





## Fun Facts About Armadillos

- ◆ An armadillo's 90 degree body temperature is 8 degrees lower than humans and other mammals.
- ◆ Armadillos eat fire ants and termites—insects that cause damage to crops, lawns, and homes.
- ◆ The word armadillo is Spanish for “little armored one.” Their armor shell is made of bones.
- ◆ Armadillos can hold their breath under water for up to 6 minutes.

## Medical Discoveries Made Possible Through the Study of Armadillos

### *Leprosy*<sup>1</sup>

- ◆ Armadillos are one of the few animals that are susceptible to leprosy, an infectious disease characterized by disfiguring skin sores, nerve damage, and progressive debilitation.
- ◆ Researchers have found that the core body temperature of the armadillo is low enough to favor the growth of the leprosy-causing bacterium
- ◆ Scientists detected leprosy in wild armadillos in 1975. Armadillos can produce enough numbers of leprosy bacilli to permit basic research and test anti-leprosy drugs.
- ◆ Several scientific groups are developing vaccines aimed at eliminating leprosy; these vaccines may become available world-wide in the next few years.

### *Reproductive Research*<sup>2</sup>

- ◆ The nine-banded armadillo serves science through its unusual reproductive system, in which four genetically identical quadruplets are born in each litter.
- ◆ Because of their identical biological and genetic makeup, armadillos are good models in scientific, behavioral and medical studies related to reproductive health.

<sup>1</sup> National Institutes of Health. [Internet]. 2006. Story of discovery: Armadillos and their role in treating leprosy. [Cited 19 August 2011]. Available at: [science.education.nih.gov](http://science.education.nih.gov).

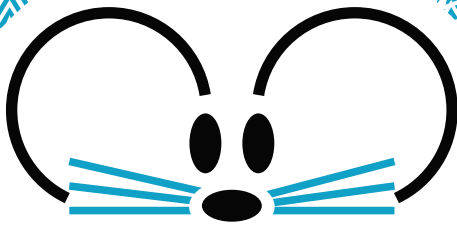
<sup>2</sup> Loughry WJ, Prodohl PA, McDonough CM, Avise JC. 1999. Polyembryony in armadillos. *American Scientist* 86: 274–279.



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# Cats



## Fun Facts About Cats

- ◆ The nose pad of cat is ridged in a pattern that is unique, just like the fingerprint of a human.<sup>3</sup>
- ◆ A cat will almost never “meow” at another cat. This sound is reserved for humans.<sup>3</sup>
- ◆ Cats **can** see in color and they need 1/6th the amount of light that humans do to see in the dark.<sup>3</sup>

## Medical Discoveries Made Possible Through the Study of Cats

- ◆ Cats have contributed to the study of emotion, cardiac disease, spinal cord injury, cataract surgery, glaucoma, lupus, diabetes, spina bifida and more.<sup>2</sup>
- ◆ These diseases are common to both humans and cats, and research in these areas has helped our understanding of human disease and the advancement of veterinary research.<sup>2</sup>

## Sensory Systems

- ◆ Cats are mainly used as models to study sensory systems and neuroscience. They have acute hearing, excellent eyesight and highly developed balance and spatial awareness.<sup>2</sup>
- ◆ Studies on cats have enhanced our understanding of eye disorders like amblyopia (lazy eye) and strabismus (cross-eye). Cats have also contributed to research on glaucoma and cataract surgery.<sup>1</sup>

## Cancer

- ◆ Leukemia, a malignant disease of the blood-forming organs resulting in the uncontrolled production of abnormal white-blood-cells, is a disease that impacts cats and people.<sup>2</sup>
- ◆ In 1965, researchers discovered that feline leukemia is caused by a retrovirus. A vaccine for the feline leukemia virus is available and has been refined over the years.<sup>2</sup>
- ◆ Mammary cancer 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.<sup>2</sup>

## Aging

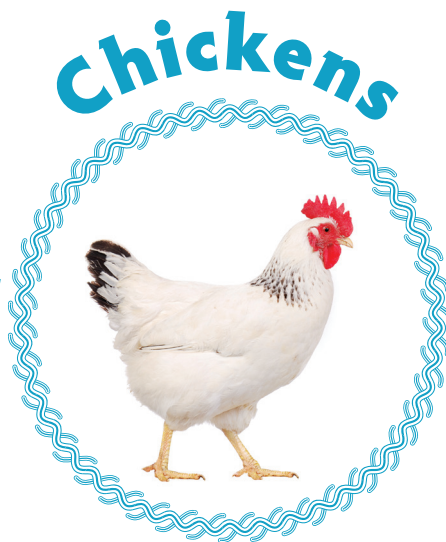
- ◆ The relatively long life span of cats, compared to mice and rats, makes it possible to observe the slower and more subtle effects of aging.<sup>2</sup>

<sup>1</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>2</sup> **Animal Research.Info.** [Internet]. 2011. Cats. [Cited 19 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>3</sup> **CatScans.** [Internet]. 1999. Fun facts about cats. [Cited 19 August 2011]. Available at: [www.catscans.com/facts.htm](http://www.catscans.com/facts.htm).





## Medical Discoveries Made Possible Through the Study of Chickens

### ***Genetic and Developmental Studies***<sup>1</sup>

- ◆ Chickens are important model organisms for genetic and developmental studies because they produce hardy embryos that develop outside the body of the mother.
- ◆ The shell of the chicken egg can be cut, and covered with clear plastic so that development of the chicken can be viewed at all stages.
- ◆ Studies of chickens provided valuable insights into the development of the nervous system, showing how cells migrate and differentiate.
- ◆ Chicken research also helped researchers discover the molecular basis of limb development—a process which is similar in humans and birds—and have helped the understanding of many limb disorders.

### ***Cardiovascular Research***<sup>1</sup>

- ◆ Studies on the development of the chick embryo are revealing clues about the heart condition atrial septal defect, often referred to as “hole in the heart.”
- ◆ In this condition, the wall between the left and right atria of the heart does not close completely during development, making it more difficult for the heart to pump blood around the body. Around 1 in 1,000 babies are affected.
- ◆ Chickens are good models for this condition because, like humans, they have a four-chamber heart.
- ◆ Researchers are investigating the involvement of a particular gene—Tbx5—by reducing its activity. This research will help to clarify the role of this gene in the development of the heart.

### ***Cancer Research***<sup>2</sup>

- ◆ Dr. Peyton Rous earned the 1966 Nobel Prize in Medicine for his 1910 study of chickens that established the first link between tumors and viruses.
- ◆ This groundbreaking research helped Rous describe the progression of human papillomavirus (HPV) warts into cancer.

<sup>1</sup> **Animal Research.Info.** [Internet]. 2011. Chickens. [Cited 30 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **RDS: Understanding Animal Research in Medicine and Coalition for Medical Progress.** [Internet]. 2007. Medical Advances and Animal Research. [Cited 23 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).



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# Chimpanzees



## Fun Facts About Chimpanzees

- ◆ Chimpanzees don't like to be in water and usually can't swim.
- ◆ Some observers have noted chimps feed on medicinal plants when they are ill or injured.
- ◆ Research has shown that chimps and humans share 98 percent of their genes.
- ◆ Chimpanzees are one of the few animal species that use tools.

