Science
eLearning
Ms. Hammond

Name_____
Date_____

In the event that ACAS is closed due to inclement weather, students are expected to complete the assignments listed below. Should students have questions regarding these assignments, they may contact me by e-mail (maryellenhammond@acalt.org) between 9:30 a.m-11:00 a.m. and 1:00 p.m.-2:30 p.m. to receive assistance. These assignments are due within two days of our return to school. **Failure to turn in all work within two days of returning to school will result in a zero for each day, and no seat hour will be awarded for the day(s) missed.**

Students should complete the attached worksheets.

Name Date Class Anatomy Day 1

Critical Thinking

Patient-Friendly Cancer Treatment

Activity 19

Radiation is a word that makes many people think of a bad accident at a nuclear power plant. But radiation in the form of radioisotopes is being used every day to treat cancer.

A radioisotope is a single atom of an unstable element. It is a radioactive form of an element that is made by hitting a stable element with neutrons. This usually happens in the core of a nuclear reactor or with the help of an accelerator. The use of radioisotopes in diagnosing and treating disease is called nuclear medicine. In the United States, almost one out of every three people going into a hospital is given a test or treatment that uses radioisotopes.

Pinpointing the Cancer Cells

Doctors are using nuclear medicine to develop promising treatments for cancer patients. Using radioisotopes, doctors can treat only the bad cancer cells. This is not only better for the patient, but also for destroying the cancer.

With traditional cancer treatments, patients are given drugs (known as chemotherapy) or their bodies are exposed to radiation. These treatments work by killing the cells. The problem is that they kill cancer cells and healthy cells. With nuclear medicine, doctors can target clumps of cancerous cells or tumors.

One promising form of nuclear therapy involves joining an antibody with a radioisotope. An antibody is a protein molecule that binds with a specific type of cell; in this case, cancer cells. When they are put together, the antibody and radioisotope form a cancer-fighting weapon that targets cancer cells. The antibody binds itself to the cancer cell and the radioisotope eventually breaks down. When it does, it releases radioactive energy, hopefully destroying the cancer.

Doctors are referring to these treatments as being patient-friendly because they're easier on the patient compared to whole-body radiation and chemotherapy. Whole-body radiation and many other treatments don't do much to stop a cancer patient's pain. However, studies on 150 patients who received radioisotopes showed that the treatment reduced up to 80 percent of their pain.

A Medical Shortage

There are problems, however, with nuclear therapies. Many of the radioisotopes that are used to treat cancers need to be created in a lab with special equipment. Ninety percent of medical isotopes used in the United States come from Canada and other countries. The U.S. Congress provides millions of dollars each year to the Department of Energy to fund production. The demand, however, continues to exceed the supply.

Applying Critical Thinking Skills

1. Some antibodies that are linked to radioisotopes can take 48 h to find their target cell. What problem might this cause for a cancer patient?
2. How might other diseases be treated using radioisotopes? Be specific.

Name Date Anatomy Day 2

Problem Solving

Treating Cancer with Light

Activity 22

One of the most commonly used treatments for cancer is chemotherapy. In chemotherapy, drugs are used to kill cancer cells. One drawback to chemotherapy, however, is that the patient usually gets sick. Nausea and other side effects occur because the drugs attack healthy cells as well as cancer cells.

Targeting the Cancer Cells

Medical researchers have found a way to treat some types of cancers without these side effects. The process, called photodynamic therapy (PDT), uses lasers and special drugs that change in the presence of light.

The treatment begins when patients are injected with a photosensitive drug. This type of drug is sensitive to a particular kind of light. At first, all the body's cells, cancerous and normal, absorb the drug. After a period of time, most of the normal cells release the drug, but the cancer cells retain it.

Then, a laser is aimed at the cancerous tissue. The photosensitive drug in the cancer cells absorbs the light and produces a type of oxygen that destroys the cells.

Only light of a specific wavelength and energy can transform the harmless photosensitive drug into a cancer killer. The laser that is used is a low-power red light that is directed through a very thin glass fiber. The laser can be focused precisely on a single area of tissue. It does not produce heat, so it does not burn surrounding tissue.

However, the laser can penetrate only about 3 cm of tissue. For this reason, it only can be used to treat cancer near the surface of the skin or on the lining of internal organs.

Reduced Side Effects

One side effect of PDT is that patients are more sensitive to light for about 60 days after the treatment. They must wear sunglasses and protective clothing before going outdoors.

PDT currently is being used to treat some types of lung and esophageal cancers. It can be repeated several times and also can be used with other treatments such as chemotherapy and radiation therapy.

Research continues on other types of lasers and photosensitive chemicals. Doctors hope to find a process that will let them treat cancers farther below the surface of the skin and inside organs.

Applying Problem Solving Skills

1. Some cancers form thick, round tumors while others are long and flat. Predict which kind of tumor would most likely respond to photodynamic therapy.
2. The original idea for PDT came from a plant. Compare a plant's use of light energy to that in PDT.