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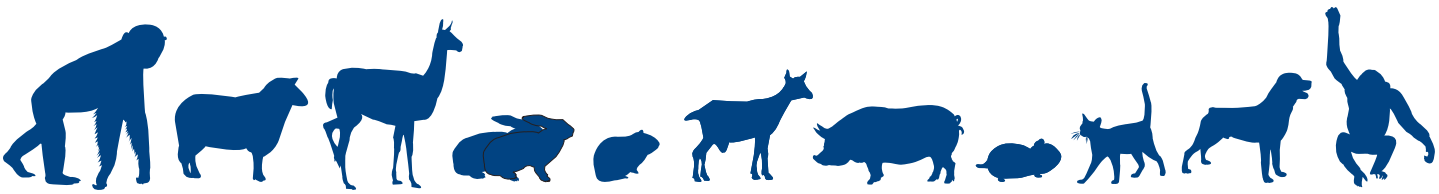
Federation of American Societies for Experimental Biology

Biomedical Research Breakthroughs: 2010-2019

The past decade has witnessed countless biomedical discoveries, innovations, and treatments. Each of these breakthroughs was made possible because of scientific animal research, which provides immense insight into human health. Because the anatomy and physiology of several animal species closely match human biology, it allows researchers to study basic science as well as clinical applications such as new treatments and pharmaceuticals.

The 2010s were a momentous period for biomedical research. Check out how animal research afforded state-of-the-art discoveries every year of the last decade.

Year	Breakthrough	Animal	Importance	Additional Information
2010	Scientists learn how to repair damage to parts of the nervous system that are necessary for the brain to send signals to the rest of the body	Mouse	This finding allows scientists to learn more about diseases such as Multiple Sclerosis (MS) and develop specific therapies. MS is a disease that affects the brain and spinal cord and disturbs the way information is processed.	Article: "Retinoid X receptor gamma signaling accelerates CNS remyelination"
2011	Antiretroviral drug therapy for HIV	Nonhuman Primate	This therapy lowers the amount of virus in blood and body fluids, allowing people with HIV, a virus that attacks cells that help the body fight infection, to live longer and healthier lives.	Article: "HIV study named 2011 Breakthrough of the Year by Science"
	FDA approves the first transcatheter aortic valve replacement	Cows	For people with heart complications that cannot get surgery to replace parts that aren't working as they used to, this technique provides similar benefits with only a small incision.	Article: "Sapien Transcatheter Aortic Heart Valve Gains FDA Approval"
2012	FDA approves *Vismodegib* (Erivedge) for basal cell carcinoma	Drosophila, Mouse	This drug is a treatment for patients with a specific kind of skin cancer.	Article:"The story of Vismodegib and skin cancer"
2013	CRISPR-Cas9 for genome editing	Mouse	This technology lets scientists modify DNA in animals, the molecule that carries genetic information, and more precisely study diseases.	Article: "Multiplex Genome Engineering Using CRISPR/Cas Systems"
2014	Improved movement for patients with chronic complete paralysis	Rat	When people injure their spinal cord, they cannot walk or move. However, research with rats showed that a special type of therapy could help patients learn how to stand and move again.	Article: "Trial Restores Movement to Paralyzed Man's Legs"