## Medical Discoveries Made Possible With the Help of Chimpanzees

### *Language Research*

- ◆ Research on chimpanzees' communicative abilities provided new approaches to teach language to children to developmentally-challenged children.<sup>4</sup>

### *Malaria*

- ◆ Malaria, caused by Plasmodium parasites, is one of the world's deadliest diseases, killing over a million people each year, mainly women and young children in Africa and Southeast Asia.<sup>3</sup>
- ◆ Chimpanzees are valuable models for understanding malaria and screening anti-malarial drugs. Researchers are studying chimpanzees in the hopes of developing a malaria vaccine.<sup>2</sup>

### *HIV/AIDS*

- ◆ Chimpanzees are the only animal, other than humans, that can be infected with HIV.<sup>1</sup>
- ◆ Researchers are trying to understand why HIV infected chimps do not suffer symptoms of AIDS.<sup>1</sup>

### *Hepatitis B*

- ◆ Studies on chimpanzees led to the development of a vaccine against hepatitis B virus. Ongoing efforts are trying to develop vaccines for other infectious diseases, such as hepatitis C (HCV) and respiratory syncytial virus (RSV), a common cause of pneumonia and bronchiolitis in children.<sup>1</sup>

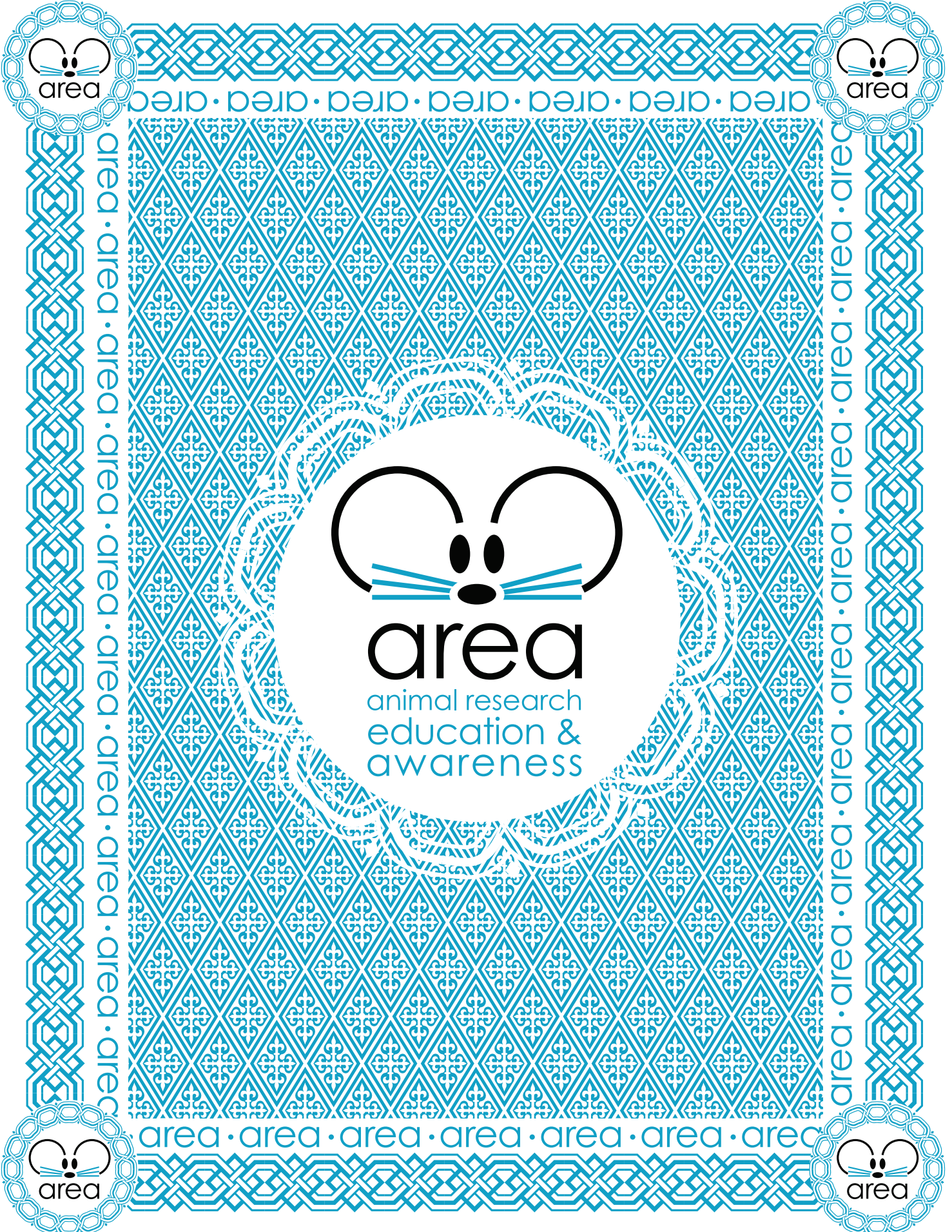
<sup>1</sup> Strandberg J. [Internet]. 2000. Testimony on biomedical research and chimpanzees. Presented before the House Committee on Commerce, Subcommittee on Health and Environment. [Cited 19 August 2011]. Available at: <http://www.hhs.gov/asl/testify/t000518a.html>

<sup>2</sup> James S, Miller L. 2000. National Institute of Allergy and Infectious Diseases. Malaria Vaccine Development: Status report. Washington, DC: GPO.

<sup>3</sup> The Wellcome Trust Centre for Human Genetics. [Internet]. 2008. Malaria vaccine trials begin using 'chimpanzee virus.' [Cited 19 August 2011]. Available at: [www.well.ox.ac.uk](http://www.well.ox.ac.uk)

<sup>4</sup> Rumbaugh, DM, Warner, H, Glaserfeld, EV. 1977. The Lana project: Origin and tactics, p 87-90. In: Rumbaugh, DM, editor. Language learning by a chimpanzee. New York (NY): Academic Press.





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# Chinchillas



## Fun Facts About Chinchillas<sup>3</sup>

- ◆ Chinchillas are agile jumpers and can jump up to five feet above their head.
- ◆ They have the highest fur density of any animal with more than 20,000 hairs per square centimeter.
- ◆ Chinchillas have no dander, which is the leading cause to pet related allergies.
- ◆ Chinchilla fur is considered the softest in the world and is thirty times softer than human hair.

## Medical Discoveries Made Possible Through the Study of Chinchillas

### *Hearing Research*<sup>1</sup>

- ◆ Chinchillas are needed as models for the study of hearing because they respond to pure tones and they have very similar middle-ear anatomy and nervous system connections as humans.
- ◆ Chinchillas provide the only animal model for the common but painful problem of childhood middle-ear infections. The result of this research has been applied in clinical studies in children.

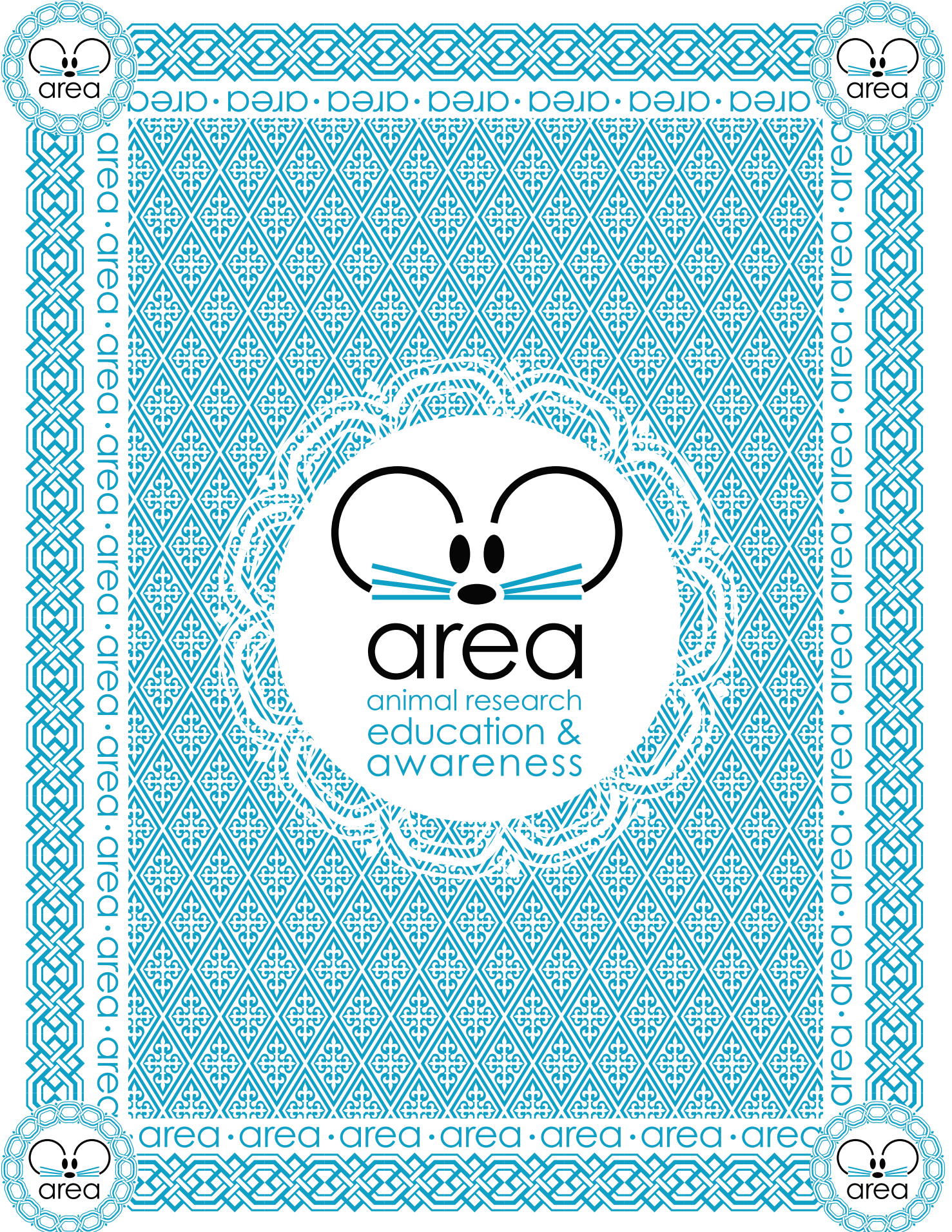
### *Study of Cholera*

- ◆ Chinchillas are very important in studying cholera, because they mimic the disease in humans so closely. Cholera is a bacterial infection of the small intestine that is primarily spread through consuming contaminated food and water.<sup>1</sup>
- ◆ The once-epidemic disease causes severe diarrhea and vomiting that, if not aggressively treated, can result in life-threatening dehydration and electrolyte imbalances.<sup>2</sup>
- ◆ Despite an oral vaccination that is 85% effective, cholera causes over 100,000 deaths worldwide each year.<sup>2</sup>

