

2024 NJABR Middle School Essay Contest
3rd Place

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COVID-19. Malaria. Tuberculosis. These diseases ravaged the population, causing millions to suffer. Thankfully, biomedical research allowed scientists to create cures for these deadly viruses. In ancient times, people were forced to use primitive methods such as drilling holes in their bodies and applying useless salves. Today, if a person has a fever, they can take a Tylenol. So what is biomedical research, and how has it allowed scientists to save the world?

Biomedical research refers to the study of diseases and how they are caused, with the intent of curing them. It follows the scientific method, known as observation, hypothesis, experimentation, and conclusion.

There are three major steps to conducting research. First, basic research is done to gain general knowledge of how the body works. It is a preliminary step used to understand the biological process, and how a potential cure might affect the body. Next, applied research is done to address the problem at hand. Knowledge from basic research is expanded to be more specific, so that a cure may arise. Finally, the researcher must perform experiments. They usually perform in vivo research, or research inside the living organism, as they can observe how an experiment can affect the entire body and future generations. Two common types of in vivo research are pre-clinical and clinical trials.

Pre-clinical trials test the early stages of a medication or device. Animals are imperative to this process, as people find it unethical to immediately test on a human, since an early medication could have adverse effects that leave them with problems for the rest of their life.

95% of the animals used in testing are rodents, particularly rats and mice. Being small, cheap, easy to breed, and with a short lifespan, rodents are the ideal model. The effects of a cure can be easily viewed, and controlling them is not difficult. They are also biologically similar to humans, meaning that if an effect is seen within a rodent, it will likely be seen within a human. This will help researchers revise the medication or device after a trial so that it is safe for humans.

After pre-clinical trials, clinical trials are conducted. They take place in a hospital or medical setting, where the cure is tested on willing volunteers. Testing on humans can only start after extensive testing, revising, re-testing, and re-evaluation have taken place. There are three main phases, all overseen by the Food and Drug Administration (FDA). The FDA must approve the product, or it cannot be legally sold in a commercial setting.

It is a common myth that experimented animals are treated inhumanely, but that is not the case, as there are numerous regulations to control animal testing. The Animal Welfare Act establishes strict regulations that researchers must follow when experimenting on an animal, including rules on the animal's hygiene, housing, feeding, ventilation, handling, and medical needs. Researchers are legally required to have an Institutional Animal Care and Use Committee (IACUC) to observe their work, approve of the use of animals, select a proper specimen, etc. Scientists also use the three R's of research: reduction, refinement, and replacement. Reduction ensures that fewer animals are needed in an experiment. Refinement means that scientists try to improve how animals are treated by improving anesthetics and creating entertainment for the

subjects. Replacement encourages the use of other methods, if possible. These include computer models/simulations, cell tissue studies, and in vitro research, where bacteria, cell, and tissue cultures are done in labs. Epidemiological studies are also used, where human diseases are linked to a certain cause using data.

However, none of these methods can fully capture the complexity of a living creature, meaning animals must still be used.

Biomedical and animal research have been very effective, as many vaccines and cures are available. The computer-assisted tomography (CAT) scan was also invented due to animal research. It has also been prevalent in my life, as whenever I had a cold, flu, or even hand, foot, and mouth (HFMD), there was always a cure. My mother was also diagnosed with thyroid cancer. If Synthroid didn't exist, she would not be here.

Biomedical researchers are continuing to search for cures for cancer and other diseases. Hopefully, with the health of animal research, scientists will continue to find cures and save millions of lives each year.

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