BIO BIZ

Biotechnology Transforms

A publication of the Georgia Bioscience Technical Institute
www.athenstech.edu/GBTI

Dec 2007

Volume 6

Employment opportunities

Athens Research & Technology Inc are looking for Research scientists.

Pilgrim's Pride is hiring a full time microbiology technician www.pilgrimspride.com

Avigenics currently has positions available. Full time and student workers. (contact: Lisa Haskins 706-227- 1170 or haskins @ avigenics.com)

Merial currently has 1 R&D and 6 industrial operation positions open. (us.merial.com/careers)

GBI crime lab associate www.ganet.org/gbi/JOBS/

This month, Bio Biz is taking a look at Gene therapy

By Mandy Latimer

Gene therapy is a process where genes are inserted into cells or tissues to treat a disease. If the disease is hereditary, a defective gene is replaced with a normal one. Usually, a vector (carrier) is used to deliver the new gene to the target cells/tissue. The most common vector used are viruses. Scientists were able to take advantage of the viruses ability to encapsulate genes and then deliver them to the target cells/tissue where they release their genetic payload. Up to this point in time, only somatic (non reproductive) cells have been targeted in Humans. This technology has had some success in treating human disease but has also resulted in some tragic losses. Just last July, Jolee Mohr, a 36 year old woman with rheumatoid arthritis died while undergoing gene therapy treatment. Jolee's case is unusual since her disease was not terminal. Most patients receiving gene therapy (129 cases out of 139 as listed by the NIH) are terminal. Most researchers believe that gene therapy is too risky to use in patients with non-terminal disease. In Jolee's case, a sudden infection occurred just after her experimental treatment and caused her organs to fail. Over the last 17 years, other trials have resulted in some bad out comes for the patients. Jessie Gelsinger (1999) died of an immune response, and a successful trial in 2003 which involved 3 children with SCID (severe combined immune deficiency) resulted in the children getting leukemia. So, where do we go from here? In this months Bio Biz I have included a few articles that may have some interesting impact on this controversial mode of treating disease.
Happy reading!
Mandy

References:

Gene Therapy: is death an acceptable risk? Brandon Keim @ www.WIRED.com 8/30/07
Gene Therapy Science Daily-science references @ www.science daily.com

'Jumping Genes' Could Make For Safer Gene Delivery System

ScienceDaily (Sep. 30, 2007) — To move a gene from point A to point B, scientists and gene therapists have two proven options: a virus, which can effectively ferry genes of interest into cells, and a plasmid, an engineered loop of DNA that can do the same thing, albeit usually only on a short-term basis.

The catch is that viruses can be infectious and some types of viruses occasionally land in a target genome near an oncogene and raise the risk of cancer. Plasmids don't carry that risk, but they are not nearly

(Continued on page 3)

Three Smart Things You Should Know About Genomics:

1. The real benefit of studying genomes is that it has taught us how little we know. We used to think noncoding "junk" DNA didn't do anything. Now it turns out it may contain underlying instructions for how DNA works.
2. Genomics' reductionist approach has become more holistic. Now, we also look at all the proteins a cell makes (proteomics), RNA transcription (transcriptomics), molecules that control which DNA gets turned on (epigenomics), and cell energy consumption (metabolomics).
3. Important genes usually exist in multiple copies, in case one iteration gets damaged. This results in lots of leftover, deactivated genes from up the evolutionary tree—solid molecular proof that Darwin was right– birds have genes for teeth; humans share genes with gorillas.

Wired Magazine: Issue 15.09 www.wired.com

English, Algebra, Phys Ed ...and Biotech

By G.Pascal Zachary **The New York Times (nytimes.com); Nov 18, 2007**

MORE than a decade ago, after George Cachianes, a former researcher at Genentech, decided to become a teacher, he started a biotechnology course at Lincoln High School in San Francisco. He saw the class as way of marrying basic biotechnology principles with modern lab practices — and insights into how business harvests biotech innovations for profit. If you're interested in seeing the future of biotechnology education, you might want to visit one of George Cachianes's classrooms. "Students are motivated by understanding the relationships between research, creativity and making money," he says. Lincoln has five biotech classes, each with about 30 students. Four other public high schools in San Francisco offer the course, drawing on Mr. Cachianes's syllabus. Mr. Cachianes, who still teaches at Lincoln, divides his classes into teams of five students; each team "adopts" an actual biotech company.

