Pathology (Neoplasm)

Test Bank

By: Shahd Alahmad

- **A 44-year-old woman notes a lump in her left breast while taking a shower. The nurse practitioner palpates a 3 cm firm, irregular, non-movable mass in the upper outer quadrant of her left breast on physical examination. A fine needle aspiration of this mass is performed, and cytologically the cells are consistent with infiltrating ductal carcinoma. The mass is removed with lumpectomy along with an axillary sentinel lymph node sampling. Which of the following findings will best predict a better prognosis for this patient?**

A Tumor cells strongly estrogen receptor positive

B No metastases in the sampled lymph nodes

C Flow cytometric analysis with aneuploidy and a high S-phase

D One relative who had a similar type of breast cancer

E High cytologic tumor grade

(B) CORRECT. The lack of metastases suggests a lower stage and a better prognosis. In general, stage is a better indicator of prognosis than grade. In general, low stage cancers are more amenable to surgical resection and chance for cure.

- **A change in bowel habits prompts a 53-year-old woman to see her physician. On physical examination there are no lesions noted on digital rectal examination, but her stool is positive for occult blood. A colonoscopy is performed and reveals a 6 cm friable exophytyic mass in the cecum. A biopsy of this mass is performed and microscopic examination shows a moderately differentiated adenocarcinoma. Which of the following laboratory findings is most likely to be present in this patient?**

A K-RAS mutation in the neoplastic cells

B Neoplastic cells positive for vimentin

C Stool culture with *Shigella flexneri*

D Presence of HIV-1 RNA

E DNA topoisomerase I autoantibody

(A) CORRECT. Many human carcinomas are associated with RAS mutations that contribute to oncogenesis. Many types of mutations can be present, and in general multiple mutations are present. Sporadic cancers in adults can have many of the same mutations, such as APC and mismatch repair, that are found in familial cancers, but they are aquired and not inherited.

- **An experiment is conducted in which proliferating cells are subjected to ionizing radiation. The ionizing radiation leads to arrest in a checkpoint that monitors completion of DNA replication. It is observed that there are increased numbers of chromosomal abnormalities in these cells. Which of the following is the checkpoint affected by the ionizing radiation?**

A G_0/G_1

B G_1/S

C S/G_2

D G_2/M

E M/G_0

(D) CORRECT. This is the second checkpoint in the cell cycle; ionizing radiation activates this checkpoint, resulting in chromosomal abnormalities in mitosis.

- **A clinical study is performed to determine the incidence of cancers in different countries. The data show that persons born in Japan and continuing to reside there have an increased risk for a certain type of cancer. A risk factor of *Helicobacter pylori* infection is postulated. Which of the following cancers is most likely seen with increased frequency in this population?**

A Breast

B Colon

C Lung

D Stomach

E Uterus

(D) CORRECT.

- **A 48-year-old woman has a routine physical examination. A 4 cm diameter non-tender mass is palpated in her right breast. The mass appears fixed to the chest wall. Another 2 cm non-tender mass is palpable in the left axilla. A chest radiograph reveals multiple 0.5 to 2 cm nodules in both lungs. Which of the following TNM classifications best indicates the stage of her disease?**

A T1 N1 M0

B T1 N0 M1

C T2 N1 M0

D T3 N0 M0

E T4 N1 M1

(E) CORRECT. She has a large invasive (high T) primary tumor mass with axillary node (N > 0) and lung (distant) metastases (M1).

- **A study is performed to analyze characteristics of malignant neoplasms in biopsy specimens. The biopsies were performed on patients who had palpable mass lesions on digital rectal examination. Of the following microscopic findings, which is most likely to indicate that the neoplasm is malignant?**

A Pleomorphism

B Atypia

C Invasion

D Increased nuclear/cytoplasmic ratio

E Necrosis

(C) CORRECT. Metastasis would be an even better indicator, but invasion of adjacent tissues suggests malignancy more than the other items listed here. Size increasing beyond 1 cm is also a risk for malignancy in a colonic polypoid lesion.