<sup>1</sup> **Partners in Research.** [Internet]. 2010. Chinchilla. [Cited 22 August 2011]. Available at: [www.pirweb.org/chinchilla.htm](http://www.pirweb.org/chinchilla.htm).

<sup>2</sup> **World Health Organization.** [Internet]. 2011. Cholera Fact Sheet [Cited 22 August 2011]. Available at: [www.who.int/mediacentre/factsheets/](http://www.who.int/mediacentre/factsheets/)

<sup>3</sup> **Infolific.** [Internet]. 2011. Chinchilla Facts [Cited 22 August 2011]. Available at: [infolific.com/pets/chinchillas/chinchilla-facts/](http://infolific.com/pets/chinchillas/chinchilla-facts/)



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# Dogs



## Medical Discoveries Made Possible Through the Study of Dogs

### ***Historical Medical Discoveries***<sup>1</sup>

- ◆ In the 1600s, William Harvey studied heart movement and blood circulation in dogs.
- ◆ In 1665, Richard Lower first performed blood transfusions in dogs.
- ◆ In 1656, Sir Christopher Wren injected medicine into a dog's veins, proving that life-saving drugs can be administered safely, quickly, and effectively through the bloodstream.

### ***Diabetes***<sup>2</sup>

- ◆ It was first discovered that diabetics lacked the hormone insulin through studies on dogs—the results of which earned scientists the Nobel Prize in Medicine in 1923.
- ◆ This discovery led to insulin treatments for diabetes—a disease that was once a death sentence.

### ***Cardiovascular Research***<sup>1</sup>

- ◆ The dog's cardiovascular system closely resembles that of a small human being, and this similarity has made the dog a critically important model in cardiac research.
- ◆ The heart-lung machine was developed through research with dogs. This machine makes it possible to perform heart and lung transplants as well as repair and replace damaged heart valves.
- ◆ Through studies on dogs, researchers created pacemakers and surgical procedures to open narrowed arteries, bypass diseased and blocked arteries, and treat children born with heart defects.

### ***Organ Transplantation***<sup>1</sup>

- ◆ Dogs were the first animal studied by researchers attempting to conquer the rejection of transplanted organs.
- ◆ Dogs were instrumental in the development of drugs used to prevent organ transplant recipients from rejecting their new organs.

### ***Aging-Related Research***<sup>1</sup>

- ◆ Artificial hips and joints were designed and studied in dogs.
- ◆ The most common treatment for human cataracts, the intraocular lens, was developed in dogs.

<sup>1</sup> **Partners in Research.** [Internet]. 2010. Dog. [Cited 22 August 2011]. Available at: [www.pirweb.org/dog.htm](http://www.pirweb.org/dog.htm).

<sup>2</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).



# Ferrets



## Fun Facts About Ferrets<sup>4</sup>

- ◆ Ferrets have been domesticated for thousands of years; in fact, on the walls of some Egyptian tombs there are pictures of ferret-like creatures on leashes.
- ◆ A newborn ferret is so small that it can fit into a teaspoon!
- ◆ Ferrets can sleep so soundly that they cannot be woken up even when picked up and jostled.

## Medical Discoveries Made Possible Through the Study of Ferrets

### *Influenza*<sup>1</sup>

- ◆ Influenza infection in ferrets closely resembles infection in humans with regard to symptoms, viral distribution, and immunity.
- ◆ Types A and B of human influenza virus naturally infect the ferret, thus providing an opportunity for researchers to study how the body's immune system reacts to the virus.
- ◆ Ferrets are needed to study age-related susceptibility to the flu and have also played an important role in understanding why flu viruses resist antiviral drugs.
- ◆ Ferrets are also studied to identify new seasonal strains of the flu and help researchers measure the effectiveness of annual flu vaccines.

### *Reproduction Research*<sup>3</sup>

- ◆ Ferrets are important models in reproduction research because their estrus cycle is easily manipulated.
- ◆ In particular, they have been useful in determining the environmental factors that influence seasonal reproductive activity and the physiological factors that control puberty and ovulation.

### *Canine distemper*<sup>2</sup>

- ◆ Ferrets are used to study all aspects of canine distemper, a serious and fatal disease of dogs and many forms of wildlife.<sup>2</sup>

<sup>1</sup> **Animal Research.Info.** [Internet]. 2011. Ferrets. [Cited 19 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Partners in Research.** [Internet]. 2010. Ferret. [Cited 22 August 2011]. Available at: [www.pirweb.org/ferret.htm](http://www.pirweb.org/ferret.htm).

<sup>3</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

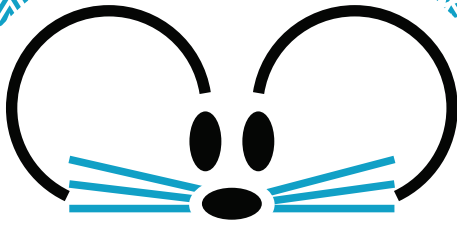
<sup>4</sup> **Drs Foster and Smith.** [Internet]. 2011. Fun Facts About Ferrets. [Cited 22 August 2011]. Available at: [www.drsfostersmith.com/pic/article.cfm?aid=770](http://www.drsfostersmith.com/pic/article.cfm?aid=770).



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# Frogs



## Fun Facts About Frogs<sup>1</sup>

- ◆ The first frog body form was found in 200 million year-old fossils.
- ◆ There are 70-100 new species of amphibians discovered each year, especially in the tropics.
- ◆ The smallest frog, found in Cuba, is 0.33 inches long. The largest frog, the Goliath Frog of West Africa, is body length of 15.7 inches and a weight of 7.2 pounds.
- ◆ The champion frog jumpers are the tree frogs or hylids. Some can jump a distance 46 times their body length and a height 62 times their body length.

## Medical Discoveries Made Possible Through the Study of Frogs<sup>1</sup>

### Cardiovascular Physiology

- ◆ The frog heart was a model for describing and understanding the dynamics of heart contraction.
- ◆ The Nobel Prize in 1920 was awarded for studies on the regulation of capillary blood flow in frogs.

### Toxicology

- ◆ Amphibians are a sentinel species for pollution dangers for humans. Examining bullfrogs and leopard frogs helps researchers understand the effects of environmental toxins on development.

### Developmental Biology

- ◆ Both the African clawed frog (*Xenopus laevis*) and the Western clawed frog (*Xenopus tropicalis*) are studied in the field of developmental biology and genetics.
- ◆ Transgenic studies with both species examine the effects of introduced genes on development and physiology.
- ◆ *Xenopus laevis* can regenerate lost or damaged limbs. Researchers are studying this unique frog to better understand limb development and regeneration.

### Cryobiology

- ◆ Frogs are one of the few vertebrates that can freeze and survive the frozen state.
- ◆ The science of cryobiology is using the natural frozen state of two frog species as a model to develop techniques for freezing and extending the life of tissue to be used in transplant procedures.

