Material for Teachers on Student Questions

Activity 1:

Do you know what mutations are?

How could mutations be problematic for your cells?

Activity 2:

Do all cancer cells have the same mutation?
   a. yes
   b. different cancers have different mutations (ie, all lung cancers have the same mutations and all bladder cancers have the same mutations, but lung cancer mutations are different than bladder cancer mutations.)
   c. The same cancer can different mutations in different tumors. That is, if a lung cancer case has two tumors, all the cells in Tumor A have the same mutations and all the cells in Tumor B have the same mutations but Tumor A and Tumor B have different mutations, even though they both arose from the same tissue.
   d. One tumor can have several different populations of cancer cells, each population with its own mutations.

Activity 4

Are the students' tumors bigger or smaller (by cell number) than their starting size?

Did the proportions of beads of each color change? (When the students started, the ratio was 3Green:2Purple:2yellow:1Pink:1orange)

What proportions of beads of each color did the students expect to end up with?

Activity 6

Did the resistant cells help the tumor grow? (Did the tumors with resistant cells grow faster OR shrink less than the tumor with no resistant cells?)

Did the tumor with no resistance grow slower or faster (compared to the other tumors?)

Were there factors other than resistance that could've affected tumor size and growth? (A big one is how fast the students "killed" the cells by pulling them out of the bag.)

Activity 7
Calculate the mean number of cells of each type within a repeated group. This is if you did replicates of each resistance group – so if you had three groups with Orange/Pink resistance, they would take the mean of each color cells they had, for a total of 5 means.

Calculate the mean number of cells of each type across different groups. Which color had the highest mean across all the groups?

Calculate the mean number of cells in all resistant tumors and compare to the mean number of cells in all non-resistant tumors. This should show whether resistant or non-resistant tumors grew more.

Did the resistant cells help the tumors grow? Why?

Did the non-resistant cell grow slower or faster? Why?

Were there any significant differences between the growth of resistant cell populations and non-resistant cell populations?

How did the original growth rate of the cells affect the final tumor composition? (That is, the students added more green than any other color during each growth cycle. Did this affect the final tumor composition? What if Green was one of the resistant populations? Pink grew the slowest. How does that affect the final tumor composition? What if pink is one of the resistant colors?)

What other factors could have affected tumor size and growth?

How did your group's tumors compare to other tumors? (And did this depend on which colors were resistant?)