* باقي الخيارات كلها إما ليست خاصة in malignancy أو انها ليست أهم ميزة مثل ما طلب السؤال .

- **A 61-year-old man has a screening colonoscopy performed. A 2.7 cm polypoid mass in the rectum is biopsied and diagnosed as grade I on a scale of I to III, and assessed as stage I disease. Which of the following is the best interpretation of these findings in this man?**

A Unlikely to be malignant

B Arising from epithelium

C May spread via lymphatics and bloodstream

D Has an in situ component

E Well-differentiated and localized

(E) CORRECT. A well-differentiated (low grade) and localized (lower stage) malignant neoplasm often has both a low grade and low stage. In such cases surgery to excise the lesion is more likely to be curative.

- **A child is born with a single functional wild type allele of a tumor suppressor gene. At the age of five the remaining normal allele is lost through a point mutation. As a result, the ability to inhibit cell cycle progression until the cell is ready to divide is lost. Which of the following neoplasms is most likely to arise via this mechanism?**

A Breast ductal carcinoma

B Pulmonary small cell anaplastic carcinoma

C Ocular retinoblastoma

D Cerebral astrocytoma

E Chronic myeloid leukemia

(C) CORRECT. The RB gene is the classic example of the 'two hit' mechanism for loss of tumor suppression. About 60% of these tumors are sporadic, while others are familial, and there is inheritance of a mutated copy of the RB gene. Loss of the second copy in retinoblasts leads to the occurrence of retinoblastoma in childhood.

- **A 22-year-old woman goes to her physician for a routine examination. A palpable nodule is found in the right lobe of her thyroid gland. No lymphadenopathy is noted. A chest x-ray shows no masses. A fine needle aspirate of the nodule is performed and cytologic examination reveals cells present consistent with a papillary carcinoma of the thyroid. There are no other family members affected by this disorder. She works as an administrator for an accounting firm part time and is earning a college degree. Which of the following findings would you consider most relevant in her past history to indicate a risk factor for this neoplasm?**

A Chronic alcoholism

B Radiation therapy in childhood

C Ataxia telangiectasia

D Blunt trauma from a fall

E Occupational exposure

(B) CORRECT. Radiation is oncogenic. Cancers of thyroid and bone often develop in children with radiation exposure. Leukemias can occur as well.

face and neck might lead to thyroid cancers الدكتورة ذكرت بالسلايدات انه العلاج في منطقة الـ

- **A 50-year-old man has felt vague abdominal discomfort for the past 4 months. On physical examination he has no lymphadenopathy, and no abdominal masses or organomegaly can be palpated. Bowel sounds are present. An abdominal CT scan shows a 20 cm retroperitoneal soft tissue mass obscuring the left psoas muscle. A stool specimen tested for occult blood is negative. Which of the following neoplasms is this man most likely to have?**

A Melanoma

B Hamartoma

C Adenocarcinoma

D Lymphoma

E Liposarcoma

(E) CORRECT. Sarcomas are big and bad. They arise in soft tissues derived from mesenchymal (connective) tissues. Retroperitoneum is a typical location for a sarcoma arising in an adult. Sarcomas are much less common than carcinomas in adults.

- **A 52-year-old man has had increasing fatigue for the past 6 months. On physical examination he has a palpable spleen tip. Laboratory studies show a WBC count of 189,000/microliter. The peripheral blood smear shows many mature and immature myeloid cells present. Cytogenetic analysis of cells obtained via bone marrow aspiration reveals a t(9:22) translocation. This translocation leads to formation of a hybrid gene that greatly increases tyrosine kinase activity. Which of the following genes is most likely translocated to cause these findings?**

A p53

B RB

C ABL

D NF-1

E RAS

(C) CORRECT. This is the 'Philadelphia chromosome' of chronic myelogenous leukemia (CML)

