

**2023 New Jersey Middle School Essay Contest**  
***1<sup>st</sup> Place***

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**WHAT IS BIOMEDICAL RESEARCH?**

Biomedical research is a part of science that finds ways to avoid and manage diseases that cause illness in humans and animals. Animals, particularly rodents, have a huge role in the research process. When the idea of a treatment or cure arises, it is tested on non-human animals first because most people find it too cruel and unethical to use humans as test subjects without prior confirmation that it is somewhat safe, and mice are biologically very similar to humans, so why not use them instead? Furthermore, rodents, like mice, are smaller and have shorter life spans than humans, so the setting of the tests can easily be controlled, and the effects of the cure, for its entire life or across generations, can easily be observed. After the treatment is tested on animals, it is tested on human volunteers. Once it is confirmed safe to use on humans, it is released to the general public, and a new medical treatment or cure has been created.

This branch of science had a significant impact on my dad and me. We both have Hashimoto's disease (an autoimmune disease relating to thyroid glands). Through biomedical research, the medication for this disease was discovered: using hormone replacement, in this case, giving the patient more Levothyroxine. I am thankful for biomedical research because, without it, my father's and my disease could be much more serious and potentially put our lives at risk. Perhaps better solutions to Hashimoto's disease will be developed through biomedical research. My case is just one of many examples that biomedical research improves the health of humans and animals. As seen in my situation, new and more effective treatments for illnesses (and thus prevention of deaths) found through biomedical research, helps humans. For example, COVID-19 vaccines were successfully developed through biomedical research. Additionally, in the article "Animal research helps pets, too", the author explains how "[a]nimal research has improved and saved the lives of countless companion animals, according to a promotional brochure, which cites the following examples: vaccines to prevent distemper, rabies, infectious hepatitis, tetanus, parvovirus, and feline leukemia" (Nolen). Therefore, this research benefits the well-being of both people and animals.

The three major methods used in biomedical research include basic, applied, and clinical research. Basic, or "pure" research, is used to gain a deeper understanding of the physical, chemical, and functional mechanisms of life processes and diseases. It is about the fundamentals and the goal is not to provide a solution to a problem; it is only there to provide a stepping stone for the two other types of research. Often, observation, measurements, and experimental manipulation are used. Applied research, unlike basic research, looks to develop a

new treatment or cure. It requires applying existing information from basic research. Lastly, clinical research combines the two previous research methods. It uses the knowledge from the other two methods to conduct research and treat a disease differently. This type of research's setting is at a hospital because it focuses on curing humans specifically. It is normally conducted on human beings, and its purpose is to directly improve humans' health. There are also some additional and alternative methods/models used for biomedical research: mathematical models, which include computer models/simulations; in vitro tests, which are tests done on samples taken from animals, like blood or tissue; whole living animals, which includes tests on humans during human clinical trials and tests on non-human animals like mice; and epidemiological studies, which are the establishment for ailment control and prevention. Epidemiology is a branch of science that focuses on the patterns, causes, and effects of diseases in human populations.

Some regulations are put in place to protect humans and animals when conducting research. The Food and Drug Administration (FDA) regulates most clinical trials (phased tests with human volunteers), and the federal Animal Welfare Act (AWA) protects animal models during research in the United States. It explains the requirements for research protocol, housing, feeding, lighting, handling, ventilation, and enrichment of animals involved.

Now, many biomedical researchers are still studying and finding solutions to COVID-19. Others are working on discovering more about the brain, stopping cancer development, and curing intestinal diseases. Looking into the future, treatments for these issues will hopefully have been found, with help from biomedical research.

All in all, biomedical research is significant because it is the first step in discovering different treatments and cures for different health conditions. Without it, our present-day lives would be extremely different.

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