The students write annual reports, correspond with company officials and learn about products in the pipeline. Students also learn the latest lab techniques. They cut DNA. And recombine it. They transfer jellyfish genes into bacteria. They purify proteins. They even sequence their own cheek-cell DNA.

Cool, eh? And very, very important.

We know the refrain by now: the United States, birthplace of most of the great commercial advances of the last 60 years, must increasingly rely on overseas talent, otherwise known as imported brains, to maintain an edge.

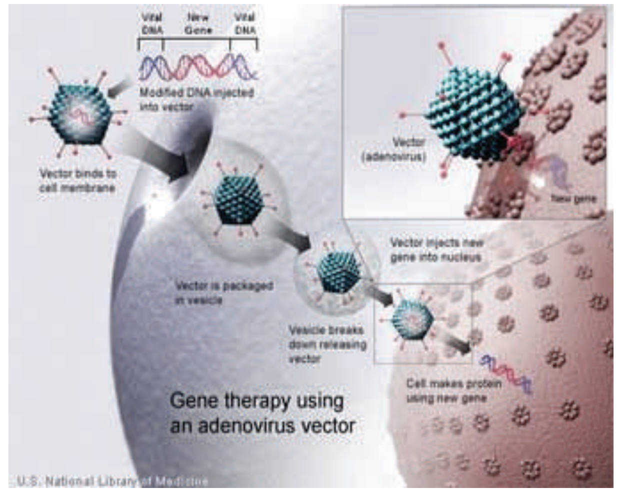
Talented immigrants are crucial to American vitality, and employers are smart to woo them. But research universities aren't content to rely only on the overseas pipeline, and are working to make science and engineering studies more appealing to American students. Sometimes overlooked in this mix is how high schools can help cultivate a fresh crop of scientists, engineers and lab technicians. Secondary science and mathematics education is on the rise, with growing numbers of students in more challenging classes. Enrollment in advanced biology and physics courses doubled from 1997 to 2004, nearly doubled for advanced math and rose 50 percent for advanced chemistry, according to the National Science Foundation.

Cont on pg 3

Additional information about the Biotechnology & Pharmaceutical Manufacturing Technology programs is available at:

This publication was funded by a:
Community Based Job Training DOL grant

(*continued from pg 1*) as efficient at reproducing in cells, which is important when the goal is to integrate an introduced gene into the targeted cells of the organism or patient.



Now, however, the advent of new nonviral gene delivery systems using transposons, or "jumping genes," provides a safer alternative than viruses. The Sleeping Beauty transposon system is one example that is used in laboratory experiments for correcting the gene defect responsible for sickle cell disease.

At present, there are an estimated 140 gene therapy trials under way in the United States. Most are aimed at treating fatal conditions such as cancer. Many use the less efficient plasmids as expression vectors, but some utilize viruses and no gene therapy treatment has been deemed safe or effective enough to merit Food and Drug Administration (FDA) approval as a routine therapy.

Techniques for targeting transposon vectors to regions of the genome devoid of cancer genes are being refined. Meanwhile, a key advantage over simple plasmids is that jumping gene technology is more effective at achieving stable expression of genes introduced into animal cells.

To harness jumping genes, researchers use an enzyme to ferry a desired DNA sequence from one DNA molecule to another inside a cell. The enzyme can then be turned off to stop genes from jumping.

Adapted from materials provided by University of Wisconsin-Madison.

American Chemical Society (2007, June 10). Sleeping Beauty 'Jumping gene' shows promise for sickle cell gene therapy. *Science Daily*

Continuesd from pg 2 ...and Biotech.

Advanced classes are just one response to the drive for more American innovators. Another is to give high school students more hands-on experience with innovation, which, in the real world, is how researchers pursue their passions. Exposing students to experiments, data crunching and lab floors, of course, helps make academic abstractions more concrete. "We moved away from hands-on learning when we thought computers could simulate everything," says G. Wayne Clough, president of the Georgia Institute of Technology in Atlanta and a member of the National Science Foundation's board. "Now we're moving back to hands-on, and high school is a great place to begin." Some public high schools are giving students lab experiences that approach, or even exceed, those found in university settings. And some teachers see an economic payoff in all of this.