- **A clinical study is performed of oncogenesis in human neoplasms. It is observed that some neoplasms appear to develop from viral oncogenesis, with serologic confirmation of past viral infection. Which of the following neoplasms is most likely to arise in this manner?**

A Retinoblastoma

B Small cell anaplastic carcinoma

C T-cell leukemia

D Prostatic adenocarcinoma

E Hepatic angiosarcoma

(C) CORRECT. Human T-lymphocytotropic virus (HTLV) infection can lead to T-cell leukemia. However, few human cancers arise as a result of viral oncogenesis. Some viruses, such as hepatitis viruses B and C, result in cellular proliferation that increases the risk for subsequent mutations that drive carcinogenesis.

- **A 64-year-old man has noted a 5 kg weight loss along with increasing fatigue over the past year. He has experienced dull abdominal pain for the past week. He has developed abdominal distention with lack of stools in the past two days. On physical examination, bowel sounds are reduced. An abdominal CT scan reveals a mass involving the descending colon. At laparotomy, a partial resection of the left colon is performed, with removal of an encircling mass. Microscopically, the mass is found to be a moderately differentiated adenocarcinoma. Which of the following laboratory test findings is related to this mass and most likely to be present in this man?**

A Microcytic hypochromic anemia

B Positive antinuclear antibody test

C Hyperglycemia

D Elevated alpha-fetoprotein

E Decreased lactate dehydrogenase

(A) CORRECT. He has an adenocarcinoma of the colon. Such lesions are often associated with blood loss from mucosal erosion and necrosis. Cancer cells are less differentiated and less functional than their normal cell of origin and thus less functional. With poor construction come many problems.(common consequence of chronic blood loss from the gastrointestinal tract)

- **A 60-year-old man who has a 90 pack year history of cigarette smoking has had a chronic cough for the past 10 years. He has begun to lose weight (3 kg) during the past year. No abnormal findings are noted on physical examination. He has a chest radiograph that reveals a right hilar mass. A sputum cytology shows atypical, hyperchromatic squamous cells. What is the most common initial pathway for metastases from this lesion?**

A Bloodstream

B Pleural cavity

C Contiguous spread to chest wall

D Lymphatics

E Bronchi

(D) CORRECT. Epithelial malignancies such as a squamous cell carcinoma of the lung often have non-contiguous (metastatic) spread initially to regional lymph nodes. This is important to determine for staging, because the treatment and prognosis depend upon accurate staging. Lymph node metastases or hematogenous metastases imply the malignancy is systemic and local excision of the lung mass will not be curative.

- **A 55-year-old man has had malaise and a 4 kg weight loss over the past 6 months. On physical examination his stool is positive for occult blood. An abdominal CT scan shows his liver contains multiple tumor masses from 2 to 5 cm in size with central necrosis. The surrounding hepatic parenchyma appears normal. Which of the following characteristics of neoplasia is best illustrated by these findings?**

A Multicentric origin

B High tumor grade

C Primary neoplasm in the stomach

D Exposure to a carcinogen

E Advanced stage

(E) CORRECT. The most likely possibility is that these masses represent metastases from a primary site elsewhere in the body, likely the colon because of blood in the stool. Thus, this is a malignant neoplasm that has an advanced stage (M1). The central necrosis is the result of tumor necrosis with collapse of a tumor nodule.

- **A 59-year-old man has had a worsening cough with chest pain for the past 6 months. On physical examination he has no remarkable findings. A chest x-ray shows a 3 cm left lung mass. A sputum cytology specimen yields cells diagnosed as a squamous cell carcinoma. A mediastinoscopy is performed and reveals metastases in a lymph node. He is given radiation therapy, and the mass diminishes in size. Which of the following cellular mechanisms is most likely to account for this tumor response?**

A Point mutations in DNA

B Generation of free radicals

C Loss of the blood supply

D Secondary inflammation

E Adenosine triphosphate depletion

(B) CORRECT. The purpose of therapeutic radiotherapy is to try and kill more neoplastic cells than normal cells. This is mediated mainly through direct damage to the cells and one mechanism is generation of oxidant free radicals. Cancer cells are more vulnerable than normal cells.

