

The Essential Need for Animals in Medical Research

Introduction

Cats tend to be independent and aloof, so much so they often seem quite mysterious. However, cats actually have helped scientists to solve medical mysteries and increased our knowledge of conditions that continue to plague humans as well as cats and other species. Cats have been a mainstay in research studies of neurological, cardiovascular, and respiratory diseases and the immune system. In particular, they have been valuable models for understanding the function of the neuron (nerve cell), the chemical transmission of nerve impulses, and the functional organization of the brain. Neuroscientists studying cats have provided a map of the circuitry of the vertebral cortex revealing the major pathways that send signals from the eye to the brain.

Domesticated as human companions many thousands of years ago, some 75 to 85 million cats¹ now reside with American families. Given their great popularity in the U.S., there is significant public expectation for veterinary treatments and preventative measures to keep pet cats healthy and thriving.

Aging & Alzheimer's

Cats are known to reach the age of 20 years, and advances in treating many feline diseases have extended their life-expectancy. This relatively long life span, compared with mice and rats, makes it possible to observe the slower and more subtle effects of aging in cats.

A century after Alzheimer's was identified, researchers are still trying to find risk factors that cause the ailment, which afflicts 28 million people worldwide. As it turns out, aging cats who forget their owners and become confused also may be suffering from Alzheimer's disease.² Scientists have found a protein accumulating in the nerve cells of cats' brains causing mental deterioration. In humans with Alzheimer's, the same protein creates tangles inside nerve cells, apparently inhibiting messages being processed by the brain. Studying the similar disease seen in cats, researchers may be better able to assess the course of the disease, the effects of medical interventions and Alzheimer's prevention. With additional understanding of molecular changes that are occurring in the aging brain, it is hoped new and novel treatments may be identified to help both cats and humans.

Cancer Research

Among the most serious diseases shared by cats and people is leukemia, a malignant disease of the blood-forming organs, resulting in the uncontrolled production of abnormal white-blood-cells. Discovered in 1965, Feline leukemia virus (FeLV)³ is second only to trauma as the leading cause of death in cats, killing 85% of persistently infected felines within three years of diagnosis. A vaccine for the feline leukemia virus is available and has been refined over the years. Mammary cancer⁴ is also common in the cat, and many features of feline

mammary cancer resemble human breast cancer which, among the human cancers, is the greatest killer of women.

Feline oral squamous cell carcinoma⁵ – a common and aggressive oral cancer – currently is deadly. Surgery and other available treatments most often are not effective. Researchers found a targeted anticancer agent⁶ suppressed cancer-cell replication and spread in cell culture, and interrupted cell-signaling circuits that promote cancer growth. These encouraging findings have warranted further study. Additional cancer research in human and other animal models, aimed at prevention and improved treatment, is likely to benefit all species in the future.

Genetics

There are over 200 hereditary human diseases for which exist closely correlated conditions in cats.⁷ To date, the genetic diversity of the general cat population (and of some purpose-bred cats) has provided several valuable genetically-based models of human disease. For example, a colony of Maine Coon cats prone to having an abnormal heart muscle condition (hypertrophic cardiomyopathy)⁸ is maintained at the University of California, Davis, and cats with a metabolic disorder called mucopolysaccharidosis⁹ are maintained and studied at the University of Pennsylvania. Not only humans, but also cats, dogs and other animals suffer from a group of similar serious metabolic ailments. As more is discovered about the implications of

our respective genomes and genetic research moves forward, it is hoped innovative treatments will be devised to benefit people, cats and other animals.

Heart Disease

Heart disease usually strikes cats in the prime of their lives—around 4 to 6 years of age but as young as 1 year old. Hypertrophic cardiomyopathy (HCM) is the most common type of feline heart disease and the greatest cause of cardiovascular disease and death. Identification of clinical risk factors in humans has improved patient health and survival. Although feline HCM is remarkably similar to HCM in people, clinical markers that could identify at-risk cats aren't available. Because the lack of this vital information inhibits efforts to develop effective preventive therapies for cats, the Morris Animal Foundation is supporting research aimed at filing this knowledge gap.¹⁰

Immunodeficiency

The feline immunodeficiency virus (FIV)¹¹ is a lentivirus genetically similar to its human equivalent, HIV. First isolated in 1986, FIV causes immune system suppression, eventually results in disease similar to human AIDS and is a leading killer of domestic cats. The development of an FIV vaccine in 2002¹² not only has helped to limit FIV effects, but also provided a new model for use in HIV vaccine development. An additional advantage of FIV models in the study of AIDS is that this virus does not infect humans. Cats, which are naturally infected with the FIV virus, have been used as models to study effective anti-viral treatments

for AIDS,¹³ which will benefit both cats and humans.

Urinary Bladder Disease

Human interstitial cystitis¹⁴ is a bladder disorder characterized by inflammation, pain, and abnormal urinary frequency. As many as 1 in 4.5 women¹⁵ as well as some men suffer from the condition. Domestic cats also develop feline interstitial cystitis¹⁶, which is clinically indistinguishable from the human disorder¹⁷. Random source cats are the only known spontaneously occurring animal models of the disease.

Vision

Studies of the development and function of the visual system in cats by David Hubel, Thorsten Wiesel and others, have determined that all mammals, including humans, are born with a partially-developed visual system. Building on information from detailed studies of the nervous systems of kittens,¹⁸ it was found proper development of the eyes, optic nerve and visual centers of the brain requires stimulation of the visual neurons by light. This work was awarded the Nobel Prize in medicine in 1981.¹⁹ Almost immediately, this realization of the importance of early stimulation to the wiring of the visual cortex translated from the lab to the clinical treatment of children born with cataracts and other eye impairments. With Hubel and Wiesel's new understanding,²⁰ doctors began treating children as early as possible, with much better outcomes.

Research Cat Statistics and Trends

Approximately 21,000 cats were part

of research, education or drug and other product safety testing in 2014, as reported by U.S. research facilities to the U.S. Department of Agriculture.²¹ Even though they remain essential for research, the number of cats used for these purposes has declined nearly 70% since the 1970s. Most vertebrate animals used in research today are mice, rats and tiny fish, but a relatively small number of cats still are needed because they are the most appropriate model, or the only one possible, to answer a research question, train veterinarians or ascertain the safety of drugs and products, some of which are designed specifically for cats themselves.

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