

2024 NJABR Middle School Essay Contest

1st Place

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What do French cuisine, Indochinese monkeys and the late 1950s have in common? The answer: a groundbreaking journey in biomedical research.

In 1958, polio struck 58,000 people. By 1961, thanks to vaccination, cases dropped to under 2,000. This ‘miracle’ vaccine, born from the cells of monkey kidneys and rigorously tested on rodents and rabbits, marked a victory over the decades-long battle against polio.

Today, our perspective on animals in research is often clouded. While Remy from *Ratatouille* is celebrated for his culinary skills, rats are relegated to pests on subway tracks, and monkeys are dismissed as mere zoo attractions. Yet, the roles these animals, along with millions of other animals — including fish and cattle — have played in biomedical research are crucial. Their contributions have been instrumental in saving countless human and animal lives, a fact that frequently goes unnoticed and unappreciated.

Biomedical Research seeks to understand the biological processes that cause diseases in order to prevent, treat and cure illnesses. It involves meticulous experimentation, lab work, and analysis to develop drugs, therapies, and medical devices that benefit not just humans but also our pets and farm animals. This field requires a collaborative effort from many backgrounds, including doctors, vets, computer scientists, engineers and specific researchers. Using cell cultures, computer models and epidemiological studies, scientists have helped increase life expectancy from below 50 in the early 1900s to over 75 today.

Animals share 70-90% of their genes with humans, making them susceptible to many of the same diseases we face, allowing for the application of research findings across species. 95% of all animals used in research are rats, mice and other rodents because of their short life cycles, which allow researchers to study diseases and treatments across many life cycles and generations. Additionally, studying animals allows for easy-to-control environment variables, such as temperature and diet, providing clearer insights than possible with humans.

For instance, surfactant therapy, developed through studies with calves, has drastically reduced deaths from respiratory distress syndrome (RDS) in premature babies. From 1985 research, this therapy decreased RDS fatalities from 10,000 to 1,000 annually, highlighting the vital role of animal research in saving lives.

Over 99% of animals used in research are bred specifically for this purpose, with a small percentage coming from regulated Class B dealers. Ensuring animal welfare is crucial for researchers, as the quality of care impacts the reliability of research outcomes. The Institutional Animal Care and Use Committees (IACUC), Animal Welfare Act of 1985 and the Public Health Service Policy ensure stringent oversight. These regulations mandate a thorough review of research proposals for animal welfare, including appropriate housing, nutrition, and veterinary care, as well as minimizing pain with analgesics and anesthesia. The rigorous review process

and adherence to ethical standards safeguard animal well-being and also ensure the integrity of research data.

Converting this animal-based research into drug discovery is a lengthy process, often taking up to 15 years, from basic research and pre-clinical trials spanning 3-6 years to clinical trials and FDA approval processes lasting ~9 years. The journey from laboratory 'bench-to-bedside' involves basic research to understand life's processes and diseases, applied research to tackle specific biomedical problems with new drugs or therapies, and clinical research to test these innovations on humans. Throughout this process, each new medicine is tested on 15 times as many people as animals, ensuring safety and effectiveness before reaching patients.

Ethical concerns surrounding animal use drive the scientific community to continually seek alternatives that can provide reliable data without involving animals. However, computer models can't fully replicate the complex physiological interactions in living organisms, making them insufficient for predicting the comprehensive effects of new drugs. In vitro tests, though crucial for initial safety and efficacy assessments, lack the context of an entire biological system. Epidemiological studies and human trials, progressing from Phase I to Phase III, are essential for understanding drug impacts in humans but cannot replace the early-stage biological insights provided by animal models. Consequently, despite ongoing efforts to Refine, Reduce, and Replace animal research following the 3Rs principle, complete substitution of non-animal methods remains unachievable today.

Every major medical advancement in the past century, from eradicating diseases like mumps, measles and smallpox to developing treatments for diabetes and cancer, has relied on animal research, significantly enhancing both human and animal health - 90% of veterinary medicine is similar to those used in humans. The evolving field of transgenic medicine, using genetically modified animals to mirror human diseases, underscores the continuing and future need for animal research in unraveling complex genetic conditions and crafting precise treatments.

References:

"General Overview." Pennsylvania Society for Biomedical Research, www.psbr.org/animal-research/general-overview. Accessed 10 Mar. 2024.

"Sixty Years of the Polio 'Miracle' Vaccine." Understanding Animal Research, 13 Apr. 2015, www.understandinganimalresearch.org.uk/news/sixty-years-of-the-polio-miracle-vaccine.

Animal Research at Stanford. "Why Animal Research?" Animal Research at Stanford, med.stanford.edu/animalresearch/why-animal-research.html. Accessed 10 Mar. 2024.

Lionstalkscience. "How Does Animal Research Advance Medicine?" Lions Talk Science, 25 Nov. 2013, lions-talk-science.org/2013/11/25/how-does-animal-research-advance-medicine/.

"Animals and Society." Pennsylvania Society for Biomedical Research, www.psbr.org/animal-research/animals-and-society. Accessed 10 Mar. 2024.