- **A 15-year-old boy has felt lumps in his right neck for the past 5 months. On physical examination there is painless lymphadenopathy in the right cervical region. One of the lymph nodes is biopsied and on microscopic examination shows effacement of the nodal architecture by many lymphocytes that are large, with clumped chromatin and occasional mitoses. The characterization of this population of lymphocytes as a neoplasm is best accomplished by which of the following methods?**

A Serum acute phase reactant measurement

B Immunohistochemical markers of clonality

C Flow cytometry indicating high S-phase

D Differential white blood count showing a lymphocytosis

(B) CORRECT. Clonality is a key characteristic of neoplastic cellular proliferations that distinguishes them from reactive proliferations (such as inflammation).

- **A 27-year-old woman in excellent health has a routine health maintenance examination. A 2 cm firm, rounded mass is palpable beneath the skin of the left forearm. She has no difficulty using the arm and there is no associated pain with the mass, either in movement or on palpation. The overlying skin appears normal. The mass does not change in size over the next year. Which of the following neoplasms is she most likely to have?**

A Metastatic carcinoma

B Melanoma

C Rhabdomyosarcoma

D Lipoma

(D) CORRECT. The small size of the lesion, the relatively young age of the patient, and the lack of other findings suggests a benign process. Lipoma is the most common soft tissue neoplasm. Most of them never reach a size sufficient to produce problems.

- **A 73-year-old man has an episode of hematemesis. Upper GI endoscopy reveals an irregular 4 cm gastric antral ulceration. Biopsies are performed and microscopically reveal crowded irregular gland-like collections of cells with hyperchromatism and pleomorphism. Molecular analysis shows DNA hypermethylation of the CDKN2 complex. Through which of the following mechanisms has this abnormal gene expression most likely occurred?**

A Amplification

B Epigenetic alteration

C Growth factor binding

D Point mutation

(B) CORRECT

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لَا عِينَ لِلَحْظِ إنْ لَمْ تُبصرِ الْهِمَمُ

- **In an experiment, it is observed that chronic, increased exposure to ionizing radiation results in damage to cellular DNA. As a consequence, a protein is now absent that would arrest the cell in the G1 phase of the cell cycle. Subsequent to this, the cell is transformed to acquire the property of unregulated growth. The absent protein is most likely the product of which of the following genes?**

A *RAS*

B *TP53*

C *MYC*

D *ABL*

E *BCL-2*

(B) CORRECT. Loss of wild type *TP53* tumor suppressor genes with altered p53 protein expression has been identified in many carcinomas

- **A 50-year-old woman notes a lump in her breast. Her physician's assistant palpates a 2 cm firm mass in her left breast. A fine needle aspiration biopsy is performed, and on microscopic examination a carcinoma is present. Molecular analysis shows HER2 positivity but estrogen receptor negativity in these malignant cells. Through which of the following mechanisms has this abnormal expression most likely occurred?**

A Amplification

B Epigenetic alteration

C Growth factor binding

(A) CORRECT. Amplification of gene expression typically occurs when there is reduplication of DNA sequences

- **A 49-year-old man complains of pain in his left thigh for 3 months. On physical examination his thigh is increased in size, compared to the right. A plain film radiograph reveals the presence of a 15 cm solid mass that does not appear to arise from bone, but it does have infiltrative margins. A biopsy of this mass is taken, and on microscopic examination the mass is composed of highly pleomorphic spindle cells. Which of the following immunohistochemical markers is most likely to be demonstrated in the cells of this mass?**

A Cytokeratin

B Factor VIII

C Alpha fetoprotein

D Lambda light chain

E Vimentin

(E) CORRECT. The location and size and histologic characteristics suggest a sarcoma. Vimentin is an intermediate filament often found in neoplasms of mesenchymal (connective tissue) origin.(refer to lec 9)

- **A clinical study is performed with patients who had a diagnosis of breast cancer. Characteristics of the grade, stage, molecular biology, and histologic type are analyzed. Of the following characteristics, which is most likely to be associated with the best prognosis for these patients?**

A. A Increased laminin receptor expression
B. C Increased aerobic glycolysis
C. D Amplification of HER2
D. E Decreased doubling time
E. F Decreased cell cycle S phase

E) CORRECT. An increased S (DNA synthetic) phase is a feature of malignancy, indicating loss of growth control with increased cell proliferation.