<sup>1</sup> Pivorun, E. [Internet]. 2009. Learning About Frogs: Advanced - Biomedical Research. [Cited 22 August 2011]. Available at: [www.aalaslearninglibrary.org](http://www.aalaslearninglibrary.org)





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# Fruit Flies



## Fun Facts About Fruit Flies

- ◆ Fruit flies are only 3 millimeters long and live only 60 to 80 days.<sup>1</sup>
- ◆ Believe it or not, fruit flies have many things in common with humans! Fruit flies and humans share many human disease genes, cellular processes, brain cell development, and behaviors.<sup>2</sup>
- ◆ Formally known as *Drosophila melanogaster*, fruit flies got their name because they are known to linger around overripe or rotting fruit.<sup>2</sup>

## Medical Discoveries Made Possible Through the Study of Fruit Flies

### Genetics

- ◆ Researchers were awarded the 1933 Nobel Prize in Medicine after demonstrating that genetic information is carried on the chromosomes of fruit flies.<sup>1</sup>
- ◆ The importance of studying fruit flies was recognized more recently by the award of the 1995 Nobel Prize in Medicine for work on the genetic control of early embryonic development.<sup>1</sup>
- ◆ Fruit flies are needed in research today because their genetic makeup is well described and easily manipulated, they are easy to maintain in labs, and they have a very quick regeneration time.<sup>2</sup>

### Alzheimer's Research

- ◆ Recent research with fruit flies has focused on the pathology of Alzheimer's disease, for although the flies have a very simple brain they have highly developed muscles and nerves.<sup>1</sup>
- ◆ Researchers study fruit flies to test treatments to address the genetic mutation that causes Alzheimer's disease in people.<sup>1</sup>

### Digestive System<sup>3</sup>

- ◆ Clues about how our gut helps to regulate our appetite have come from a most unusual source: fruit fly feces.
- ◆ Fruit flies have helped researchers understand aspects of human metabolism, including why pregnant women suffer from bloating and constipation, and even the link between a low-calorie diet and longer life spans.

### Other Research

- ◆ Fruit flies helped in the development of drugs to combat pathogens responsible for a range of diseases from skin infections to pneumonia and meningitis.<sup>1</sup>

<sup>1</sup> **Animal Research.Info**. [Internet]. 2011. *Drosophila melanogaster*. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **National Aeronautics and Space Administration**. [Internet]. 2011. Flies in Space. [Cited 23 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

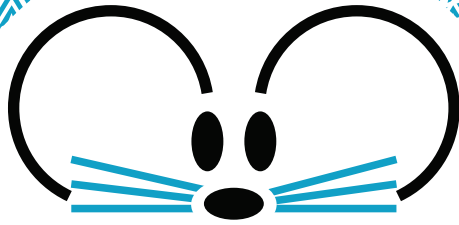
<sup>3</sup> **University of Cambridge**. [Internet]. 2011. Fruit fly droppings give insight into human gut problems. [Cited 23 August 2011]. Available at: [www.cam.ac.uk/research/news/fruit-fly-droppings-give-insight-into-human-gut-problems/](http://www.cam.ac.uk/research/news/fruit-fly-droppings-give-insight-into-human-gut-problems/)



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# Giant Squids



## Fun Facts About Squids<sup>4</sup>

- ◆ Giant squid have eyes the size of basketballs.
- ◆ Some squid have bioluminescent organs that make them glow in the dark.
- ◆ Squid have three hearts.

## Medical Discoveries Made Possible With the Help of Giant Squids

### *The Nervous System*

- ◆ Research on squids has greatly contributed to our understanding of the nervous system.
- ◆ Squid were first studied in the 1930s to examine the properties of nerve cells. Scientists found that the nervous system behaves like a series of microscopic generators, with electrical pulses repeatedly created and fired along nerve cells in response to a stimulus, such as touch or heat.
- ◆ By showing how these impulses are generated and transmitted, the three scientists who received the 1963 Nobel Prize in Medicine revealed the key triggers that spark the nervous system's built-in electrical system into life.<sup>2</sup>
- ◆ Studying the nerve axon of the giant squid provided the foundation for the understanding of how messages are transmitted in human brains, particularly the many roles played by ion channels in regulating activities in living cells.<sup>3</sup>

### *Vision*

- ◆ Squid have excellent vision, which they rely on to catch their prey. The retina of squid shares many common features with those found in the eyes of humans and other mammals.<sup>1</sup>
- ◆ Research on squids is particularly useful for researchers studying human melanopsin, a photoreceptor pigment that is involved in regulating our biological clock and contracting and dilating our pupils.<sup>1</sup>

<sup>1</sup> **Animal Research.Info.** [Internet]. 2011. Squid. [Cited 19 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Nobelprize.org.** [Internet]. 2011. The Nobel Prize in Physiology or Medicine 1963: Signal to Charge. [Cited 23 August 2011]. Available at: [www.nobelprize.org/nobel\\_prizes/medicine/laureates/1963/speedread.html](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1963/speedread.html)

<sup>3</sup> **Partners in Research.** [Internet]. 2010. Squid. [Cited 23 August 2011]. Available at: [www.pirweb.org/squid.htm](http://www.pirweb.org/squid.htm).

<sup>4</sup> **Squid World.** [Internet]. 2009. Top Squid Facts. [Cited 23 August 2011]. Available at: [www.squid-world.com/facts-about-squids.html](http://www.squid-world.com/facts-about-squids.html).





## Fun Facts About Guinea Pigs

- ◆ The guinea pig is not at all related to the pig. Guinea pigs got their name because they emit a sound that sounds like a pig.
- ◆ An average size for an adult guinea pig is two pounds. They live between 4 and 5 years.
- ◆ Research on guinea pigs contributed to 23 Nobel Prizes in Medicine.<sup>3</sup>
- ◆ Guinea Pigs' teeth are constantly growing. Chewing helps wear their teeth down.

## Medical Discoveries Made Possible Through the Study of Guinea Pigs

- ◆ Studies on guinea pigs led to the discovery of Vitamin C, the tuberculosis bacterium; adrenaline; vaccines for diphtheria and tetanus; replacement heart valves; blood transfusions; kidney dialysis; antibiotics; and anticoagulants.<sup>1</sup>

## Asthma and Respiratory Diseases

- ◆ Guinea pigs' airways are sensitive to allergens, so they been widely used in asthma studies.
- ◆ The inhaled medications that are the mainstays of asthma treatment were developed through the study of guinea pigs, as were orally-active drugs for asthma such as montelukast.<sup>1</sup>
- ◆ Guinea pigs are needed for studies of vaccines against anthrax and new medicines to treat drug-resistant tuberculosis, which is becoming a problem in many countries, including the U.S.<sup>1</sup>
- ◆ Noble prize-winning research on guinea pigs in the 1940s led to the antibiotic streptomycin.<sup>2</sup>
- ◆ Anaphylactic shock, an extreme allergic reaction, has been studied extensively in guinea pigs, which display this reaction more readily and strongly than most other species.<sup>1</sup>

## Hearing<sup>1</sup>

- ◆ The structure of the guinea pig ear and hearing range is similar to that of humans.
- ◆ The first successful attempt to regenerate hair cells, which convert sound into an electrical signal in the inner ear, was achieved in guinea pigs in 2003.
- ◆ Damaged hair cells in human ears don't re-grow; loss of hair cells leads to hearing loss as we age.

<sup>1</sup> **Animal Research Info.** [Internet]. 2011. Guinea Pig [Cited 19 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Partners in Research.** [Internet]. 2010. Guinea Pig [Cited 23 August 2011]. Available at: [www.pirweb.org/guinea\\_pig.htm](http://www.pirweb.org/guinea_pig.htm).

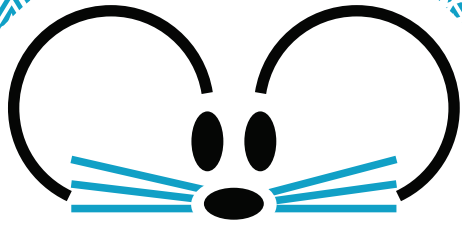
<sup>3</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).



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# Hamsters



## Fun Facts About Hamsters<sup>2</sup>

- ◆ Like other rodents, a hamster's teeth grow continuously throughout their lifetime
- ◆ In the wild, hamsters dig extensive tunnels beneath the ground—extending as far as 3 feet in depth.
- ◆ Hamsters will line their tunnels with grasses and wool or hair shed from other animals to help maintain a fairly constant temperature in their burrow (around 60°F), no matter the outside temperature.

## Medical Discoveries Made Possible Through the Study of Hamsters<sup>1</sup>

### ***Diabetes***

- ◆ Chinese hamsters develop an inherited form of diabetes mellitus similar to insulin-dependent diabetes in humans.
- ◆ This type of hamster has also been used in studies on radiobiology, infectious diseases, growth and reproduction, development, behavior and the effects of environment on breeding activity.

