

The Essential Need for Animals in Medical Research

Introduction

The close relationship between dogs and people may pre-date recorded history. One of the most significant results of our partnership with dogs has been their contribution to our understanding of disease, and how to prevent and cure it. In fact, dogs and people get many of the same diseases from heart disease to cancer. What we can glean from studying dogs in medical and scientific research often yields treatments that help not only people, but also dogs themselves.¹

Pet Health

There are at least 70 million pet dogs in the U.S. according to the latest American Veterinary Medical Association statistics.² Caring for the health of our pets is vital, and thanks to research with dogs, we are able to offer our canine companions:

- Vaccinations against infectious diseases, some devastating, such as canine distemper, parvovirus, rabies, coronavirus, leptospirosis, Lyme disease, measles, and hepatitis.³

- Prevention and treatment of common, but sometimes serious, health issues: heartworm and a variety of intestinal parasites, fleas, ticks, mites and mange.

With optimal diet⁴ of great interest to dog owners, pet food and other product manufacturers study dogs to better understand how to create the most nutritious food for our pets. Because of pet overpopulation, dog reproduction is studied with the aim of devising less invasive and lower-cost means of ensuring birth control.⁵

Research that Benefits Both People & Pets

Research with dogs leads to life-preserving and life-enhancing treatments for humans, dogs and other animals. Most of the top 25 drugs prescribed in the U.S. were developed with the help of studies in dogs.

Aging & Alzheimer's Disease

Unlike mice and rats, older dogs naturally develop significant brain disease and may display learning and memory problems, strikingly similar to changes seen in people.⁶ For example, dogs develop amyloid plaques in their brains made up of a protein identical to one that humans produce. Multiple teams of NIH-supported investigators are studying aged beagles to find treatments for dementia, such as special diets and behavioral enrichment.^{7 8 9} At the University of Washington, 32 dogs will participate in a study of an experimental anti-aging drug due to start in 2015¹⁰.

Cancer

Research with beagles could lead to better diagnostic tests for bladder cancer in both canine and human patients.¹¹ Numerous studies are addressing innovative treatments like immunotherapy¹² for other types of cancer suffered by dogs and humans, such as skin cancer,¹³ bone cancer,¹⁴ and nasal adenocarcinoma.¹⁵ Searchable databases for animal cancer and comparative medicine clinical trials are available online.^{16 17}

Diabetes

Insulin was discovered in dogs. The 1923 Nobel Prize in Medicine was awarded for the discovery of insulin in experimental dogs,¹⁸ and they continue to serve as an essential model for alternative treatments to preserve the insulin-producing cells of the pancreas, improve the quality of life for humans and dogs with diabetes, and ultimately to find a cure for the disease.¹⁹

Genetic Abnormalities

About six in 100,000 babies are born with centronuclear myopathy, which causes severe muscle weakness and often results in death before age 18. Now, by discovering a similar condition in dogs, researchers can diagnose the disease, unravel its molecular intricacies, and target new therapies.²⁰ Spontaneous genetic models in dogs are available for research involving sleep apnea, muscular dystrophy, progressive retinal atrophy, hereditary nephropathy, hemophilia A and B and dilatative cardiomyopathy.^{21 22} An ongoing study begun in the dog model²³ suggests that a new kind of gene therapy for hemophilia B could be safe and effective for human patients.

Heart Disease

Dogs played a major role in the development of surgical procedures for heart valve and artery replacement; angioplasty studies with dogs have significantly advanced our understanding of narrowed or clogged arteries and renarrowing of coronary arteries after angioplasty. The canine

aorta is a relevant model for testing the implantation of devices, such as the stent designed to prevent the recurrence of arterial narrowing.²⁴ Since they develop cardiac problems similar to those experienced by people, dogs also benefit from the participation of their species in ongoing research.²⁵

Kidney Disease

Kidney dialysis treatment of dogs²⁶ whose organs have failed is one example of a medical solution developed for people that is now also saving pets.

Spinal Cord, Bone and Muscle Conditions and Injuries

Dogs are integral to the study of spinal cord injury,²⁷ the development of prosthetics for human hip and knee replacements, tendon and ligament repair, and assessment of biomaterials for orthopedic devices.^{28 29} Older dogs have been used to study osteoarthritis, cervical disc degeneration, and vertebral fusion because the pathophysiology of such dogs is similar to that of aged humans.^{30 31 32} These research advances now afford companion dogs many of the same benefits as for humans, such as hip and knee replacement, arthroscopic ligament repair, and other procedures associated with degenerative joint disease.³³ Dogs — young and old, big and small — may suffer from hip dysplasia, a malformation of the ball and socket joint of the hip. Fortunately, treatment options are available to help pets stay mobile and free of pain.^{34 35}

Transplantation of Organs and Cells

Pioneering surgeons in kidney, heart and other organ transplantation Joseph Murray³⁵ and Thomas Starzl³⁶ credit dogs with making essential

contributions to their success in treating human patients. Dogs were also critical in the development of hematopoietic cell transplantation or bone marrow transplantation because of their genetic diversity, large size, long life, and the fact that, other than humans, they are the only mammals to possess these qualities.³⁷

Statistics & Trends

Approximately 60,000 dogs were part of research, education, or drug and other product safety testing in 2014, as reported to USDA by the U.S. research facilities. Dogs account for less than one-quarter of 1 percent of the research animal total. Since 1979, when reliance was highest, the use of this model has been reduced 70 percent. Most vertebrate animals used in research are mice, rats and tiny fish, but a relatively small number of dogs still are needed because they are the most appropriate model, or the only one possible, to answer a research question. Today, dogs needed for research are bred specifically for this purpose and typically are beagles or mongrels.

