

2024 PSBR Middle School Essay Contest
3rd Place

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There are many aspects in biomedical research. However, when people think of biomedical research, they primarily think of the research animals used. Animal research is important in the biomedical research process because tests on animals yield information that can be used for human benefit. This is due to the similarities both groups share. Humans and animals share similar organ systems, genetic makeup, drug responses, and basic biological processes. This means the information from testing is directly applicable to people. However, animal models cannot simulate human responses perfectly, as there are dissimilarities, some of which include differences in anatomical makeup and genetic variability. Most animals used in biomedical research are rodents, fish, dogs, cats, and non-human primates. These animals are bred by licensed vendors for the specific purpose that they are involved in. Research facilities dealing with animals are required to keep records of their animal sources. Organizations such as the Public Health Service (PHS) Policy on Humane Care and Use of Laboratory Animals set research animal regulations. These include rules on research protocol, feeding, sanitation, ventilation, and overall well-being of any animals used.

Biomedical research is the scientific process that scientists go through to try and create a product to solve problems. These products can be a drug or a type of therapy, and are effective due to the thorough research stages in the biomedical research process, including basic, applied, and clinical stages. Basic research, which the rest of the biomedical research process builds off of, increases fundamental knowledge. Applied research is done for a specific objective, such as the development of a drug, therapy, medical device, or surgical procedure. Scientists then conduct clinical research, where there are three main phases a product must pass through before being released for public use. The purpose of the first phase is to make sure the product has no safety issues that could harm the user. The second phase is to see if the product is effective. Finally, the third phase confirms dosage levels, identifies side effects, and compares the results against existing treatments. After the drug or therapy passes this process, it can be put onto the market, where the FDA continues to monitor it for any problems missed.

There are alternate methods of testing in biomedical research to animal models. The most common is a computer simulation. However, while inexpensive, they cannot test how an organism reacts to its environment or the safety of a solution to an organism, and cannot fully replace an animal model. In vitro research is done on a microscopic level, such as bacteria, cell, and organ cultures. Though it can eliminate some use of animal models, it cannot fully replicate animal research. Human clinical trials can give valuable insight into the effects of a product. They can yield useful information since people can communicate after taking a product. Research tests done on humans are ethical. Testers are usually volunteers who understand the nature of the test. Epidemiological studies can yield information about how a certain product

will affect the general public. There are multiple types of studies, and each is suitable for different situations and can provide specific desired information.

The ethics of biomedical research is highly debated. However, it is important to note that while animals are killed or harmed in research, they do make up less than 0.5% of animals killed in the US. Biomedical research tests on fewer animals to create a vaccine or cure that is beneficial to millions, while the food industry kills many more animals to serve a single meal. In comparison, biomedical research seems much more ethical.

Biomedical research has had monumental success and is highly effective. Vaccines, sanitation, antibiotics, and other advances allow many more people to survive infectious diseases that used to kill them during childhood. It has increased people's average life expectancy by roughly 30 years and has increased the quality of life. Scientists are researching solutions to current and future problems. In the future, our planet will suffer through many problems. Biomedical research will help us by finding solutions to issues that arise.

Biomedical research is the backbone of world healthcare. Scientists often use animal models due to their similarity to humans, though there are differences between the two, and replacements. There are many different species of animals used in biomedical research, and they have to be supplied by licensed vendors. It is ethical, especially when compared to other industries, and has had great success and will support our current and future needs.

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