### ***Lyme Disease***

- ◆ Hamsters were developed as a model for Lyme disease, which is transmitted through the bite of a deer tick.
- ◆ Though hamsters do not themselves contract the tick-borne disease, people, pets and livestock are quite susceptible to the bite of the deer tick, which carries the parasite responsible for the disease.
- ◆ An experimental hamster vaccine has been produced as a result of this work, which will hopefully lead to vaccines suitable for livestock, pets, and eventually, humans. A vaccine that protects dogs from Lyme disease is in general use.
- ◆ Hamsters will continue to be needed for testing the effectiveness of various antibiotics in treating Lyme disease, as well as in developing diagnostic tests.

### ***Sleep Research***

- ◆ The growth and reproduction of the Djungarian hamsters are known to be influenced by the amount of natural light in the environment.
- ◆ For this reason, the role of the pineal gland in maintaining the body's "biological clock" has been studied intensively with the Djungarian hamster model.
- ◆ Researchers found that neural basis of our "biological clock" is found in the hypothalamus of the brain, and the study of hamsters clearly demonstrated the role of the hormone melatonin plays in our daily cycle.

<sup>1</sup> **Partners in Research** [Internet]. 2011. Hamsters [Cited 9 September 2011]. Available at: [www.pirweb.org/hamster.htm](http://www.pirweb.org/hamster.htm)

<sup>2</sup> **Drs. Foster and Smith** [Internet]. 2006. Hamster Fun Facts [Cited 9 September 2011]. Available at: [www.drsfostersmith.com](http://www.drsfostersmith.com)

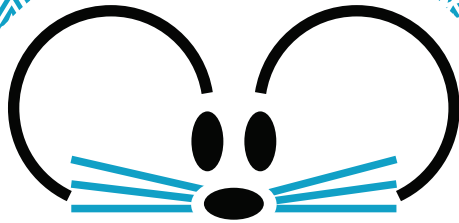




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### **Fun Facts About Horseshoe Crabs<sup>3</sup>**

- ◆ The horseshoe crab is harmless, despite its threatening appearance. Its spike-like tail is not poisonous, and its claws are not sharp.
- ◆ The horseshoe crab does not have the same type of blood as mammals; its blood is called “hemolymph” and it is blue in color.
- ◆ British naturalist Thomas Harriot first called it the “horsefoot” crab in the 1500s, probably because the shape of the crab reminded him of the foot of a horse.

### **Medical Discoveries Made Possible Through Research On Horseshoe Crabs**

#### ***Vision Research<sup>1</sup>***

- ◆ The studies of horseshoe crabs over 50 years ago have provided the foundation for much of what is known about the physiology of the eye today.
- ◆ The Nobel Prize in physiology or medicine was awarded in 1967 to a scientist who discovered how cells in the retina help the brain to process lines, shapes, and borders.
- ◆ This research led to a better understanding of human eye diseases like retinitis pigmentosa, which causes tunnel vision and can progress to total blindness.

#### ***Bacteriological Research<sup>2</sup>***

- ◆ In the early 1950s Dr. Frederick Bang discovered that the blood of horseshoe crabs contain a clotting agent that attaches to dangerous toxins produced by bacteria. This discovery led to an agent that is used to test for the presence of bacteria and toxins in drugs, products and medical devices.

<sup>1</sup> University of Delaware College of Earth, Ocean, and Environment and the Sea Grant College Program. [Internet]. 2010. Biomedical Eye Research. [Cited 22 August 2011]. Available at: [www.ceoe.udel.edu/horseshoecrab/Research/eye.html](http://www.ceoe.udel.edu/horseshoecrab/Research/eye.html)

<sup>2</sup> University of Delaware College of Earth, Ocean, and Environment and the Sea Grant College Program. [Internet]. 2010. LAL Research. [Cited 22 August 2011]. Available at: <http://www.ceoe.udel.edu/horseshoecrab/Research/lal.html>

<sup>3</sup> University of Delaware College of Earth, Ocean, and Environment and the Sea Grant College Program. [Internet]. 2010. History and Biology. [Cited 22 August 2011]. Available at: <http://www.ceoe.udel.edu/horseshoecrab/History/index.html>



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# Mice



## Medical Discoveries Made Possible Through the Study of Mice

- ◆ The development of “transgenic” mice (which have added genes) and “knock-out” mice (which have disabled genes) revolutionized our understanding of cancer, Parkinson’s disease, Alzheimer’s disease, cystic fibrosis, heart disease, memory loss, muscular dystrophy, spinal cord injuries, and many other human diseases.<sup>1</sup>

### **Penicillin**

- ◆ Researchers first tested the effects of penicillin in mice in 1940. By 1941, penicillin was being used to treat injured soldiers. This research won the Nobel Prize for Medicine in 1945.<sup>2</sup>

### **HPV**

- ◆ Studies with mice directly led to the development of a vaccine for the human papilloma virus (HPV), the leading cause of cervical cancer in women.<sup>3</sup>

### **Polio Vaccine**

- ◆ 40 years of research on monkeys and mice led to a polio vaccine in the 1940s. Polio, once a global epidemic, is a viral disease that affects nerves and can lead to partial or full paralysis. It’s been eradicated in the U.S.<sup>2</sup>

### **Meningitis Vaccine**

- ◆ Through mouse studies, researchers developed vaccines to prevent the most common types of bacterial meningitis, an infection of the membranes covering the brain and spinal cord that can cause brain damage, learning disabilities, and death.<sup>5</sup>

### **Diabetes**

- ◆ Studies on mice helped researchers develop medicines to fight Type II diabetes. Researchers are currently studying mice to test the effectiveness of oral or inhaled insulin treatments for Type 1 diabetics.

### **Immune System**

- ◆ Nude mice models provided the key to developing effective chemotherapy treatments for leukemia and allowed insights into the function of the immune system, solid tumors, and HIV/AIDS.<sup>4</sup>

<sup>1</sup> **Foundation for Biomedical Research.** [Internet]. 2010. Rats & Mice: The Essential Need for Animals in Medical Research. [Cited 23 August 2011]. Available at: [fbresearch.org/WorkArea/DownloadAsset.aspx?id=890](http://fbresearch.org/WorkArea/DownloadAsset.aspx?id=890)

<sup>2</sup> **RDS: Understanding Animal Research in Medicine and Coalition for Medical Progress.** [Internet]. 2007. Medical Advances and Animal Research. [Cited 23 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>3</sup> **Discover Magazine.** [Internet]. 2007. How We Got the Controversial HPV Vaccine. [Cited 23 August 2011]. Available at: [discovermagazine.com/2007/may/hpv/](http://discovermagazine.com/2007/may/hpv/)

<sup>4</sup> **Animal Research.Info.** [Internet]. 2011. Mouse (immunodeficient). [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>5</sup> **Animal Research.Info.** [Internet]. 2011. Hib-meningitis vaccine. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).



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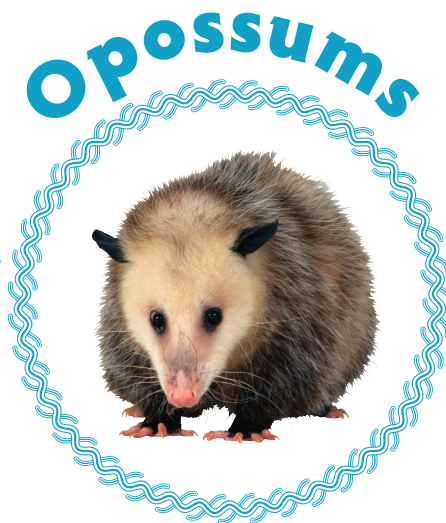
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## Fun Facts About Opossums

- ◆ Opossums are quite often referred as ‘the living fossil’, as they have been residing on earth since the dinosaur age. They have been known to inhabit the earth since the past 70-80 million years, making them one of the world’s oldest surviving mammals.<sup>3</sup>
- ◆ A female opossum gives birth to helpless young as tiny as honeybees. Babies immediately crawl into the mother’s pouch, where they continue to develop.<sup>3</sup>
- ◆ These animals are most famous for “playing possum.” When threatened by predators, opossums sometimes flop onto their sides, lie on the ground, and pretend to be dead.<sup>3</sup>

## Medical Discoveries Made Possible Through the Study of Opossums

- ◆ The gray short-tailed opossum has become the predominant laboratory-bred research marsupial in the world today, studied as a model organism for comparative research on topics related to human development, physiology, and disease susceptibility.<sup>2</sup>

### **Cancer**<sup>2</sup>

- ◆ The gray short-tailed opossum is the only mammal known to develop melanoma skin cancer solely in response to ultra-violet light.
- ◆ As most human skin cancers develop due to overexposure to ultra-violet light, studies of opossums are helping researchers find new ways to prevent and treat the disease.
- ◆ The opossum is also susceptible to a form of corneal cancer induced by UV radiation, and this susceptibility is highly heritable.
- ◆ Scientists are studying the genetic mechanisms that contribute to the disease in hopes of developing a better understanding of the genetic mechanisms that make some individuals resistant and others more susceptible to this and other cancers.

