

2017 PSBR 7th & 8th Grade Essay Contest
Third Place

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As Neil Armstrong once said, “Research is creating new knowledge.” Biomedical research is providing the world with new understanding through the process of careful experimentation, observation, laboratory work, and testing. The scientific method includes all of these steps.

There are 3 types of research: basic, applied, and clinical. Basic research increases our knowledge and understanding of life processes and how diseases work. Applied research is scientists using what they know to develop a new vaccine, treatment, or medical device. Clinical research is testing this newly developed vaccine, treatment, or medical device on living organisms. Animal models are used as test subjects before humans are. In the first phase of these trials, after animal trials, only a small amount of human volunteers are given the treatment to see the effects. If this phase goes well, the scientists can continue onto the second phase with more patients being tested. Test subjects increase as success increases. Finally, if the treatment passes all the stages, it can be mass distributed.

Animal models are living animals used during experimentation in biomedical research. They are ideal because they are biologically similar to humans. They share DNA with humans and are susceptible to many of the same diseases and health problems. Ninety-five percent of all animals used in research are rats, mice, and other rodents. However, animal models can also be unreliable because, even though humans and animals share genetic material, the genes don't always react the same way to disease. Therefore, treatment for a certain disease shouldn't necessarily be the same. When using animals in biomedical research, scientists must use the 3R's: reduction, refinement, and replacement. Reduction is using the fewest animals possible. Refinement is treating the animals as if they were our own pets. Replacement is, when possible, using methods that do not involve whole animals. The Animal Welfare Act, passed in 1966, regulates the treatment of animals in research, exhibition, and transport.

There are alternative methods to animal testing in biomedical research. Simulations/computer models are used in the early stages of research and can sort out problems and provide information. In vitro tests are used in the early to middle stages of research and are studies done in lab dishes, such as petri dishes or test tubes. These tests often use cells from living models which help scientists see how a cell would react to a specific treatment. Human clinical trials test a treatment on human volunteers after it has been tested on animal models and proven to be safe. Human volunteers have rights that help protect them. For example, patients can leave the study at any time and must be told about new risks that emerge. Epidemiological studies deal with the causes, distribution, and control of diseases in groups. They are the studies that help find out which people get diseases, how they get them, and where they get them.

There has been much success in biomedical research such as treatments for prostate cancer. My two uncles were recently diagnosed with it and both had surgery to remove their

prostates using the *da Vinci* Surgical System. The *da Vinci* Surgical System is a medical tool that enables surgeons to perform operations through small incisions. This was developed through the biomedical research process and has helped cure various diseases while making surgery less invasive.

There are current and future needs for more biomedical research. More research professionals in biomedical research would bring about more ideas, and with more ideas comes more progress in fighting disease. If these scientists work together and collaborate, the advancement in their knowledge will help fight more diseases!

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