Animal Models for Experimental Research

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Abstract

An animal is an ideal tool using a non-human species handed down in medical research because it can mimic the attitude of a disease found in humans. Animal models are used to bring to successful completion of the information about a disease and its avoidance, diagnosis, and treatment.

Keywords: Thalidomide; Sulphonamide; Diethylstilbestrol (DES); Caenorhabditis elegans; Drosophila melanogaster

Introduction

The use of animals for scientific purposes is both a longstanding practice in biological research and medicine [1].

Some mouse strains are fully resistant to Ebola virus, others die without specific symptoms and others develop fatal hemorrhagic fever [2].

Although biological activity in an animal model does not ensure an effect in humans, many drugs, treatments and cures for human diseases are developed in part with the guidance of animal models [3].

Animal models representing specific taxonomic groups in the research and study of developmental processes are also referred to as model organisms [4].

The difference of responses to SIV, the monkey homolog to human HIV, between Rhesus macaques which develop simian AIDS and sooty mangabeys which do not develop symptoms despite high levels of circulating virus [5].

The animal experimentation demonstrates how it has not and could not be validated as a necessary step in biomedical research, and the survey casts doubt on its predictive value [6].

Animal experimentation is poorly predictive of human outcomes, that it is unreliable across a wide category of disease areas [7, 8].

It shows that the collective harms that result from an unreliable practice tip the ethical scale of harms [9].

A crucial protein that controls blood sugar in humans is missing in mice [10].

The challenging areas where basic scientists and clinicians need to have a cross-link. There are considerable drugs candidates that were successful in the animal model but failed in clinical trials. Medical research remains vulnerable on model organisms and systems for endowing potency prior to the architecture of clinical trials. Animal researches are required for basic biological and medical re-

search. Elixer sulphonamide in 1937, successfully engaged in the treatment of streptococcal infections. This drug is associated with various deaths. Many children suffered from simple sore throats died of kidney failure by consumption of diethyl glycol. This drug has not been tested on animals. Diethylstilbestrol (DES) medication was given from 1940-1970 to pregnant women expected that it would reduce the risk of pregnancy complications.

In 1971, DES was shown to cause clear-cell carcinoma, a rare vaginal tumor, in girls and women. The United States Food and Drug Administration subsequently withdrew approval of DES.

There are incidences where the situation evades diagnosis and evil effects manifest after the situation goes out of hand as in Thalidomide tragedy of 1962. Thalidomide is a sedative drug that used to be prescribed to treat anxiety, tension, gastritis and insomnia. It was also used to relieve morning sickness in pregnant women. However, thalidomide was found to cause deformity in children born to mothers who took the drug and it was withdrawn in the UK during the early 1960s.

The subtle effect of Thalidomide tragedy resulting in phocomelia, apoda, other defects included abnormal or absent ears, heart and kidney problems, cleft palate, spinal cord defects and digestive system disorders. etc in the offspring led to untold miseries.

There are a similar good number of cases of fetal deaths, stillbirths, teratogenices, etc the young ones of mothers are exposed to toxicants like pesticides, radiation, heavy metal, etc. Can we save innocent lives growing in the wombs of the mother from becoming the victims of the hostile environment that cannot avoid?

Laboratory animals are paramount to unearth and expansion of strange and superior drugs for the treatment of human disease. Probable new drugs are approved first in the laboratory animals and then in human contributors. During pregnancy, a fetus can be exposed to a variety of chemicals that may induce abortion and malformations. Different species have been used as animal models for teratogenices screening, most of them sharing similar development processes with humans despite the fact that animals differ from humans in many ways, they are also identical to people in many ways. Animals establish many of the same diseases as people, together with hemophilia, diabetes, and epilepsy. Animals are also vulnerable to many of the same bacteria and viruses as people, such as anthrax, smallpox, and malaria. An animal is selected as an "animal model" for research only if it contributes essence with people that are applicable to the research. Louis Pasteur used dogs as an animal model for studying rabies. He developed a rabies vaccine on the ground that dogs and humans can both develop rabies. The immune systems of dogs and people counter to rabies correspondingly. Humans and dogs conflicted by other ways that is dogs cannot develop AIDS or measles, diseases that disturb humans. Animals and humans score many of the same syndromes. Certain animals have susceptibility for certain conditions that are also found in humans. Cats are used to develop immunodeficiency virus vaccines and to study leukemia Armadillos and humans are among only a few animal species that naturally suffer from leprosy; as the bacteria responsible for this disease cannot yet be grown in culture, armadillos are the primary source of bacilli used in leprosy vaccines.

All medical research is meticulously programmed and includes medical research with animals. Under federal law, all animals must be studied graciously and undergo the least disquietude and discomfort achievable.

Caenorhabditis elegans

It is an invertebrate research model. The genome of this nematode has also been fully mapped out and any one of these genes can easily be operated through RNA interference, by battening the worm's antisense RNA. *C. elegans* is an extremely useful model for human diseases like congenital heart disease and kidney disease, and neurological disorders, apoptosis is strikingly similar to vertebrates It was the first multi-cellular organism to have its whole genome sequenced. It is used to study the space environment. The worm is a very popular model for studying developmental biology. The simple nervous system of this nematode allows the effects of genetics on the development of nerves to be studied in detail.

