertrophic cardiomyopathy most often causes symptoms in older individuals.

22. How does treatment for hypertension improve secondary hypertrophiccardiomyopathy?
Answer: Treatment of hypertension reduces outflow obstruction in the aorta, reducingventricular workload.

23. Describe the effect of hormonal fluctuations on the cervical transformation zone.
Answer: The transformation zone, also known as the squamocolumnar junction, is the location of the merger of the squamous cells of the ectocervix and the columnar cells ofthe cervical canal. The transformation zone migrates from inside the endocervical canalto the ectocervix under high estrogen conditions and recedes into the endocervical canalunder conditions of low estrogen.

24. List three risk factors that increase the risk for the development of cervical cancer.

    Answer: Early age of sexual activity onset, multiple sexual partners, exposure to oncogenic forms of the human papillomavirus (HPV) and smoking.

25. What are the differences between screening and diagnostic tests? Provide examples of one screening and one diagnostic test for cervical cancer.

    Answer: A screening test suggests the presence of disease, while a diagnostic test confirms the presence of disease. The Pap smear and HPV testing are considered screening tests for cervical cancer. Diagnostic tests for cervical cancer include colposcopy and biopsy of cervical tissue.

26. Describe how toxins in the air contribute to cardiovascular disease.

    Answer: Toxic substances in the air lead to physical cellular injury leading to disease and illness. Airborne particulate matter causes oxidative damage in the heart and blood vessel cells.

Reference Case Study 3

Carole is a 60-year-old Caucasian housewife born and raised in Des Moines, Iowa, who presents to her primary care clinic with concerns regarding shortness of breath. She undergoes a chest x-ray and is told that she has lung cancer. Lung cancer is the leading cause of cancer death among nonsmokers in the United States. When she asked why she might have developed lung cancer since she never smoked, she is told radon is responsible for about 21,000 lung cancer deaths every year. Radon is a tasteless, odorless, invisible radioactive gas that is estimated to cause thousands of cancer deaths each year. Radon in soil and water enters homes through cracks and gaps in a home's foundation, floor, and walls.

1. What adaptations are the cells likely to make in response to the stressor of radon exposure?

   Answer: Cells will likely undergo metaplasia as an initial response to the stressor.

2. What is the most likely cause of cellular damage due to radon?

   Answer: Radiation and chemical injury are the most likely causes of cellular damage resulting from radon exposure. Radon gas inhaled into the lungs decays into radioactive particles causing DNA damage. Damaged cells are reproduced leading to tissue and organ damage. The chronic exposure over a long period of time results in dysplasia, with progressive loss of differentiation leading to carcinoma.

3. What risk factors were mentioned in this case study related to radon exposure?

   Answer: Long-term exposure to radon due to increased time in the home as a housewife and age. Iowa also has the highest average radon concentration in the United States.

4. What lab tests can be used to identify the expected adaptations?

   Answer: Sputum samples may be used as a screening test to identify suspected damage to lung cells. Tissue samples obtained by biopsy may be used to diagnose lung cancer.

Reference Case Study 4

James is a 52-year-old black male who presents to the clinic for a checkup for his diabetes. He tells the doctor that he has noticed that his feet have been getting numb and cold, causing him annoyance and irritation. The pulses in James' feet are faint, and they are pale in color. James is diagnosed with vascular insufficiency secondary to consequences of his diabetes.

1. What is the most likely cellular stressor and injury type that may result from vascular insufficiency?
   Answer: Vascular insufficiency leads to reduced blood flow to cells and tissues. Deficit injury to cells is the likely result of ischemia due to reduced oxygen supply.

2. What other form of cellular injury may result from ischemia?
   Answer: Free radical injury resulting from cellular exposure to reactive oxygen species secondary to ischemia may enhance damage to cells and tissues. Impaired cellular oxygenation may impair mitochondria's ability to produce ATP for cellular metabolic and active transport processes. Accumulation of cellular metabolites may also worsen cellular damage.

3. What signs and symptoms did James manifest that suggested vascular insufficiency?
   Answer: Symptoms included feelings of numbness and coolness of feet. Signs included pale color and faint arterial pulses.

4. What other symptom might be likely result from chronic ischemia?
   Answer: Impaired oxygenation is likely to cause pain.

5. What is the likely result of chronic ischemia?
   Answer: Impaired healing of injury and necrotic cell death is a likely risk from prolonged exposure to oxygen deprivation and ischemia.