### **Spinal Cord Injury**<sup>1</sup>

- ◆ Baby marsupials have the ability to regenerate a crushed or severed spinal cord until they are around 10 days old.
- ◆ Studying the cellular mechanisms that enable this to occur will improve understanding of nervous system development, and may help to find new therapies for spinal cord injuries.

### **Heart Disease**<sup>2</sup>

- ◆ Opossums are a valuable model for dietary-induced hypercholesterolemia, a major contributor to heart disease.
- ◆ Research revealed that a single recessive gene is primarily responsible for determining that some opossums are resistant to this condition and others are susceptible. Further investigation is underway to identify the gene and to learn how it functions.

<sup>1</sup> **Animal Research Info.** [Internet]. 2011. Other Mammals [Cited 9 September 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Texas Biomedical Research Institute.** [Internet]. 2011. The Laboratory Opossum [Cited 9 September 2011]. Available at: [http://txbiomed.org/About/resources\\_6.aspx](http://txbiomed.org/About/resources_6.aspx).

<sup>3</sup> **National Geographic.** [Internet]. 2011. Opossum [Cited 9 September 2011]. Available at: <http://animals.nationalgeographic.com/animals/mammals/opossum/>



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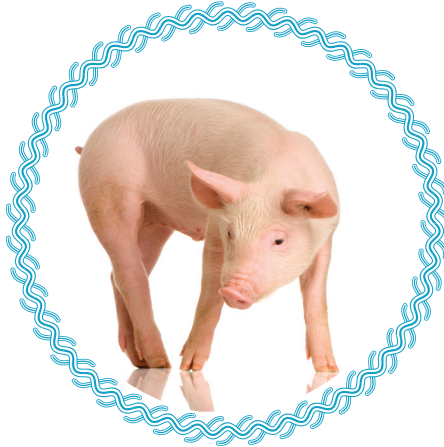
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# Pigs



## Fun Facts About Pigs

- ◆ Pigs do not have functional sweat glands. They use water or mud for the purpose of staying cool.
- ◆ Pigs prefer not to sit in mud. In fact, they prefer cleanliness much more than other animals.
- ◆ Many experts consider pigs to be more trainable than dogs or cats.

## Medical Discoveries Made Possible Through Research on Pigs

### *Skin Research*

- ◆ Many treatments and drugs for skin diseases, including therapy for severe burns, were developed from studies on pigs.<sup>1</sup>
- ◆ Research into how wounds heal has also benefited from the contributions of swine, making them invaluable tools for researchers in reconstructive surgery.<sup>1</sup>

### *Cardiovascular Research*

- ◆ In general, the cardiovascular system of pigs is more biologically similar to humans than those of any other animal. This similarity is most marked in the anatomy and physiology of the heart.<sup>1</sup>
- ◆ Pigs are models of cardiac surgery, including heart transplantation, and pacemaker studies.<sup>1</sup>
- ◆ Pigs have helped refine cardiovascular drug treatments, and they are good models for studies of stress and its relation to such disorders as hypertension.<sup>1</sup>
- ◆ Pigs have shed light on the relationship between exercise and coronary physiology and health and are the model of choice for studying the role of diet in development of atherosclerosis.<sup>1</sup>
- ◆ Pig heart valves have been used for many years to replace diseased or damaged human heart valves.<sup>2</sup>

### *Digestive System*

- ◆ Being omnivorous with a digestive system similar to humans, pigs are the preferred model for gastric ulcer research. Like humans, pigs develop ulcers as a result of bacteria, diet, and stress factors.<sup>1</sup>

### *Osteoporosis and Bone Surgery*

- ◆ The similarity of aspects of the skeleton, including bone-healing rates, makes pigs a well-established model for bone and joint surgery. Pigs are also studied to identify new treatments for osteoporosis.<sup>3</sup>

<sup>1</sup> **Partners in Research.** [Internet]. 2010. Pig. [Cited 22 August 2011]. Available at: [www.pirweb.org/pig.htm](http://www.pirweb.org/pig.htm).

<sup>2</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>3</sup> **Animal Research.Info.** [Internet]. 2011. Minipigs. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).





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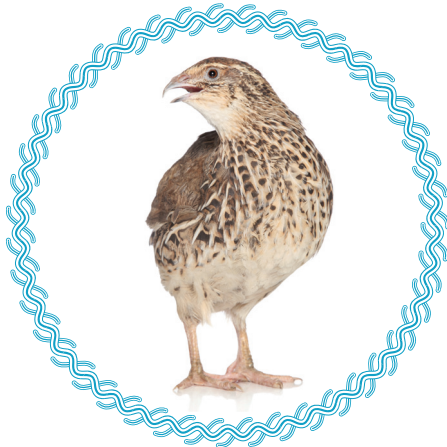
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# Quail



## Medical Discoveries Made Possible Through Research on Quail

- ◆ The most commonly studied is the Japanese quail. Its relatively short lifespan and physiological similarities to humans make it useful in the study of aging and disease.<sup>2</sup>

### **Developmental Biology**

- ◆ The Japanese quail' 16-day developmental period and easily accessible embryo make it a suitable model for developmental biology.<sup>2</sup>
- ◆ Unlike rodents, quail embryos can be easily studied and manipulated as they grow by removing a small section of the eggshell. Researchers can use time-lapsed video-microscopy to watch quail embryos as they grow.<sup>2</sup>
- ◆ Quail play a critical role in research into head and facial development. In one study, the embryos from both quail and ducks were used to implant neural crest cells—simple cells that arise early in development—from one species into another.<sup>1</sup>
- ◆ The result was quail with duckbills and ducks with quail beaks. This research suggests that head and facial diversification is due to neural crest cells, and further work should help unravel the underlying causes of craniofacial defects, which are among the most common birth defects.<sup>1</sup>

### **Toxicity**

- ◆ The American bobwhite quail is frequently a model in toxicity studies, particularly of agrochemicals.<sup>1</sup>
- ◆ Quail eat many kinds of seeds and are used in palatability studies, which show the likelihood of a new pesticide being eaten by birds.<sup>2</sup>
- ◆ Quail also eat a variety of worms and insect larvae, and may be used to study the potential effects of a chemical substance on the food chain.<sup>2</sup>
- ◆ Quail are important models for reproductive studies that look at the effects of chemicals on the environment.<sup>2</sup>

<sup>1</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

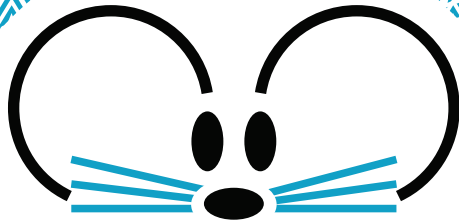
<sup>2</sup> **Animal Research.Info.** [Internet]. 2011. Quail. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).



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# Rabbits



## Fun Fact About Rabbits

- ◆ Rabbits can see behind them without turning their heads.

## Medical Discoveries Made Possible Through the Study of Rabbits

- ◆ Studies of rabbits are crucial in many aspects of medical research, including cancer, glaucoma, ear infections, eye infections, skin conditions, diabetes, and emphysema.<sup>1</sup>

### Vaccine Development

- ◆ Louis Pasteur studied the infected tissues of rabbits in 1885 to develop a vaccine for rabies, a highly contagious and deadly infection which attacks the central nervous system.<sup>1</sup>
- ◆ Researchers studied effects of toxins produced by the bacteria *Bordetella pertussis* in rabbits, resulting in a vaccine for whooping cough, a significant cause of child mortality in developing countries.<sup>5</sup>
- ◆ Studies on rabbits led to a vaccine to prevent HPV, a common sexually transmitted disease that can cause cervical cancer.<sup>4</sup>

### High Cholesterol<sup>2</sup>

- ◆ Studies of Watanabe rabbits are unlocking the mysteries of familial hypercholesterolemia, a genetic condition that causes blood-cholesterol levels three to seven times higher than normal.
- ◆ Humans born with hypercholesterolemia, like Watanabe rabbits, usually die of a heart attack in childhood.
- ◆ Studies on rabbits provide better treatments for children with hypercholesterolemia, including an artificial liver to remove excess cholesterol from the blood of children suffering from this disease.

