Name: _____
Score: _____ / _____

Quiz 10 on Cancer Biology

Part 1

Environmental and genetic changes are associated with carcinogenesis. Since many cancers exhibit a 'field effect', many normal-appearing cells in a target tissue or organ may have elevated malignant potential. This is consistent with

- A. that most cancers start with many cells collectively to form a tumor
- B. the fact that there is nothing anyone can do to prevent cancer or to treat it once it occurs
- C. a molecular genetics view of cancer from a monoclonal progression
- D. ancient Chinese herbal medicine
- E. the observation that cancer does not have a genetic component

There have been genes that have been identified to be associated with certain types of cancer. Microarrays or biochips have been used to examine differences in RNA population in cancer v non-cancerous cells. Human cancer genes of special interest are

- A. genes that are causally linked to cancer development or oncogenesis
- B. now being investigated in cloned humans who have had these genes removed from their genome
- C. only simple somatic cell mutations
- D. currently only those involved with breast cancer
- E. those that have been introduced by genetic engineering

Are there chemical or environmental factors which can cause cancer? How do they work? There are many causes of cancers, including:

- A. Benzene and other chemicals
- B. Drinking excess alcohol
- C. Smoke inhalation (tobacco)
- D. Exposure to environmental toxins
- E. all of these may be involved

How tumors develop is an intense area of cancer research. A single tumor is a heterogenous mass of different cell types. As cancer develops, cells re-colonize previously normal tissues in a process called metatasis. How are certain signals perceived by cells? Motion in living cells or creatures which is directed by chemical signals and undirected by any choice or goal is known as;

- A. being untrue in nature
- B. random walk
- C. intelligent design
- D. chemotaxis
- E. ecological feedback

How a spider makes its web is indeed an amazing phenomenon. Just how smart is that spider to figure this out? Remember the idea of emergence that makes fractals or snowflakes appear very complicated when actually the patterns are based on very simple if/then rules. A cancer cell can ”outsmart” the body's immune system because:

- A. the cancer cell actually has a higher IQ that most college freshmen
- B. cancer cells have learned how to receive this knowledge to mutate from universal teachings
- C. the cancer cell generates a natural form of LSD
- D. feedback and signaling pathways in biochemical networks involve an underlying series of relatively simple if/then rules
- E. complex cellular behavior of cancer is outside the realm of biology and is because of consciousness and purposefulness of the cancer cells in a tumor

Although most cancers originate from a single cell, the frequency of the possibility is increased as whole tissues are exposed to carcinogens. Since many cancers exhibit a 'field effect', elevated malignant potential across a target tissue or organ can be seen in which of the following examples:

- A. smokers' lungs
- B. HPV infected uterine cervix or esophagus
- C. exposure to environmental air-borne toxins
- D. sun-exposed skin from UV light
- E. all of these examples exhibit field effects

Biopsy and histology has been an effective tool for staging of colon cancer using Dukes' staging. This type of staging works well only for very good / very poor prognosis patients (Dukes' stage A and D), but it is not very informative when predicting long-term outcomes of intermediate prognosis patients (Dukes' stage B and C). A bigger problem is that a biopsy and a Dukes' classification provides only a single snapshot in time… within the long natural history of a colon tumor (until the day of biopsy). Molecular staging in colon cancer may have the following implications:

- A. directly cause an increase in health care costs and therefore be prohibitive
- B. cancer diagnostics will be in the control of the big pharmaceutical companies who will prefer to keep it secret because it will decrease the sales of their most effective chemotherapies and decrease sales.
- C. the process itself may cause cancer
- D. there will be an increase of misdiagnosis
- E. may provide more accurate and early predictions of patient outcome than is currently possible with clinical staging

Some cancers may be preventable. The organ of origin which is the leading cause of cancer deaths in the US per year is

- A. Lung and bronchus (male and female, ~90,000 and 73,000)
- B. breast (female, ~211,000)
- C. pancreas (male and female, ~650,000)
- D. prostate (male, ~ 232,000)
- E. colon (male and female, ~1,450,000)

The growth of blood vessel is known to have a strong influence on tumor growth. AVASTIN is a very effect anti-cancer recombinant DNA drug that as an antibody reacts with VEGF to inhibit tumor

- A. transcription
- B. origins
- C. angiogenesis
- D. DNA synthesis
- E. protein production

Most cancers are derived from a single cell which has accumulated enough mutations to perturb the normal cell cycle for division. The origin of cancer is called

- A. carcinogenisis
- B. cellular dystrophy
- C. a benign tumor
- D. metastasis
- E. angiogeniesis

