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The Student Career Guide to Biotechnology

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Over the past century humans have made marvelous achievements. We have dramatically improved our technology to make our lives more efficient. The creation of the computer chip completely changed our lifestyle in the 20th century. Our human desire to advance will never diminish. What career will be a major contributor in the 21st century that will change the way we live? According to the Bureau of Labor Statistics, the career field of biotechnology is expected to change the way we live and work in the future. Biotechnology is an emerging field of scientific research and development that aims to create useful products for humans.

What is biotechnology? According to a website by the Biotechnology Institute, a non-profit organization involved in educating the public about biotechnology, the most simple definition is "the use of organisms by man"(Biotechnology Institute). One good example of Biotechnology is the cloning of plants which has been going on for centuries. This process involves cutting off clippings of a plant then placing them in the soil to grow a similar plant. Now that technology has increased in the 21st century cloning is not only taking place on the physical level but also in the organism on the molecular level because of advanced tools. Scientists are manipulating the genetic makeup of organisms to produce the traits that they desire. This is done with the use of "biology, chemistry, physics, engineering, computers, and information technology" (Biotechnology Institute).

Even though most people seem clueless when asked what biotech is, they have unknowingly used or even consumed a biotech product. For example according to the Institute for Career Research the majority of "most vaccines are made from viruses or bacteria that have been weakened or killed" (1) using a biotech process. Also some of Americas most consumed products are being modified: "A third of the corn and more than half the soybeans and cotton grown in the U.S last year were products of biotechnology, according to the Department of Agriculture" (Gates 78). Products developed using biotech processes involve extensive research.

As stated by the BLS "Most workers in the industry work in offices or laboratories…" (BLS Scientific Research). This is because advanced machines are used in order to conduct research. Working hours can vary greatly "depending on the requirements of each job." This is because tasks can involve constant monitoring or long testing procedures. A typical day for a biotechnologist can vary greatly depending on the specific task being researched. For instance a biotechnologist trying to find a cure for a disease would conduct an extensive amount of research on that disease in a laboratory in order to find possible ways to destroy it. The extensive amount of research conducted can easily require a years worth of meticulous work (BLS Scientific Research).

According to the Biotechnology Institute, if you plan on entering the field, bachelor's degrees in science are recommended and are usually the minimum requirement. Once you have entered the field constant on the job training is required in order to become familiar with the latest technologies. Because biotech is an emerging field, proper training hasn't been incorporated in all states. In order to pursue a career in biotechnology you need to have a solid background in all subject areas with strong emphasis in math, science, and communications. Talking with Individuals affiliated with national organizations is recommended in order to acquire internships. People interested in biotech careers predominantly earn degrees in various science fields then transfer into the specific biotech field of their interest. Pay rates for biotechnologists are very competitive with the top employers paying experienced biotechnologists roughly $100,000 dollars annually (Biotechnology Institute).

Biotechnology is a discipline of the life sciences. Life science is any sciences that deal with organisms. Three life science fields that relate to biotechnology are Agricultural, Industrial and Environmental, and Medical.

Biotechnology related to agriculture involves the production of genetically modified food. A genetically modified food is "[a] genetically engineered product… created in the laboratory by taking DNA from one organism and inserting it in another" ("Biotechnology and Genetically Altered Foods"). According to her book *Biotech Careers*, Carole Moussalli states that vegetables and fruits are being genetically altered to be more nutritious, "longer lasting, less prone to disease, and have longer delayed ripening" (18). Also salmon are being altered to "breed faster and cost less" (18). The use of these biotech practices in America are steadily growing. In the previous year, two thousand it has been stated by Bill Gates that "[m]ore than 65 million acres of genetically modified crops will be planted" (Gates 78). At this rate it is inevitable that the vast majority of American crops in the near future will be affected by biotech practices. Scientists have also modified plants that can grow in poor soil allowing more land to be harvested for food (Gates 78). The benefits of biotech foods for human are proving to be endless and very versatile.

According to a website by the Illinois Biotech Institute, Industrial and Environmental applications of biotechnology involve finding ways to make manufacturing processes more efficient and the environment cleaner for the future. Some of the challenges that biotechnologists are facing now are finding alternative petroleum solutions to stop our dependency on oil from foreign countries and also keep the environment cleaner. Biotechnology is also being used for processes like environmental cleanup in cases where the environment has been damaged due to human negligence such as oil spills (IBIO Institute). According to the Institute for Career Research biotechnologists involved in oil spill cleanups have actually "bioengineered a plant that can absorb and break down oil in dirt contaminated, for example, by a spill from an under-ground tank"(3). Biotechnology is slowly proving to humans that it has the potential to solve a large portion of our problems.

The field in biotechnology that interests me the most is the medical field. I find it amazing how we can create things to put in our bodies to improve our health. Biotechnology has produced over a hundred different drugs and vaccines. Biotechnologists are currently working on ways to cure diseases such as, "various cancers, Alzheimer's disease, heart disease, diabetes, multiple sclerosis, AIDS and arthritis"(Biotechnology Institute). Growing numbers of cancer patients are surviving thanks to new biotech practices. The medical applications of biotech seem endless; it could very well be that biotech processes will one day cure all our illnesses.

Even though humans have benefited greatly from biotech in a relatively short amount of time, biotech has also created some major ethical controversies concerning the public. The main sources of controversies involve stem cell research, cloning and genetically altered foods.

According to Moussalli, stem cell research involves taking "undifferentiated embryonic cells to become differentiated into virtually any type of cell found in the human body" (Mousalli 17). This practice concerns the public, because the fear of what the future might hold. If scientists are trying to take a cell and turn it into a liver for a needy patient where will it end? Will they eventually create humans for parts for the needy? The main concern from the public is do we have the right to play "God" and create human items as we need. Even though there are concerns from the public, scientists have not stopped this practice because its benefits to treat ill patients are potentially helpful. The U.S government is currently allowing stem cell research under strict federal supervision. Cloning refers to making an exact copy of a gene. Currently there is only one form of cloning supported by the industry which is therapeutic cloning for creating new tissues to fix diseased tissues (Mousalli 17-18).

Genetically altered foods are currently creating even more ethical debates. The main issue of concern is will these alterations effect plant diversity and cause health problems to those who consume them? The truth is scientists don't know. Other countries have banned biotech foods but

"[t]he U.S wants full unconditional acceptance of biotech food stuff" (Mousalli 18). As of 2004 the European Union has passed a law stating that "[a]ll food sold in the European Union with genetically modified ingredients must now say so on the label…" (Ralli). European consumers have been resentful of biotech foods with concerns that these foods might cause great biological and environmental damages, yet Americans seem somewhat oblivious to the same issues in this country. So far there hasn't been any proof that biotech foods will cause problems for humans. The only way to find out is if problems actually do occur; America seems willing to take that chance in hope that biotech will only benefit humans.

I am personally fascinated with this career field because I am an investigative person and I enjoy solving problems. I hope to one day create something that will make the world a better place. Biotechnology involves research and development in the science disciplines that aims to make useful products for people and make the environment a better place. Biotechnology involves all the great qualities of a good job, good pay, growing potential, new technologies, and creative problem solving. If you want to be involved in a cutting edge career field in the science disciplines, biotechnology might be right for you.

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