### In Vitro Fertilization Research<sup>3</sup>

- ◆ The development of in vitro fertilization (IVF) relied on basic and applied research in rabbits to identify the essential conditions required for human IVF.
- ◆ IVF treatments enable the 10% of couples worldwide that are infertile to have children. Over four million children have been born through IVF since the world's first "test tube baby" was born in 1978.

### Laser Surgery

- ◆ The rabbit is an excellent model to simulate the response of human tissue to surgical lasers. Advances in eye surgery were made through studies on rabbits, as were techniques to dissolve plaque build-up in arteries.<sup>2</sup>

<sup>1</sup> **Animal Research Info.** [Internet]. 2011. Minipigs. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Partners in Research.** [Internet]. 2010. Squid. [Cited 23 August 2011]. Available at: [www.pirweb.org/squid.htm](http://www.pirweb.org/squid.htm).

<sup>3</sup> **Nobel Prize.Org.** [Internet]. 2010. Press Release: The Nobel Prize in Physiology or Medicine 2010. [Cited 23 August 2011]. Available at: [www.nobelprize.org/nobel\\_prizes/medicine/laureates/2010/press.html](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2010/press.html)

<sup>4</sup> **Discover Magazine.** [Internet]. 2007. How We Got the Controversial HPV Vaccine. [Cited 23 August 2011]. Available at: [discovermagazine.com/2007/may/hpv/](http://discovermagazine.com/2007/may/hpv/)

<sup>5</sup> **Thalen M.** [Internet]. 2008. Whooping Cough Vaccines: Production of Virulent *B. pertussis* [Cited 23 August 2011]. Available at: [www.bpe.wur.nl/NR/rdonlyres/A52619DF-B34A-4C46-A92E-B830DB-1D04EB/97471/dis4474.pdf](http://www.bpe.wur.nl/NR/rdonlyres/A52619DF-B34A-4C46-A92E-B830DB-1D04EB/97471/dis4474.pdf)



# Rats



## Medical Discoveries Made Possible Through Studies of Rats

- ◆ Rats are the second most commonly studied mammal in research.<sup>1</sup>
- ◆ Rats have frequently been studied in research focusing on cardiovascular diseases, psychiatric disorders, spinal injury, stroke, diabetes, surgery, auto-immune disorders, cancer and bone healing.<sup>1</sup>
- ◆ In drug development, rats are studied to measure the efficacy and safety of new medicines.<sup>1</sup>

### **Psychiatric Disorders**

- ◆ Researchers have produced rat models of schizophrenia and other psychiatric disorders that mimic the symptoms of these diseases in humans.<sup>3</sup>
- ◆ These studies helped researchers develop antidepressants and antipsychotics such as Chlorpromazine, a drug used to treat the symptoms of schizophrenia.<sup>3</sup>

### **Breast Cancer**

- ◆ Animal studies in the 1950s showed that changes in hormonal can cause breast tumors in rats. This led to the development of Tamoxifen, which blocks the growth of hormone dependent breast cancers.<sup>2</sup>

### **Learning and Memory**

- ◆ Rats were among the first animals to be studied by researchers investigating how learning takes place in the brain and how memories are formed.
- ◆ Some of the basic foundations of Neuroscience were laid by studying how rats learned to navigate mazes and how their brains functioned to learn and remember these tasks.

### **Aging**

- ◆ Research in rats illustrated that a reduced intake of calories markedly increases longevity, slows physiological deterioration, and delays the incidence of age-associated disorders.<sup>5</sup>

### **Alzheimer's Disease**

- ◆ Amyloid protein deposits in the brain are a characteristic feature of Alzheimer's disease, a disorder that affects patients' memories and personalities.<sup>4</sup>
- ◆ Rats bred to carry a gene that over expresses human amyloid protein have helped researchers understand and develop new drugs to prevent or delay the onset of Alzheimer's disease.<sup>4</sup>

### **Vaccines**

- ◆ Rats were critical in the development of vaccines to fight typhoid and cholera, two once-epidemic diseases that ravaged the country in the 1800s.<sup>3</sup>

<sup>1</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>2</sup> **Speaking of Research.** [Internet]. 2011. Medical Benefits. [Cited 23 August 2011]. Available at: [speakingofresearch.com/facts/medical-benefits/](http://speakingofresearch.com/facts/medical-benefits/)

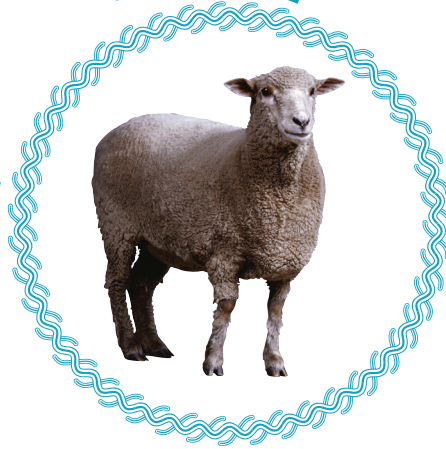
<sup>3</sup> **RDS: Understanding Animal Research in Medicine and Coalition for Medical Progress.** [Internet]. 2007. Medical Advances and Animal Research. [Cited 23 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>4</sup> **Foundation for Biomedical Research.** [Internet]. 2010. Rats & Mice: The Essential Need for Animals in Medical Research. [Cited 23 August 2011]. Available at: [fbresearch.org/WorkArea/DownloadAsset.aspx?id=890](http://fbresearch.org/WorkArea/DownloadAsset.aspx?id=890)

<sup>5</sup> **Medicine Encyclopedia.** [Internet]. 2011. Caloric Restriction Nutrition - Studies on Rats and Mice. [Cited 23 August 2011]. Available at: [medicine.jrank.org](http://medicine.jrank.org).



# Sheep



## Medical Discoveries Made Possible Through the Study of Sheep

- ◆ Sheep have proven to be useful models include research on aneurysms, fetal alcohol syndrome, organ transplantation, and decompression sickness.<sup>1</sup>

### ***Kidney Disease Research***

- ◆ The materials used to construct the first successful shunt, which allow kidney failure patients to be connected to dialysis machines for long-term treatment, were perfected through research in sheep
- ◆ Development of the first shunt to connect patients to dialysis machines was made possible by studying sheep. The surgical techniques for implanting shunts were also developed in sheep.<sup>1</sup>

### ***Reproductive Research***

- ◆ Pregnant female sheep, or ewes, are good models for human pregnancy because sheep have very short gestation periods and give birth to lambs with birth weights similar to those of human babies.
- ◆ Techniques where surgery is performed on fetuses were developed using sheep models.
- ◆ Studies of sheep helped researchers understand the hormonal changes that occur in mother and fetus shortly before birth, and develop new treatments of respiratory distress in premature infants.

### ***Orthopedic Research***

- ◆ Sheep are good subjects in orthopedic research because of anatomical similarities to humans.
- ◆ Researchers studied sheep to improve techniques to repair bone fractures, treat arthritis and osteoporosis, and perfect hip replacement surgery.<sup>3</sup>

### ***Anthrax Vaccine***

- ◆ Sheep were essential to research which led to a vaccine for anthrax, an infectious and deadly disease of farm animals that can be transmitted to people.<sup>1</sup>

<sup>1</sup> **Partners in Research.** [Internet]. 2010. Sheep. [Cited 22 August 2011]. Available at: [www.pirweb.org/sheep.htm](http://www.pirweb.org/sheep.htm).

<sup>2</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

<sup>3</sup> **Foundation for Biomedical Research.** [Internet]. 2010. Other Species: The Essential Need for Animals in Medical Research. [Cited 23 August 2011]. Available at: [www.fbresearch.org/WorkArea/DownloadAsset.aspx?id=889](http://www.fbresearch.org/WorkArea/DownloadAsset.aspx?id=889)





# Woodchucks



## Fun Facts About Woodchucks<sup>3</sup>

- ◆ A woodchuck's defense mechanism is the spraying of a musky odor from its anal glands—look out!
- ◆ Woodchucks mate once per year in March and April. The gestational period lasts 30 days.
- ◆ Woodchucks give birth to up to seven (7) babies at one time. Woodchuck young are born pink, hairless, blind and helpless.