The USS John Harvey, an American ship in Bari Harbor, carried a highly classified load of 2,000 100-lb mustard bombs on Dec 2, 1943 when a German raid damaged 17 ships, including the Harvey. Fire on the Harvey caused a mustard gas-laden smoke that spread quickly. 617 mustard gas poisoning cases among troops and merchant marine seamen occurred. Studies of mustard gas by two young assistant professors in Yale's new Department of Pharmacology, Louis S. Goodman, M.D., and Alfred Gilman, Ph.D had already shown interesting biological effects of mustard gas that eventually lead to the development of

- A. stem cell therapy
- B. gene therapy
- C. chemotherapy
- D. molecular staging
- E. radiation therapy

Cells can generate mutations during DNA replication and cell division. Some of these changes can occur in genes which control and regulate cell division causing cell to enter uncontrolled cell division resulting in tumors. Cancer grows

- A. as a result of metabolic pathways which have become non-biologically re-directed in tumor cells
- B. from whole organs, such as lung or breast cancer where every cell is affected at once causing the organ to become a tumor
- C. out of normal cells in the body, usually originating form a single cell
- D. from sources which are non-biological in origin and still totally unknown
- E. as a consequence of 'sinful' behaviors, which can be prevented as lifestyle choices

How do cancer cells spread through the body? Malignant tumors can invade nearby parts of the body. The malignant cancer may also spread to more distant parts of the body through the lymphatic system or bloodstream. This process is usually very difficult to treat and is a phase of cancer development called:

- A. catabolic carcinoma
- B. metastasis
- C. metabolic dystrophy
- D. metaphase
- E. bloodstream carcinoma distribution

The frequency of certain cancers in the United States have changed over time. For example, stomach cancer rates dropped significantly after 1938, possibly because of the widespread use of refrigeration for foods resulting in a drop in microorganism which may have stimulated stomach cancers. Which type of cancer (as described by the organ of origin) has caused the most cancer deaths in the US per year and increased most dramatically between 1960 and 1990, but then dropped most significantly since 1990?

- A. Pancreas
- B. Prostrate
- C. Breast
- D. Lung and bronchus
- E. Colon

Progress in cancer diagnosis has occur from the use of a microscopic view of the histological appearance of tumors in biopsies to a molecular view of analyzing the genes that are expressed or not expressed in tumors can be done now by

- A. conducting a 'Southern blot' on the patient's DNA
- B. sequencing all of the genes in the patient's normal cells
- C. comparing all the genes of a patient to a healthy individual
- D. generating a genomic sequence analysis and/or a molecular profile on a GeneChip (microarray)
- E. using electron microscopy on single tumor cells

Tumors are often comprised of diverse cell types. Tumors were long thought to evolve in a linear fashion as a single cell acquired growth-spurring mutations and dominated the final mass. But now studies indicate that in many tumors, cells branch off and form a diverse tumor cell lineage with cells that may evade treatment. The most likely cause for this may be because

- A. the outside of the cell purposely adapts to the selective pressure of the chemotherapy
- B. of non-biological conditions that are still totally unknown
- C. of subsequent fungal infections in the patient
- D. cancer cells keep changing, undergoing secondary mutations, and evolving in the tumor
- E. the cancer cells develop immunity to chemotherapy trying to evade it.

One of the standards of care in cancer treatments include the use of chemotherapy. Chemotherapies were first developed in the 1940s to stop the rapid growth of tumor cells. Many of the small molecule chemical drugs still used in modern chemotherapy are

- A. no longer developed by large pharmaceutical companies
- B. only placebos
- C. totally ineffective
- D. cytotoxic (kill fast growing cells)
- E. free of all side effects

In the brief time you have to read these questions, ~60 more Americans will lose their fight with Cancer… One per minute… Every minute… Every hour… ~1500 more victims each day. Most of us know someone who has been touched by this disease and the socio-economic burden to the country is large. The financial costs of cancer per year in the US, according to NIH estimates are

- A. $300.0 million
- B. $189.8 billion
- C. over ten times the cost of the National debt
- D. unable to be determined
- E. $156.1 trillion

Many different genes have been linked to cancer by identification of mutations in primary human tumors. These genetic changes in DNA linked to cancer include

- A. Deletions/insertions/frame shifts
- B. Translocations
- C. all of the types of mutations described in the other answers
- D. Point mutations; those that are activating or inactivating
- E. Aneuploidy (an extra chromosome)

Avastin is a humanized antibody that binds the peptide factor VEGF with a half-life in humans of 17-21 days. This drug is produced from a cloned segment of DNA that has been introduced into cell culture to make a stable transgenic cell line. These cells are then grown in large fermentors that are then harvested and the antibody is then purified through biomanufacturing processes. This purified antibody is sold as the drug Avastin which when introduced into the patient will cause

- A. The neutralization of VEGF that reduces or eliminates the ongoing angiogenesis in tumors
- B. Metastasis
- C. Tumors to stop replicating their DNA
- D. Debilitating side effects, such as paralysis
- E. a shortened death process