

2021 PSBR 7th & 8th Grade Essay Contest
Third Place

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Biomedical research, the study of the prevention and treatment of disease, is extremely important for our world. The research consists of devoted scientists and special laboratory animals, helping us to tackle our biggest health-related problems.

More specifically, “Biomedical research is the broad area of science that involves the investigation of the biological process and the causes of disease” (“Fact Sheet”). The biomedical research process consists of basic, applied, and clinical research. Basic research involves scientists studying how a disease works or studying certain basic life processes (Conover 2000). After analyzing the data obtained from basic research, scientists turn towards solving a specific problem in applied research. Typically, in these first steps, *in vitro* (meaning “in the glass”) research is used, which is research involving experiments conducted in plastic dishes and test tubes.

After that, clinical research is performed to ensure that a new proposed treatment is safe. In this phase, scientists test a new medication or cure on human volunteers and animals. *In vivo* (meaning “in the living”) research is used; this type of research involves experiments performed on live organisms such as animals and humans. *In vivo* research is much more effective than *in vitro* research because it can mimic the complex and organized structures of living bodies.

Within clinical research, there are two phases: preclinical trials and clinical trials. Preclinical trials involve animals and other non-human models. Animals can shed light on our own disease processes since some of our organs function in similar fashions. After preclinical trials, clinical trials for therapeutics are conducted on human volunteers. While animals provide useful information, their bodies still operate differently, resulting in the need for human testing. With all clinical trials, ethics must prevail, and the basic tenets of biomedical ethics are that no human subject is exploited and that all volunteers are allowed to make their own decisions while being informed of the risks and benefits.

When handling animals, scientists try to apply the three R’s: reduction, replacement, and refinement. Reduction takes place when research laboratories try to reduce the number of animals involved while still giving useful results. Replacement involves using other techniques such as computer modeling over *in vivo* research. However, computer models simply cannot mimic the complexities of organisms (“The Use of Animals”), reminding us of the need for animals in research. Finally, refinement is the process by which procedures are modified to give minimal distress or discomfort to the research animals. Organizations such as the Institutional Animal Care and Use Committee (IACUC) and acts such as the Animal Welfare Act (AWA) of 1966 protect animals from being mistreated.

Although we take it for granted, biomedical research has helped us immensely. Since the 1840s, our life expectancy has almost doubled (“How has life expectancy changed”), mainly attributable to biomedical research. Animals play an instrumental role in this, as nearly every biomedical research medication would not exist without their involvement in experiments. Of all research animals, over ninety percent are rodents including mice, rats, and hamsters. Other animals used are dogs, cats, rabbits, sheep, pigs, fish, frogs, birds, and nonhuman primates (“The Use of Animals”).

Epidemiology is another field of study for disease. It focuses on the causes and outcomes of large-scale disease spread in populations and provides ways to control the pathogen. In the context of today’s pandemic, this field of study has been extremely helpful.

COVID-19, one of our biggest health crises today, has impacted me on a personal level. My father, a front-line worker, was separated from us for two months after contracting the virus. After a bleak spring and endless worrying about his recovery, biomedical research helped to produce a vaccine. Without the determination of the researchers and the help of the laboratory animals, my parents and other countless individuals would not be vaccinated. Additionally, my grandmother has pulmonary fibrosis, a rare and debilitating lung disease. Currently, certain medications are being tested in clinical trials to help find a cure.

Biomedical research saves millions of people every year, and it is helping today’s society in innumerable ways. Every day, determined researchers and laboratory animals work hard to help improve our lives, and we are indebted to their contributions and efforts.

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