Ethics of genetic engineering

Engineering

Scientists want to protect their original work, but patents (the main method of said protection) restrict the research ability of others. The progression of research in the biotech industry is both dependent on and hindered by patents. Also, with human genes, is patenting even ethical? With regards to decoding individual genetic codes, the risk for genetic profiling emerges, along with a myriad of other hidden problems. Patients need to weigh the potential for discrimination and unforeseen issues against all of the potential benefits of knowledge gained.

With all of these issues, the dead of genetic engineering sounds unconscionable. However, the field of biotechnology redeems this research, especially when one looks at the impressive list of drugs the industry has produced over the last few decades-? thanks to genetic engineering. The speed with which genetic research is moving forward, and the current level of knowledge bring up some very sticky ethical questions: the moral correctness of patenting, patient testing and rights, and the potential for genetic profiling.

However, the advances in medical treatment due to innovative medicines resulting from molecular biology cannot be denied. The current field of genetic engineering has its roots in the work of Gregory Mendel, and in the desire to produce sturdier and more productive crops and livestock. In 1953, James D. Watson and Francis H. C. Crick discovered the double helix structure unique to DNA (Genome News Network, 1953). From these foundations came the techniques of DNA sequencing and gene splicing. There are four nucleotides that make up DNA: adenine (A), cytosine (C), guanine (G), and thiamine (T).

The order in which pairs of bases are arranged is the genetic code of an organism, which determines the type of being as ell as all the traits and characteristics of that being. Gene sequencing is the process of taking small pieces of DNA and then decoding the order of the bases. This can lead to an understanding of the genes, and thereby the proteins and functions of an organism. The success of sequencing the E. Coli (a common intestinal bacteria) genome led to the more lofty aim of decoding all 23 chromosomes of the human genome, to learn more about our own makeup. In 1990, the Human Genome project was launched.

This was a very ambitious attempt to decode the entire Human Genome (Human Genome Project). The initial goal of the project was to improve the genetic linkage map of the human species by locating specific genes to their relative positions on the chromosomes" (ANN. 1986-1990). Eventually, the venture hoped to " sequence the three billion base pairs of the human genome" (ANN. 1986-1990), or to determine the order of all of these nucleotides. The sequences that resulted from the project could then be used for identification of specific genes, as well as in recombinant DNA for the production of new therapeutics.

The process for recombinant DNA was developed in 1 973 and opened up an entirely new field for molecular biology (ANN. 1973). Through the introduction of human genes into plasmids then used to transform bacteria, techniques were developed by which bacteria produced medicines in a faster and more efficient manner than before. When genes from an animal are introduced to a bacterial cell through the use of a plasmid, the bacteria can replicate the plasmid every time they multiply-? even as quickly as every

twenty minutes (ANN. 1973) and create the desired product when signaled to do so.

Through this rapid growth and protein expression, the organism can produce in hours or days the amount of product it would take the original animal months or years to produce. This whole process forms the basis of the biotech industry, which protects all of its developments through the use of patents, Although the concepts of entities 'owning' genetic material and the barrier to outside research that patents present are very contentious topics, patents have provided the incentive for continuing genetic research.

All scientists and companies want to protect their work-? after all, they are the ones who invest time and effort into developing a product or technique. The established mode of such protection is through the U. S. Patent Office. One aspect of the controversy over patenting genes is the Issue "... F allowing individuals or companies to 'own' the essence of human life" (Cooper). Those against patents of genetic material argue that the human genome is what makes us who we are.

As soon as you patent it, you privative it... " (Cooper)-? as the Thirteenth Amendment outlaws slavery, which by definition is the ownership of one person by another, is genetic patenting even constitutional? The other concern with patenting, and especially in such a fast-moving field as genetic engineering, is that it restricts the research potential of other scientists and companies. In her interview, Sniff discusses the fairness of patenting a coverer, so that no one else can work on, or at least benefit from it.

She talks about how if an individual or a company is able to obtain a patent, the entity could have more than a decade of exclusive rights to research based on that discovery. However, other researchers could have same idea-? and if they re not the first ones to the patent office, leveraging that knowledge is essentially off-limits to them for the duration of the patent. A recent court case over patenting genetic research confirmed both of these issues. Judge Robert Sweet invalidated... Patents on two genes linked to an increased sis of breast and ovarian cancer... Cause Dona's existence in an isolated form does not alter the fundamental quality of DNA as it exists in the body not the information it encodes" (Institutes). This reasoning is based on the concept of exclusivity that patents provide-? when only one entity owns the research, no others have access to it. This ruling could set a precedent for cases over all the other genetic patents, which encompass about one-fifth of the human genome. Negative repercussions could, potentially, slow or even stop the progression of the biotech industry.

A much more reasonable answer to the question of patenting ethics is found in a citation of John Doll, the director of biotechnology patent examination. He states that a gene, when submitted for patenting, "... Is an isolated and purified chemical compound that is not naturally occurring in nature" (Cooper). Indeed, when a scientist patents a gene, " a lot of it is what [she] does once [she's] identified the gene-? Caches has to patent more than the gene [itself]. It's [the] process, it's [the] construct... " (Sniff): it is far more than just the genetic material.

Patenting of genes, while there are valid concerns about ownership, is much ore than a simple DNA sequence. An extraordinary amount of work goes into

the knowledge. The redeeming value of patents is that they do Offer a security that can't exactly be found anywhere else. One of the major reasons the United States is so far advanced in the biotech industry is because of the patent protection it offers. Scientists and companies know that they will receive the credit for, and more significantly, the return from their inventions. This provides the incentive for continuous new innovation and creation of more drugs to treat various conditions.

These new therapeutics are in part the result of extensive genetic study and revived extraordinary benefits for patients, regardless of the potential risks of such testing. Individuals weigh the risks and benefits before undergoing genetic testing, as part of a method to ensure complete patient understanding as well as protection of the doctors and researchers involved. Nothing is certain before undergoing genetic tests, and the knowledge gained could potentially bring about problems like paternity cases and heredity issues. However, certain knowledge could be used in a proactive way, such as the likelihood of an individual developing cancer.

More genetic research also revived biotech with more material upon which to develop new therapies (Sniff). A major concern in this area is genetic profiling and discrimination. " If [someone] has a documented predisposition to a disease, the potential to be denied insurance... Because of the knowledge is substantial" (Sniff). However, the same knowledge could also inform insurance companies as to the most practical route of the treatment should a condition occur. Individual genetic testing also opens the door to personalized medicine, where cures or treatments are specified to each person-? and therefore more likely to be successful.

Genetic engineering is an extraordinarily diverse field. All of the various branches raise different ethical questions, although some contain more controversy than others. Patients really need to understand everything that could come out of genetic tests, both the good and the bad; companies, while trying to protect their own interests, have to be careful with regards to genetic discrimination. Companies and individuals absolutely need patent protection in order to continue expanding the field of molecular biology, and to continue innovation for the creation of new drugs.