- **A 66-year-old man has noted darker urine for the past 2 weeks. A urinalysis shows hematuria. Cystoscopy is performed and there is a 3 cm mass in the dome of the bladder. Biopsies of the mass are taken and on microscopic examination show a urothelial carcinoma. Cells of this neoplasm demonstrate a single mutation causing cellular inability to hydrolyze GTP, thus resulting in cellular transformation. Which of the following oncogenes is most likely implicated in this case?**

A *ABL*

B *HER2*

C *PDGF*

D *RAS*

(D) CORRECT. Through mutation the RAS gene can be turned on, typically by a point mutation, to make it an oncogene.

- **In an experiment, biologic characteristics of neoplastic and non-neoplastic cells are analyzed in culture. It is observed that cell division in cells derived from malignant neoplasms, but not in normal cells, is aided by the presence of an enzyme which repairs progressive chromosomal shortening. The lack of chromosomal shortening allows the malignant cells to undergo many more divisions than the normal cells. Which of the following enzymes is most likely to have this effect?**

A Reverse transcriptase

B DNA polymerase

C Telomerase

D Protein kinase

(B) CORRECT. The telomerase synthesizes telomeric chromosomal ends

- **A 62-year-old man has complained of pain on urination for the past week. He is afebrile. On cystoscopy, a slightly erythematous 1 cm diameter area is seen on the bladder mucosa. This area is biopsied and on microscopic examination shows cells with marked hyperchromatism and increased nuclear/cytoplasmic ratio involving the full thickness of the epithelium. However, these changes are confined to the epithelium above the basement membrane. Which of the following terms best describes these biopsy findings?**

A Metaplasia

B Minimal dysplasia

C Microinvasion

D Hyperplasia

E Carcinoma in situ

(E) CORRECT.

- **A 32-year-old woman has noted dull pelvic pain for the last two months. On physical examination there is a mass palpated in the right lower quadrant. An abdominal ultrasound reveals an 8 cm mass involving the right ovary. The**

mass is surgically excised. On gross inspection, the surface of the mass is smooth and is not adherent to surrounding pelvic structure. On sectioning it is cystic and filled with hair. On microscopic examination there is squamous epithelium, tall columnar glandular epithelium, cartilage, and fibrous connective tissue. Which of the following neoplasms is she most likely to have?

A Choristoma

B Hamartoma

C Myxoma

D Teratoma

(D) CORRECT. A teratoma is a neoplasm derived from totipotential germ cells that differentiate into tissues that represent all three germ layers: ectoderm, endoderm, and mesoderm. When the elements are all well differentiated, the neoplasm is 'mature' (benign).

- **A previously healthy 67-year-old man has been feeling tired for 5 months. He goes to his physician, who performs a complete physical examination, including stool occult blood, which is positive. A colonoscopy is performed, and a large, sessile 4.5 cm mass with surface ulceration is found in the cecum. A biopsy of this mass microscopically shows irregular glands with crowded, tall columnar cells having marked nuclear hyperchromatism. Which of the following gene alterations is he most likely to have?**

A Inherited mutant *APC* gene

B Chromosome translocation with *BCR* gene

C Acquired *TP53* gene mutation

(C) CORRECT. He has an adenocarcinoma of the colon. At his age, a sporadic colon cancer is more likely, and inherited APC and HNPCC are very unlikely. It takes many years for multiple sporadic mutations to have occurred that contribute to development of most malignancies. p53 mutations are found in many carcinomas.

