

2020 PSBR 7th & 8th Grade Essay Contest
Second Place

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Biomedical Research is an area of science used to gain knowledge about causes and prevention of diseases. Scientists study this through experimentation, observation, laboratory work, analysis, and testing. This is known as the Scientific Method. First, basic research starts so scientists may better understand a disease/condition. Next, applied research involves taking knowledge gained from basic research and applying it to test medicines or procedures.

Scientists move to In Vitro research which involves studying bacteria, cells, tissues, and organ cultures in laboratories. Ex Vivo Research involves testing these materials. Pre-clinical and Clinical trials are forms of this research.

Pre-clinical trials consist of animal models for testing. Scientists use animals because biologically they are similar to humans and are prone to almost the same diseases as us. 95% of animals used in testings are rats, mice, and other rodents bred specifically for laboratory research uses. The 5% consists of dogs, cats, chinchillas, fish, guinea pigs, rabbits, sheep, and other animals. Fish and mice are preferred by scientists because they have a shorter life cycle. It is easier to study these animals' life spans. Scientists can control the environment around the animals including diet, temperature, and lighting.

Scientists follow the 3 Rs. Reduction reduces usage of animal models when possible. Refinement makes sure animals are treated humanely. Replacement means they are against using methods using whole animals. Why use animals? Animals, unlike humans, are easier to control. Scientists can't always control peoples' lives. Scientists can control those variables with animals. Animals are fairly similar to humans. Pigs have similar skin, mice have similar DNA, and cats have similar eyes. Although animals are similar to humans, they are different. Different diseases are common in animals and others are common in humans.

The Animal Welfare Act was passed by US Congress in 1966. It is made for protection of animals in biomedical research. Places like the Institutional Animal Care and Use Committee and USDA support this law.

Scientists use computer models/simulations instead of animals whenever possible. Computer models and simulations are used to predict what scientists' prototypes would do in real life settings as replacements for animals.

Clinical trials take place in hospitals or clinical settings and involve human volunteers to measure the safety or effectiveness of a prototype. Pre-clinical trials, regulatory evaluation, and exhaustive studies are required before human clinical trials begin. Three major processes of clinical trials must occur in careful coordination and approved by the US Food and Drug Administration (FDA) to be effective. The NIH (National Institute of Health) assists the FDA with

research and compares scientists' ideas with current technology seeing if it is better, worse, or the same.

Every person tested in biomedical research has rights or Ethics of Human Experimentation. These rights resulted in a strict FDA. Humans, like animals, are treated humanely and dignified when being tested on.

Epidemiological is another study form. These studies examine populations of people with similar characteristics. These studies allow scientists to see a "trend" in the groups of people and find results through percentages. The coronavirus takes part in epidemiological studies.

One past success of biomedical research was my grandfather, who received carpal tunnel surgery. Without biomedical research, my grandfather wouldn't be able to feel his fingers anymore. One big current need is my father. He has Pulmonary Artery Hypertension (PAH). This disease affects both the heart (mainly the Pulmonary Artery) and the lungs. Currently, no cures exist for him. He took part in 3 clinical trials but there is still no better alternative. Hopefully, Biomedical Research evolves and cures PAH to help my family and other families too.

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