## Medical Discoveries Made Possible Through the Study of Woodchucks *Hepatitis B and Liver Cancer*

- ◆ Woodchucks are now assisting medical researchers in studying the link between hepatitis B virus and human liver cancer.<sup>1</sup>
- ◆ Studies in humans have strongly suggested that people who are chronically infected with the hepatitis B virus are at high risk for developing cancer of the liver.<sup>1</sup>
- ◆ Despite the existence of a vaccine, 250 million people world-wide are carriers of the virus; and, of these, at least 10 percent eventually succumb to malignant liver disease.<sup>2</sup>
- ◆ However, proof of a link with the hepatitis B virus was lacking until it was discovered that a strikingly similar virus afflicts half of the woodchucks in the Mid-Atlantic States.<sup>1</sup>
- ◆ In a recent study, 200 woodchucks infected with woodchuck hepatitis virus soon after birth, two-thirds became chronic carriers.<sup>1</sup>
- ◆ More than 60 of these carriers have been followed for three years or more, and almost all of them have gone on to develop severe liver disease and cancer.<sup>1</sup>
- ◆ In a group of 100 uninfected woodchucks, not a single animal developed liver disease.<sup>1</sup>
- ◆ Researchers are now tracing the whole disease process to discover how the hepatitis virus causes liver cells to become cancerous.<sup>1</sup>
- ◆ Scientists are also studying woodchucks to come up with new drugs and new strategies for human immunotherapy.<sup>2</sup>

<sup>1</sup> **Partners in Research.** [Internet]. 2010. Woodchuck. [Cited 22 August 2011]. Available at: [www.pirweb.org/woodchuck.htm](http://www.pirweb.org/woodchuck.htm).

<sup>2</sup> **Understanding Animal Research.** [Internet]. 2005. A to Z of animals used in research. [Cited 19 August 2011]. Available at: [www.understandinganimalresearch.org.uk](http://www.understandinganimalresearch.org.uk).

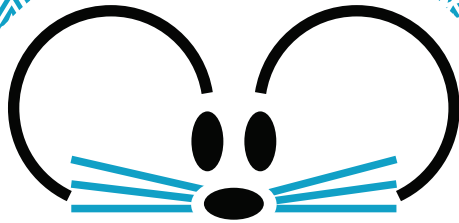
<sup>3</sup> **OutwitCritters.com.** [Internet]. 2005. Woodchuck Fun Facts [Cited 29 August 2011]. Available at: [www.outwitcritters.com/woodchuck/facts.html](http://www.outwitcritters.com/woodchuck/facts.html)



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## Fun Facts About Worms<sup>2</sup>

- ◆ Nematode worms are now studied extensively in biological research; the most common being the tiny roundworm *Caenorhabditis elegans*.
- ◆ *C. elegans* are commonly found in the soil, are approximately 1.0 mm long, develop from a larva to adult in three days, and have an average life span of just 2 weeks.
- ◆ In 1998, *C. elegans* were the first animal whose genome was completely sequenced
- ◆ *C. elegans* are easy to breed, have a well studied genome, and many generations are born in a time-frame of days.

## Medical Discoveries Made Possible Through the Study of Worms<sup>1</sup>

### Developmental Biology

- ◆ Worms are susceptible to environmental changes and mutations, and the effects of these can be seen on later generations within a short experimental timeframe.
- ◆ The Nobel Prize in Physiology or Medicine 2002 was awarded to researchers for their discoveries relating to genetic regulation of organ development and programmed cell death, an important discovery in cancer treatment research.

### Nervous System

- ◆ *C. elegans* has a small nervous system, but carries out many of the same functions as the nervous systems of higher organisms. Thus, *C. elegans* are often studied as a model to help understand the basic mechanisms behind complex behaviors.
- ◆ A research team discovered how *C. elegans* 'smell' food, triggering receptors, which in turn activate particular nerve pathways and lead to certain types of movement, enabling the worm to reach its food source.
- ◆ Despite the clear differences between *C. elegans* and mammals, this particular piece of 'circuitry' shares many features with the way that the retina senses light in mammals, and how this information is used by the brain to initiate other tasks.

### Antibiotic Research

- ◆ *C. elegans* are studied to identify chemicals with antibiotic properties. The process involves infecting worms by laying them in a dish of infectious bacteria for 15 hours before a particle sorter is used to drop a precise number of the infected worms into small wells.
- ◆ Each of the wells is loaded with a different, potentially-antibiotic chemical. Worms are sorted into wells and left for five days before they are examined to determine whether the worms survived their infection, which would indicate they were in contact with an antibiotic.
- ◆ This research helped identify dozens of new antibiotics, some of which work by different mechanisms to existing antibiotics, allowing them to bypass previously drug resistant bacteria.

<sup>1</sup> **Animal Research.Info.** [Internet]. 2010. *C. Elegans* [Cited 12 August 2011]. Available at: <http://www.animalresearch.info/en/science/animalsused/nematode>

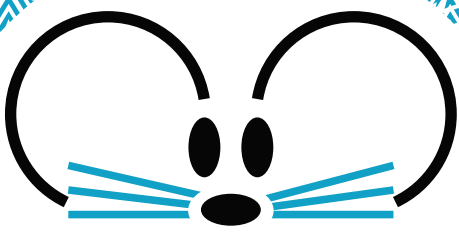
<sup>2</sup> **Canada's Michael Smith Genome Sciences Centre.** [Internet]. 2005. Facts about the Worm *C. elegans*. [Cited 12 September 2011]. Available at [www.bcgsc.ca/people/msleumer/htdocs/fact\\_sheet/facts.html](http://www.bcgsc.ca/people/msleumer/htdocs/fact_sheet/facts.html)



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# Zebrafish



## Fun Facts About Zebrafish

- ◆ The zebrafish is a 1-2 inch long aquarium fish found in the rivers of India.
- ◆ Zebrafish grow to adulthood and are able to breed within 2 to 3 months. They also produce large numbers of young; female zebrafish can lay 200-400 eggs a week.<sup>1</sup>
- ◆ Zebrafish embryos are transparent and develop outside the mother's body, which enables researchers to visualize developmental processes easily without invasive procedures.<sup>1</sup>

## Medical Discoveries Made Possible Through the Study of Zebrafish

### *Developmental Biology*

- ◆ The zebrafish is the animal model of choice for developmental biology, the study of the process by which organisms grow and develop.
- ◆ Developmental biologists prefer to study zebrafish because its genome can be manipulated, it has a fast regeneration time, and large numbers of animals can be housed in a relatively small space.<sup>3</sup>
- ◆ Genes responsible for human diseases often have equivalents in the zebrafish. By injecting small pieces of DNA into the fish embryo, researchers can create mutant fish to identify genes and visually observe their specific role during development.<sup>2</sup>
- ◆ At certain stages, zebrafish embryos are remarkably similar to human embryos, possessing all sensory systems: taste, smell, balance, vision, and learning.<sup>2</sup>
- ◆ In order to develop therapies to prevent and cure these types of abnormalities, researchers must understand the mechanisms which regulate the development of nerves and the brain.<sup>3</sup>
- ◆ When researchers know which of the 20,000 genes in the human embryo are controlling certain processes, therapies can be designed to correct defective genes that cause diseases such as blindness, deafness, and mental retardation.<sup>3</sup>

### *Leukemia Research*

- ◆ Using genetic techniques, a team of researchers stimulated the development of T cell acute lymphoblastic leukemia in zebrafish, enabling researchers to screen thousands of zebrafish genes for mutations that contribute to the disease, and to test the effect of various anti-cancer drugs.<sup>1</sup>

<sup>1</sup> **Animal Research.Info.** [Internet]. 2011. Zebrafish. [Cited 23 August 2011]. Available at: [www.animalresearch.info](http://www.animalresearch.info).

<sup>2</sup> **Foundation for Biomedical Research.** [Internet]. 2010. Other Species: The Essential Need for Animals in Medical Research. [Cited 23 August 2011]. Available at: [www.fbresearch.org/WorkArea/DownloadAsset.aspx?id=889](http://www.fbresearch.org/WorkArea/DownloadAsset.aspx?id=889)

<sup>3</sup> **Partners in Research.** [Internet]. 2010. Zebrafish. [Cited 22 August 2011]. Available at: [www.pirweb.org/zebrafish.htm](http://www.pirweb.org/zebrafish.htm).