C.elegans mutants can be screened with thousands of potential drugs for important diseases like cancer.

Drosophila melanogaster

It is the fruit fly, or vinegar fly, or Cinderella genetics, which is used as a model to study genetics. Drosophila can be used as an exemplary to test the consequences of drugs on the biochemical pathways that regulate many key cellular actions. The fruit fly is used in Mutations, Crossing over, Sex-linked inheritance, Jumping genes, co-dominance. About 75% of known human disease genes have a discernable match in the genome of fruit flies. D melanogaster is being used as a genetic model for human diseases like neurodegenerative disorders Parkinson's, Huntington's, spinocerebellar ataxia, and Alzheimer's disease. The fly is also being passed down to study mechanisms hidden aging and oxidative stress, immunity, diabetes, and cancer, and drug abuse. D. melanogaster is not extensively used in enforced medical research, as the fly immune system set aside greatly from that found in humans.

Scorpions

All scorpions have a long gestation period. It goes from several months to a year and a half, depending on the species. Young scorpions develop as embryos in the mother's uterus. During this time, the embryo gets food from his mother hence scorpion can be used as an ideal medical research model A number of studies have delineated the anticancer effects of venoms and toxins of scorpions were achieved mainly through the inhibition of cancer growth, arrest of the cell cycle, induction of apoptosis, and suppression of cancer metastasis. Biomedical researchers have found a way to use scorpion venom to help children with brain cancer, gastric cancer. Chlorotoxin of venom can be used to block signals from cancer cells. It Helps to prevent organ Rejection, treat arthritis and malaria.

Guinea pig

The guinea pig is not a pig nor is it derived from New Guinea. It is a rodent without a tail. It is native to South America. Guinea pigs are popular laboratory animals until the late 20th century. They have many biological resemblances to humans, and they are mammals. Guinea pigs have been used as experimental animals for centuries. They are widely used in medical research, respiratory, nervous, infectious disease, and seminal work on the role of certain vitamins and immune systems. Guinea pigs have an analogous hearing range to humans. Guinea pigs have gratuitous 23 Nobel prizes for medicine. The discovery of Vitamin C, the tuberculosis bacterium, and adrenaline, over and above the development of vaccines for diphtheria and tuberculosis, replacement heart valves, blood transfusion, kidney dialysis, antibiotics, anticoagulants, and asthmatic drugs They are useful models for understanding how human ears work and how they can be repaired. Guinea pigs are useful in embryonic developmental studies, as they share similarities with humans, in placental structure, teratogenic effects.

Rabbit

Rabbits are used for toxicity and security testing of drugs, and chemicals. They are used in skin and eye irritation studies, and corneal transplants. Rabbits are popularly used in antibody research and production. Several diseases have benefitted from antibody production, including the COVID disease caused by the SARS-COV-2 virus. Rabbits were the first models for studying atherosclerosis.

Rat

Rats and other rodents are widely used animals in biomedical research, sepsis, burns, inflammation, stroke, Alzheimer's, diabetes, cancer, Parkinson's disease, and rabies vaccine. Rats have been used in genetics, diseases, and the effects of drugs. The aortic arches of the rat are homologous to the human cardiovascular system. Both rat and human aortic arches exhibit branching of the brachiocephalic trunk. The murine model of the heart and its structures remains a valuable tool for studies of human cardiovascular conditions.

Dogs

Dogs are used in the discovery of insulin, cardiovascular disease (Due to the resemblance and size to the human heart). Duchenne Muscular Dystrophy, diabetes, joint disease, and parvovirus vaccine. Certain breeds of dog suffer from narcolepsy making them the major model used to study the human condition.

Pig

Human skin is very similar to pigskin. It is used in biomedical research and for drug testing, and xenotransplantation. Skin grafts for burn victims and computer-assisted tomography (CAT) scan. Doing research with human subjects is illegal and unethical. Viviparity is common among mammals but not many provide a long gestation period. So in this situation scorpion comes handy, cheap, available, viable, and reliable, with viviparity and a long gestation period and it can be used as a medical experimental model. This can be summarized as:

1. New thoughts in drug research to prevent teratogenices.
2. New biochemical targets for drug screening
3. It focuses on drug discovery
4. Why more failures than success?

Mistakes are painful when they happen. But years later a collection of mistakes is called experience which leads to success.

Conclusion

Animals are in many features biologically and psychologically analogous to humans, especially in the pain, fear, and suffering show collaborative characteristics. In comparison, evidence shows that consoriously important physiological and genetic dissimilarity between humans and other animals can nullify the use of animals to study human diseases, treatments, pharmaceuticals, etc

Animal models particularly, and animal experimentation normally, are insufficient for predicting clinical outcomes in human beings in the lion share of biomedical science. As a result, humans can be subject to significant and unsure damage.

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