A few breeding colonies have been maintained at research facilities to study genetic diseases naturally occurring in dogs, including for hemophilia A and B, von Willebrand disease, and Duchenne muscular dystrophy.^{38 39} Most institutions have longstanding laboratory dog adoption programs. When appropriate and feasible, efforts are made to find permanent new homes for dogs no longer needed in research. Often scientists, students and staff adopt the dogs they have worked with, cared for and learned from.

References

- 1 Strait, J E, Shared Medicine. Wash. Univ. in St.Louis School of Medicine Magazine Outlook. April 2015.
- 2 AVMA 2012 U.S. Pet Ownership & Demographics Sourcebook.
- 3 AVMA Vaccination Recommendations for Dogs.
- 4 FDA's Regulation of Pet Food
- 5 AVMA Policies, Dog and Cat Population Control
- 6 Head, E. What can beagles teach us about Alzheimer's disease? The Conversation, Jan. 9, 2015
- 7 Opii W O, Head E, Melgram N W, et al. Neurobiol Aging. 2008 Jan; 29(1): 51–70.
- 8 Siwak-Tapp CT, Head E, Muggenburg BA, Milgram NW, Cotman CW. Neurobiol Learn Mem. 2007; 88(2):249-59.
- 9 Siwak-Tapp C T, Head E, Muggenburg B A, et al. Neurobiology of Aging 2008; 29(1): 39-50
- 10 Keats J. Why testing drugs on our dogs is good for our health. Wired. April 21, 2015.
- 11 Shapiro SG, Raghunath S, Williams C, et al. Chromosome Res. 2015;23(2):311-31.
- 12 Roberts NJ, Zhang L, Janku F, et al. Sci Transl Med. 2014;6(249):249ra111.
- 13 Lade D C, Drug May Help Dogs with Cancer. Sun Sentinel, April 14, 2014
- 14 <http://www.sciencedaily.com/releases/2012/05/120509123657.htm>
- 15 <http://phys.org/news/2014-08-veterinary-nanoparticles-cancer-treatment-dogs.html>
- 16 <https://ccrod.cancer.gov/confluence/display/CCRCOP-Web/Clinical+Trials>
- 17 <http://www.vetcancertrials.org/>
- 18 <http://www.nobelprize.org/educational/medicine/insulin/discovery-insulin.html>
- 19 <http://www.understandinganimalresearch.org.uk/why/human-health/insulin-for-diabetes/>
- 20 Gura, T, Dogs Provide Insight Into Rare Genetic Disease. <http://news.sciencemag.org/2013/06/dogs-provide-insight-rare-genetic-disease?intcmp=collection-dogs>
- 21 <http://ic.ucei.ca/cidd/>
- 22 <http://www.ncbi.nlm.nih.gov/pubmed/19293462>
- 23 <http://news.unchealthcare.org/news/2015/march/new-gene-therapy-for-hemophilia-shows-potential-as-safe-treatment>
- 24 Narayanaswamy M et al. 2000. Vasc Interv Radiol 11: 5-17.
- 25 <http://vetmedicine.about.com/od/diseasesandconditions/a/CW-DogHeartDiseaseCauses.htm>
- 26 http://articles.philly.com/2015-03-22/news/60373377_1_dozen-dialysis-kidneys-harley#RGOOqu4ZmWUj3ETY.99
- 27 <http://phys.org/news/2013-11-iowa-state-veterinary-treatments-spinal.html>
- 28 <http://www.ncbi.nlm.nih.gov/pubmed/7056776>
- 29 <http://www.ncbi.nlm.nih.gov/pubmed/11476392>
- 30 <https://www.crcpress.com/product/isbn/9780849321153>
- 31 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1571361/>
- 32 <http://www.ncbi.nlm.nih.gov/pubmed/9627007>
- 33 <http://fbresearch.org/paraplegic-dogs-getting-treatment-and-helping-humans/>
- 34 33 <http://www.news-gazette.com/living/2015-05-18/pet-talk-hip-hip-hooray.html>
- 35 http://www.nobelprize.org/nobel_prizes/medicine/laureates/1990/murray-bio.html
- 36 <http://www.225.pitt.edu/story/organ-transplantation-capital-world>
- 37 <http://www.ncbi.nlm.nih.gov/pubmed/16339369>
- 38 Nichols TC, Dillow AM, Franck HW, et al. ILAR J. 2009; 50(2):144-67.
- 39 Wang Z et al. ILAR J. 2009; 50(2):187-98.

