Conclusion

My hypothesis was: *Genes located at recurrent chromosome aberrations in cancer are subject to differential expression by gene loss or gain, and thereby may contribute to cancer progression*. At every recurrent aberration I analyzed, there were genes that were highly differentially expressed in cancer. This finding verifies my hypothesis.

However, there may be other mechanisms by which genes can be subject to differential expression. To prove this requires a great deal of further research.

It was interesting that I found some genes that are already known to be involved with breast cancer, such as TSG101 and TSSC1 at aberration 11p15.

My observation that I found ribosomal genes differentially expressed at each aberration I studied, suggests that ribosomal genes may be driving the development of cancer. I have not been able to find any literature that mentions differentially expressed ribosomal genes in cancer, however.

As described in the Locus Link reports, ribosomes are complexes of up to eighty proteins, held together with strands of ribosomal RNA. The function of a ribosome is to translate the message RNA into protein. It is possible that the ribosomes in the cancer cells are built up of combinations of ribosomal proteins in amounts that are different than the normal cells. This is shown by the fact that the EST messages are significantly different in cancer and normal cells. These abnormal ribosomes may not be subject to the same controls on how they translate proteins as are the ribosomes in normal cells, and thereby help the cancer cell make abnormal proteins. These abnormal proteins may help the cancer cells grow into tumors. If we could find a drug that stops the functioning of the abnormal ribosomes and does not affect the normal ribosomes, this drug could be used to treat cancer.

My project was only a small part of the many discoveries that can possibly be made. I picked certain aberrations for various reasons, and if I had decided to pick others, I may have come up with completely different observations. Indeed, every gene and every chromosomal aberration should be analyzed.

Recommendations for Future CGAP Researchers

* Do not feel so overwhelmed and discouraged that you do not start working hard right away. I felt overwhelmed with this topic around the month of January, and so I decided not to enter my project into the Science Fair. By March I was feeling more confident again and wished that I had just persevered through the difficulties and entered it in to the fair. I also wished that I hadn’t waited until March to feel excited again, because then I felt rushed all through March and Spring Break.
* If you decide to do a project about cancer using the CGAP website, make sure you have a mentor scientist to help you, or e-mail the help desk to ask questions, because there are many complicated details about the website (and this whole project in general) that are not clear to first time researchers.
* Be prepared to spend a lot of time entering data into excel spread sheets, which may seem monotonous and tedious. But after analyzing the data and seeing many differentially expressed genes in cancer, you’ll understand why this is such an exciting field of medical research.
* More about procrastination: Don’t decide to start your project in the spring because that will be too late. Do the preliminary steps in the fall; you’ll find that by December and January you want to spend more time studying for finals, but get back into it full force in February. The more time you put into your project, the better it will be.
* Literature research is a must for your first step. I tried to start my research project before I had done extensive research on cancer. It wasn’t until I studied the text books and wrote my introduction that I felt more confident about the actual research I was doing.
* There are many different projects that can surround this field of science. Concentrate on a different type of cancer tissue, or study the Hox genes (which are fascinating) for an extension and variation on this science project.
* Cancer research is changing everyday. The websites CGAP, Locus Link and Entrez change faster than I can keep up with. It turns out that now my huge excel spread sheets were not even necessary because CGAP decided to put the p values right on their website less than a month after I was done entering data. So with the methods and data constantly changing, be sure to be flexible because this is an extremely dynamic field of research.