Student Name: _____
Date: _____

Activity Sheet

Shedding a "Little" Light on Cancer Surgery Primer Activity

Objectives:

1. Differentiate "healthy" brain tissue in the model from "malignant" tissue.
2. Conduct surgery on both brain molds removing the unhealthy tissue.
3. Quantitatively determine whether or not fluorescent markers are an effective means of locating and diagnosing tissue for removal during surgery.
4. Discuss the effectiveness of the procedure with the class and how it would translate to surgery in vivo.

Vocabulary:

Fluorescence
Nanoscale
Optical imaging
Nanoparticles
Melanoma
C-Dots
Surface Receptors

Materials:

Jello brain mold, two packets clear Knox Gelatine Mix, one liter tonic water, 1 ml plastic squeeze bulb pipet, scalpel, tweezers, UV light source (black light), scale that measures mass in grams.

Procedure:

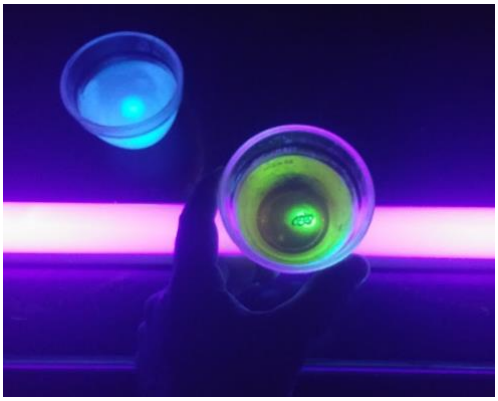
Student Name: _____
Date: _____

Brain Mold Preparation:

1. Prepare two batches of Knox Gelatine mix, use the instructions of the packaging. Each batch should make two cups of gelatin.
2. Pour one batch of gelatin in each brain mold and place in a refrigerator to set.
3. Prepare a half batch of gelatin mix, double the amount of powdered gelatin and replace the water component with tonic water. Set this batch to slowly cool on a table surface, do not refrigerate.
4. After one hour of refrigeration, remove one of the gelatin brain molds from refrigeration and using a straw or pipet, remove approximately 3 ml of the setting gelatin mix.
5. Using the pipet, inject 3 ml of the tonic water gelatin into the areas of the brain mold you removed material from.
6. Place this brain mold back into refrigerator for 2 more hours.
7. Remove the other brain mold and repeat steps 3 through six, but leave the tonic water out of the half batch of increased concentration gelatin.
8. The 3 ml of high concentration gelatin, both with tonic water and plain water, will amount to approximately 4 grams of “malignant tissue”.

Surgery:

1. Once the gelatin has properly set, remove brains from refrigerator and carefully extract the gelatin brains from the molds.
2. Observe the two brains under normal lighting conditions, you should be able to make out a slight difference between the typical gelatin and the increased concentrations sections you injected (the increased concentration areas will seem slightly opaque).



3. Now turn off the classroom lights and turn on the UV light source. The tonic water gelatin will now fluoresce and stand out clearly. As seen in the image to the right. The nontonic water samples will appear the same as they did under normal lighting.
4. Using your scalpel and tweezers, remove the fluorescing “malignant” tissue and set aside on a plastic massing tray. Remove as much of the tissue that fluoresces as you can.
5. Repeat the same procedure for the tissue that was not prepared with tonic water from the other brain mold and set that tissue aside. Be sure to collect all the opaque material you can see.

Student Name: _____
Date: _____

6. Complete this section by making measurements and analyzing your data.

Material	Mass (grams)
Tonic water tumor tissue	
Water tumor tissue	

Analysis:

1. Which method made for a simpler surgical procedure based on your lab experience, the unmarked tumors or the fluorescent marked tumors?

2. Given the accepted mass of the tumor tissue implanted in each brain mold was 4 grams, what percentage of the malignant tumor tissue were you able to remove using each method?

3. Based on your previous answers, was one method more effective at removing all tumor tissue than another? Why?

4. Do you think that finding a way to mark tumor cells before surgery or treatment would make for a more successful process of diagnosing and treating cancer? Explain your reasoning using evidence from your lab experiement.