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Third Place

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Understanding biomedical research can help us learn from the past, improve the present, and prepare for the future. Biomedical research is the study of living things and how diseases are caused in them. Through experimentation, scientists can develop a better understanding of the cause of diseases and how to prevent them. The knowledge they gain can be used to develop new procedures and medications to cure the illness. This research can be found through several testing methods; the most beneficial is animal testing.

Animal models are used for biomedical research because of their similarities to a human and how the disease affects them. Animal testing can be used to understand how a disease works, spreads, and how it can be treated. Researchers can test different medications, procedures, and proper dosages of drugs on animals to understand if it will benefit human health. Most animals used for testing are only bred for medical research. Rats and mice make up about 95% of the animals used in research. Rodents have similar genetic makeup, genomes and also get many of the same diseases as humans. This is helpful in biomedical research because scientists can research how the illness will act the same in animals and humans. Scientists still have to make genetic alterations to the animals as they are being bred to match those of humans. When making these alterations, scientists have to follow rules and regulations to protect the health of the animals. The welfare of these animals have been kept protected by the three R's, which are replace, reduce and refine. These rules state that either animals need to suffer as little as possible, the amount of animals used needs to be reduced, or animal testing needs to stop altogether. Scientists follow these to keep the animals safe. Using animal testing has created new medical benefits and discoveries to help human life.

The biomedical research process includes basic research, applied research, and clinical research. Basic research provides knowledge on biological processes that can be used in applied research to address and develop specific medical problems. Clinical research applies the knowledge and determines whether it would be safe for a human and if it is effective enough to solve the health issue. When they can determine this, they can do a human clinical trial. With a clinical trial, the development of a medical procedure, from applied research, is tested on human volunteers. There are many regulations, evaluation of the procedures, and pre-clinical trials done before a clinical trial can be held. It still takes three clinical trials before the Food and Drug Administration can approve the use of a new developed medical procedure.

Alternatives to human clinical trials include computer models, cell tissue studies or In Vitro tests, and Epidemiological studies. Computer models use algorithms to better understand analytical results from other tests. In Vitro tests test organ, cell and tissue samples to show how they develop diseases and how they react to them. Finally, epidemiological studies are used to

find the factor or determinant of diseases outside of the body, such as a human's environment and how it plays a role in their disease. Even though these tests are all helpful in biomedical research, animal testing is more helpful and informative.

Past animal tests and other methods have helped create the rabies vaccine, CAT scans, cancer diagnostic tests, diabetes treatments and many more. We will need biomedical research in the future as diseases grow and the need for prevention does too. Research using many methods of testing will continue to improve the future of human health.

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