Biotechnology, for example, remains a promising field, and companies in the industry have less math-intensive demands than electronics and computing employers. So biotech is a popular field with students and is emerging as an educational proving ground. "Our whole goal is to transform the work force," says Xan Simonsen, who coordinates the biotech program for high schools in Mesa, Ariz. The schools follow a curriculum very similar to San Francisco's, including an emphasis on learning about the biotech business. To be sure, biotech lab work is expensive. Mr. Cachianes's classroom in San Francisco has about $500,000 of equipment, obtained mainly through grants and donations from local companies. (The spending total was similar for the Mesa district's biotech labs.) "What Mr. Cachianes is doing is very high end, but he shows what's possible," says Paul A. Hanle, president of the Biotechnology Institute, a nonprofit group in Arlington, Va., that provides training for secondary school teachers. While the institute promotes a low-cost alternative for teachers that it labels "biotech on a shoestring," Mr. Hanle says "high-end programs in high schools are growing significantly." San Francisco's high schools continue to have one of the most sophisticated biotech programs in the country, perhaps because of the city's proximity to thriving biotech companies.

Three years ago, Mr. Cachianes began offering a second, more advanced biotech course in response to requests from seniors who had done well in his other class. Last spring, Wendell Lim, a molecular biology professor at the University of California, San Francisco, learned about the course and chose five graduating seniors to work in his lab over the summer. Active in the emerging field of synthetic biology, which marries engineering, computing and biotech, Dr. Lim wanted the team of students to enter a Massachusetts Institute of Technology contest. Dr. Lim asked Mr. Cachianes's graduating seniors to carry out two experiments: one to create a protein "scaffold" to control the flow of information in a cell, and the other to create the cellular version of an electronic bar code. "These kids took a while to gain confidence, but by the end of the summer, their experimental work was as good or better than a lot of our graduate students'," Dr. Lim said. This month, the Lincoln-U.C.S.F. team, all of whose members now attend public universities and colleges in California, flew to M.I.T. to present its findings. Competing against 57 teams from universities representing 20 countries, it snared one of six finalist spots. *Continued on pg 4*

Continued from pg 3 ...and Biotech

A team from China won.

The lesson here is that seeds of innovation are sown in high school — and that setting higher expectations can encourage better performance. "Our kids can shatter limits," Mr. Cachianes says, "if we adults take a risk and give them the chance to try."

Biotech lab corner

Quick biotechnology related protocols for teachers to use in their classrooms

This months quick pick is a soap making procedure

Good luck!

COLD PROCESS SOAP

Adapted from a talk given by Amber Jordan at the'07 Florida Dairy Goat Association convention

Note: When making soap, all ingredient measurement is based on weight

Saponification is what happens when a fatty acid meets an alkali. When fats or oils, which contain fatty acids are mixed with a strong alkali, the alkali first splits the fats or oils into their two major parts fatty acids and glycerin. After this splitting of the fats or oils, the sodium or potassium part of the alkali joins with the fatty acid part of the fat or oils. This combination is then the potassium or sodium salt of the fatty acid.

Ingredients:

Freeze Goat's Milk into	14.0 oz block
Coconut oil	14.0 oz melt in microwave
Emu oil	6.0 oz
(Crisco, palm oil = body)	
(Emu oil= body & bounce for hair)	
Lye (NaOH)	5.8 oz
Olive oil	14.0 oz
Rice bran oil	6.0 oz

www.the chemistry store.com has chemicals and molds.
www.university oils.com
www.the-sage.com has a "lye calculator" to help create new recipes.

Equipment needed:
Well ventilated room
Stick blender
Molds *(wooden box lined with wax paper, purchased soap molds or plastic butter containers)*
Microwave
Gloves & goggles

Protocol:

Step 1) slowly mix lye and milk together
Note: if you mix too fast, the mixture will heat up too fast and your soap will turn yellow. This is why we use the milk in frozen blocks. Also, if you keep mixture on ice, this will help.

Step 2) Melt the Coconut oil in a microwave and then
Mix all oils together (oils are the acid while lye is the base).

Step 3) Mix oil, milk & lye mixture with a stick blender (5 min) or by hand (1hr).
As a result of emulsification, the mixture will begin to look creamy.
A light trace is = thick pudding (at this point, you can add fragrance oil at 0.5-0.7 oz/lb of oil used in soap process.)
A heavy trace is = lemon pie (at this point, you can add color.)

Step 4) pour into mold that will withstand heat and alkali conditions.
Note: remember that the soap is still going through a reaction and is very basic (corrosive) at this point. After a few days, check outside of bars with a piece of pH paper. The bars should become more neutral when done.

Step 5) bars can be cut with fishing line or popped out of molds.