- **An 81-year-old man has a routine physical examination and a stool sample is positive for occult blood. He undergoes colonoscopy and a 5 cm sessile mass is present in the sigmoid colon. Biopsy of the mass yields a diagnosis of adenocarcinoma. A chest x-ray shows multiple 1 to 3 cm nodules in both**

lungs. An alteration in which of the following molecular components in the neoplastic cells is most likely to explain the formation of lung nodules?

A Vimentin

B Leukocyte common antigen

C Beta-catenin

(C) CORRECT. Beta-catenin can locate to the nucleus to drive cellular proliferation, Mutations of the beta-catenin gene, or in genes such as APC that produce proteins that downregulate beta-catenin, will favor carcinogenesis

- **A clinical study is performed involving children who have developed skin cancers, including squamous cell carcinomas and basal cell carcinomas. Molecular analysis of their cancer cells shows defective DNA repair from loss of nucleotide excision repair gene expression. Which of the following genes is most likely mutated in these children?**

A *APC*

B *BRCA2*

C *MSH2*

D *NF1*

E *TP53*

F xeroderma pigmentosa (XP) genes

(F) CORRECT. There are multiple xeroderma pigmentosa (XP) genes, from XPA to XPG and XPV. Sunlight exposure with ultraviolet radiation induces pyrimidine dimer formation that is ordinarily countered through the action of excision repair gene products

- **A study of malignant neoplasms reveals that some of them have a greater potential for invasion and metastases. Analysis of the cells of cancers that have metastasized reveals a mutation which results in decreased cell surface expression of E-cadherin. Which of the following genes is most likely mutated to produce these findings?**

A *Beta-catenin*

B *BRCA-2*

C *Cyclin D*

D *NF-1*

(A) CORRECT. Beta-catenin binds to the intracellular portion of cadherins, which anchor cells together, and the loss of this function results in less cell adhesiveness that favors tumor cell infiltration and metastases

- **A 59-year-old woman has a screening mammogram that identifies a suspicious 3 cm mass in her right breast. Fine needle aspiration biopsy is performed and malignant cells are present. Excisional biopsy is performed and molecular analysis of the malignant cells shows that they are estrogen receptor positive. In addition to anti-estrogen therapy, a biotherapy with monoclonal antibody targeting the G1 phase of the cell cycle involves which of the following targets and may be useful in treating this woman?**

A CDK4

B BCR-ABL

C HER2

(A) CORRECT. Cyclin-dependent kinases (CDKs) promote transition through the cell cycle, and may neoplastic are dependent upon the G1 phase of the cell cycle.

- **In an experiment carcinoma cells are observed to evade immune destruction by lymphocytes which have been stimulated to proliferate. Which of the following mechanisms is most likely to provide the tumor cells with the capacity to evade immune destruction by lymphocytes?**

A Downregulation of MHC Class I expression ((A) **CORRECT**. Tumor cells may not express normal levels of MHC class I molecules to reduce attack by cytotoxic T cells.)

B Expression of oncofetal antigens ((B) Incorrect. Expression of oncofetal antigens is a characteristic for cancer cells and may help in recognizing 'tumor markers' for diagnosis.)

C Formation of blocking antibodies ((C) Incorrect. Tumor cells do not produce antibodies (unless they are myeloma cells, but such antibodies would not block immune attack).

D Inhibition of regulatory T cells (Tregs) ((D) Incorrect. Tumor cells may upregulate Tregs which keep the immune response in check.

E Upregulation of caspase production(Incorrect. Caspases may be produced in apoptosis, and it would be useful to develop a tumor therapy where apoptosis was increased. Tumor cells may survive by reducing apoptotic pathways.)

وَآخِرُ دَعْوَاهُمْ أَنِ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ

اللهم يسرنا لليسرى وجنبنا العسرى واغفر لنا في الآخرة والأولى واجعلنا من أئمة المتقين :)

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