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What is Biomedical Research?

Biomedical research is defined as an area of science where scientists and doctors try to find ways to understand and prevent diseases and inherited conditions and the deaths caused by them. The goal of biomedical research is to learn about medical devices, medicine, new therapies, and new treatments, to help people overcome sicknesses or other medical issues. Throughout the years, as technology has become more advanced, so has biomedical research, and it is certain to continue to improve even more in the future.

While researching, the process is split into three parts: basic, applied, and clinical. Basic research is where scientists try to increase their general knowledge and understanding of a certain topic by observing and experimenting. The next step, applied research, involves specific objectives and goals to achieve while finding an appropriate treatment. This is where scientists use animal models to help. Normally, rodents such as rats or mice are used because their genetics are very similar to those of humans, but other animals, such as dogs and non-human primates can also be used. The main purpose of this step is to see if they are safe and effective to use for humans yet.

Scientists always try to be as ethical and humane with animals as possible, which led to the creation of the three Rs - reduction, replacement, and refinement. This means that they try to reduce the number of live animals used while still making sure to receive accurate results, and also resorting to non-animal alternatives whenever possible, such as using computer models or tissue cultures, known as *in vitro*, meaning “in the glass” tests.

Ultimately, the bodies of animals still do not act completely the same as those of humans, so the research will be required to move on to humans for further *in vivo*, meaning “within the living” tests. Clinical research consists of clinical trials on humans, which are typically split into four phases, with one for healthy volunteers and three for patients. Those conducting these trials always make sure to follow a strict rule of conduct to not exploit or harm volunteers, who may be risking their lives for science. This process can take many years to complete, with each phase having its own function, whether it is to monitor the dosage, safety, efficiency, or side effects.

Epidemiology is another branch of science that also focuses on the study of disease. Scientists in this field learn about the pattern of distribution of widespread health crises and learn about preventative treatment methods by finding out about its causes and risk factors. It views the human population as a whole to control and prevent diseases.

An important part of biomedical research is to develop vaccines and treatments for diseases and finding out how to prevent them. A recent example is the SARS-CoV-2 virus, which has caused a global pandemic over the past two years. From the combined efforts of many scientists around the world, two vaccines were discovered less than 11 months after the virus was first discovered. The vaccines have prevented millions of deaths and hospitalizations, and they have also played a large part in the removal of the mask mandate.

Another major example is cancer, the second leading cause of death, and a disease that doctors and scientists have been trying to find the cure for. Biomedical research has helped us learn more about what causes cancer, how it spreads, and how to treat it, which I am especially grateful for, as thanks to the countless hours of research done by scientists and doctors, some of my relatives who have been previously affected by cancer are still alive and well.

The importance of biomedical research cannot be described with words, as not only is it providing people protection against diseases that would have been fatal less than a century ago, but it is also greatly extending the life expectancy of humans, which has nearly doubled in the past two centuries. The results of the work done by doctors and scientists are definitely making a huge difference in our society, with the most important one being that people now have the ability to live longer, healthier, and more meaningful lives.

Bibliography

- “The 3Rs.” *Foundation for Biomedical Research*,
<https://fbresearch.org/biomedical-research/3rs-animal-testing/>. Accessed 11 Mar. 2022.
- “Biomedical Research COVID-19 Impact Assessment: Lessons Learned and Compelling Needs.” *National Academy of Medicine*,
<https://nam.edu/biomedical-research-covid-19-impact-assessment-lessons-learned-and-compelling-needs/>. Accessed 12 Mar. 2022.
- “Biomedical Research Definitions.” *States United for Biometric Research*,
<https://statesforbiomed.org/education/background-on-biomedical-research/biomedical-research-definitions/>. Accessed 11 Mar. 2022.
- “Cancer.” *Centers for Disease Control and Prevention*,
<https://www.cdc.gov/chronicdisease/resources/publications/factsheets/cancer.htm>. Accessed 12 Mar. 2022.
- “Ethics of Human Testing.” *National Library of Medicine*,
<https://pubmed.ncbi.nlm.nih.gov/16032818/>. Accessed 13 Mar. 2022.
- “The Importance of Animal Research.” *National Association for Biomedical Research*,
<https://www.nabr.org/biomedical-research/importance-biomedical-research>. Accessed 11 Mar. 2022.

“Life Expectancy.” *Our World in Data*,
<https://ourworldindata.org/life-expectancy>. Accessed 12 Mar. 2022.

“Step 3: Clinical Research.” *U.S. Food & Drug Administration*,
<https://www.fda.gov/patients/drug-development-process/step-3-clinical-research>.
Accessed 12 Mar. 2022.

“What is epidemiology?” *Centers for Disease Control and Prevention*,
<https://www.cdc.gov/careerpaths/k12teacherroadmap/epidemiology.html>. Accessed 13
Mar. 2022

“What is the difference between in vivo and in vitro?” *Medical News Today*,
<https://www.medicalnewstoday.com/articles/in-vivo-vs-in-vitro>. Accessed 13 Mar. 2022