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

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Biomedical research is the scientific study of the causes of diseases in humans and animals in order to find preventions, treatments, and cures. Animals play an essential role in the advances of medicine. Antibiotics, anesthetics, surgical techniques, and diagnostic imaging were all developed through the study of animals. Veterinary care has greatly improved through animal studies. The life expectancy has increased from age 47 in 1900 to age 78.8 today.

Basic biomedical research involves observing, describing, measuring , and experimenting to gain knowledge about how living things work; for example, how taste and smell change with age. *Applied* biomedical research builds on what was obtained from basic research to reach a specific objective like developing a new drug or surgical procedure, such as a cure for skin cancer. *Clinical* biomedical research uses the knowledge already gained, within a hospital or clinical setting, to focus on treating particular human and animal diseases; for example, determining the side effects of a new drug.

About 95% of animals used in laboratory experiments are mice, rats, and other rodents. Fish are often used; and cats, dogs, and primates make up less than 1% of the animal models used. Most animals used for medical research are bred and raised for this purpose. Veterinary technicians ensure that the animals are cleaned, fed, healthy, and have proper anesthesia and postoperative medications. The Animal Welfare Act was passed by Congress in 1966 to ensure that animals were safely transported, sold and humanely handled by licensed animal dealers in appropriate research facilities. Some animals have similar characteristics to humans. For example, a pig has similar skin and cardiovascular systems to a human, which allows researchers to identify factors for a cure for skin and heart conditions. Sometimes the differences between species also provide great insight. For example, sharks rarely get cancer, some amphibians can regrow their lost limbs, or zebrafish can regenerate damaged heart muscle.

Other methods of biomedical research can include in vitro (test tube) testing, which takes human tissues and cell cultures, answering questions about molecular, cellular, tissue, and organ functions. Computer models or simulations use math, physics, and computer science to study the behavior of complex systems. Epidemiological studies investigate how diseases are allotted, how they change, their frequency, and their causes. Human clinical trials, conducted in a hospital or clinical setting with informed human volunteers, can determine the safety and effectiveness of drugs, procedures, or medical devices. The World Health Organization has provided strict guidelines to ensure the ethical standards for human experimentation. Despite the importance of alternative methods of research, such questions as how the digestive system interacts with the cardiovascular system, or the safety and efficiency of a medication, can only be answered using animal models.

Biomedical research undoubtedly saved by brother Jake's life. He was born with a cardiac defect and has had three open heart surgeries at the Children's Hospital of Philadelphia

(CHOP). He has a biomedically engineered heart valve, which may offer a nonsurgical approach to interventions necessary in his future. Jake and my parents also participated in two major biomedical research studies. My parents donated blood and Jake donated blood, heart tissue, and stems cells from his surgery. The first study, sponsored by CHOP, was to identify the genomics of cardiac cells, and the second study, sponsored by the National Institutes of Health (NIH), sought to find the genetic basis of pediatric heart disease.

The current need for biomedical research is imminent as disease and illness affects every living thing. However, as research continues to advance, the need for animal studies may be eliminated. Patients like Jake have a bright future because of the brave, innovative, and persistent advances of the biomedical research industry.

References

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