

**2020 PSBR 7<sup>th</sup> & 8<sup>th</sup> Grade Essay Contest**  
**First Place**

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Biomedical Research, the study of diseases and their treatment, will always be important in our world. Animals play a key role in this process, with both humans and animals benefiting.

The Biomedical Research Process includes Basic, Applied, and Clinical Research. In Basic Research, scientists study a topic to increase general knowledge. In Applied Research, scientists use Basic Research to look for specific information to solve problems; this type of research incorporates animals, humans, and non-living models. Basic and Applied Research use *in vitro* research, meaning “in glass.”

Clinical Research includes pre-clinical trials on animals and clinical trials involving humans. In pre-clinical trials researchers practice the 3Rs: Reduction of the number of animals, Refinement to treat animals humanely, and Replacement of animals in studies when possible. Clinical trials test new drugs and processes on human volunteers; though not yet approved, the drug can save lives. Pre-clinical and clinical trials use *in vivo* research, meaning “in living” animals or humans.

Researchers, when possible, use alternatives to animal models including: simulations/computer models, *in vitro* tests, human clinical trials, and epidemiological studies. Simulations/computer models predict what would happen to a disease or process without using animals or humans. *In vitro* tests are performed with bacteria, cells, tissue, and organ cultures. Human clinical trials study a drug on volunteers with diseases, but only after preliminary research. Epidemiological studies examine disease, focusing on populations, health problems, and contamination.

Animal models are very useful in research. Humans and animals look different, but have many similarities: They share diseases and viruses and have similar organs (e.g., cats’ eyes and pigs’ skin and hearts). Also, many animals share DNA and genes with humans. However, most animals have smaller organs than ours. In research, scientists try to model human disease in animals. Cared for by veterinarians, studied animals receive pain medication.

95% of animal research is done in mice, rats, and fish from licensed suppliers. Less than 1% is done on cats, dogs, and primates. 99% are bred for research. Some come from USDA-inspected vendors and agricultural sources. Laws require researchers to record sources for research animals, ranging from frogs to farm animals.

Laws were established to prevent research animal abuse. The USDA monitors companies and labs. First passed in 1966, the Laboratory Welfare Act makes mistreatment of warm-blooded animals, including dogs, cats, and primates, illegal. The IACUC includes five people that perform inspections at each research laboratory.

Today, scientists are searching for a vaccine and cures for highly contagious Covid-19. Dogs and other animals are also susceptible; a vaccine would benefit both humans and animals. For this and future diseases, Biomedical Research will come into play. One past success of Biomedical Research is Polio, mostly eliminated because of a vaccine tested on animals, such as monkeys and mice. A personal past success story involves my brother, born with Vesicoureteral Reflux. His life was saved by a surgery resulting from Biomedical Research. If not for this research, my brother wouldn't be here.

The ethics of human experimentation are based on two mandates: don't harm the patient and let patients make informed decisions. If these rules are followed, human testing is good. In the doctor's and patient's best interests, a process or drug must be tested on humans. In the past, unethical testing was performed on the world's poor, without consent. This is very wrong.

Biomedical Research is amazing and saves countless lives every single day with newly discovered drugs, vaccines, and medical processes. Biomedical Research shows the connection between humans and nature: together, humans and animals make the world a healthier place to live.

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