

2023 PSBR Middle School Essay Contest
Second Place

Kush A.

Charles F. Patton School
Kennett Square, PA

Out of all the memories I have collected during my lifetime of twelve years, one experience will forever be engraved in my mind; Actually, two experiences will be engraved in my mind. These two experiences are the strokes of my 70-year-old grandmother. I remember anxiously waiting for a call saying “She’s gonna be okay!”, or “We’ve fixed her blood clots!”. I am happy to say that she made it through both of those strokes, and I would not be able to say so if it weren’t for biomedical research; specifically, the blood-thinning pills created due to biomedical research.

Firstly, what is biomedical research? Biomedical research includes the investigation of the causes of diseases through careful and precise experimentation. Biomedical research identifies methods to prevent illnesses and helps scientists create treatments and antidotes for them. These methods include basic research, applied research, in vitro research, ex vivo research, and in vivo research. The first step of biomedical research is basic research, in which scientists collect data as a foundation for other levels of research.

Applied research is the stage in which scientists use their basic knowledge and expand to address a specific medical problem. In vitro research (translating to “in the glass”) refers to bacteria, cell, tissue, and organ cultures done in laboratories. These studies are done on a small part of an organism. In vitro studies cannot reproduce the whole, complex, interactive system that is present in an animal or a human. But researchers can learn a lot from in vitro studies. Ex vivo research (meaning “out of the living”) refers to experimentation done in or on living cells or tissues taken from an organism and cultured in a laboratory outside the organism. These cells and tissues serve as models of the organism, reducing the need for in vivo research. In vivo research (meaning “in the living”) is experimentation inside the body of an entire living organism. This includes both pre-clinical and clinical trials. Pre-clinical trials are trials performed on animals instead of humans. These trials are done to test the safety of medicines before testing them on humans. Clinical trials are trials done on humans to test medicines before being sent out to hospitals and other medical facilities.

Aside from using animals and humans, scientists also use simulations for experiments. Although they can be useful for scientists on a basic level, no computer simulation can compare to the complexity of living beings yet. This is why animals are sometimes used to gather crucial data. Another branch of biomedical research is epidemiology. Epidemiology is defined as the branch of medical science that deals with the incidence, distribution, determinants/characteristics, and control of a disease in a population. It is the foundation of all biomedical research pertaining to disease control and prevention.

As I mentioned before, animals are used in pre-clinical trials to test the safety of medicines. Although they may look drastically different from humans, mice, and other rodents make up over 90% of the animals tested. This is because they share about 80% of their DNA structure with humans. These animals are treated with care during trials. Scientists use the three R's: Reduce, Refine, and Replace. Scientists reduce the number of organisms needed to the minimum amount required for the trial. Trials are refined and perfected so that animals only go through one set of trials to acquire necessary data. Finally, as mentioned before, computer simulations and in vitro testing replace animals in trials whenever possible. Almost the same principles are used in human trials.

Biomedical research, specifically on animals, has had a tremendous impact in the past. Studies that use animals have played a role in the prevention or treatment of conditions as diverse as tuberculosis, diabetes, polio, Parkinson's disease, muscular dystrophy, and high blood pressure. Animal research also has been used for disease prevention in animals. Diabetes and pasteurellosis can be treated and prevented due to animal research.

Ultimately, biomedical research provides us all with medicines to prevent diseases and illnesses. Animals and humans are treated ethically and safely during trials. Biomedical research has helped many in the past, and it will continue to do so in the future.

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