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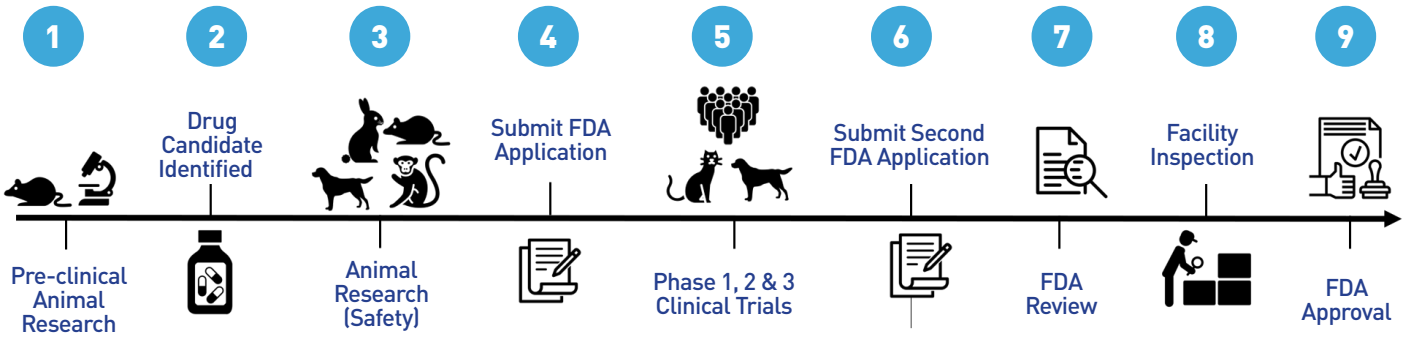
2015	FDA approves *Nivolumab* for cancer treatment	Nonhuman Primate, Rat, Rabbit	The discovery of this drug helps people with lung and skin cancer to live longer. The drug stops cancer from "turning off" the immune system, the body's defense system that fights off sicknesses. By blocking this effect, the body can fight cancer cells properly.	Article: "Lung cancer therapy is 'milestone'"
2016	The invention of the Stentrode	Sheep	This device allows scientists to record brain signals and study diseases of the brain without complicated surgery.	Article: "Research using sheep leads to new device to record and stimulate brain" Video: "Barack Obama on Stentrode Device"
2017	FDA approves CAR-T cell therapy for cancer	Mouse, Nonhuman Primate	This new therapy teaches the body how to use its own cells to target and attack cancer cells. This drug can help children and young adults that have a specific type of cancer, like leukemia.	Article: "FDA-Approved CAR-T Therapy Evaluated in NSG Mice"
2018	Gene therapy for humans and animals, including: 1) Duchenne muscular dystrophy 2) Hemophilia B	Dog	Gene therapy is a medical treatment where healthy genes are put inside the body's cells to cure certain diseases. Scientists researched this treatment in dogs and found: 1) For dogs with Duchenne muscular dystrophy, an illness that involves gradual muscle weakness, this therapy helped repair the dogs' muscles. 2) For dogs with Hemophilia B, a disease where the body cannot correctly form blood clots, this therapy safely stopped bleeding.	1) Article: "A CRISPR cure for Duchenne muscular dystrophy is closer after a trial in dogs" 2) Article: "Gene Therapy Injected into Dog Muscle Fares Well in Hemophilia B Study"
2019	Gene therapy for sickle cell anemia Ebola vaccine (Ervebo)	Nonhuman Primate Mouse, Nonhuman Primate	This breakthrough allows scientists to better understand sickle cell anemia, a disorder where the body does not make enough red blood cells. With this research, scientists believe they can use gene therapy to cure this disease and save millions of lives. This vaccine is the first one to be approved by the FDA that helps prevent Ebola, a virus that causes severe bleeding, organ failure, and possibly death. Between 2014-2016, Ebola quickly spread through Africa, which motivated scientists to create a vaccine that will prevent future outbreaks.	Article: "Sickle cell patient's recovery after gene therapy heightens hopes for a cure" Article: "Against all odds: The inside story of how scientists across three continents produced an Ebola vaccine"
2020	Vaccine for COVID19	Hamster, Ferret, Llama, Nonhuman Primate	Scientists are diligently working to develop a vaccine for SARS-CoV-2, better known as the coronavirus "COVID-19." This disease first appeared in December 2019 and created a global pandemic. Common symptoms of this infectious disease include fever, cough, fatigue, shortness of breath, and in several cases the severe respiratory problems can lead to death.	Article: "COVID-19 Researchers Study Llama's Special Antibodies" Article: "From Hamsters to Baboons: The Animals Helping Scientists Understand the Coronavirus"

The Drug Approval Process

Overall, the process between discovering a drug and seeing it on the shelves in stores can take several years because medical experts and veterinarians must go through several steps to guarantee the product is safe and effective. The process of approving a drug for humans and animals is very similar, which shows that animal research helps people as well as our pets.



1. Animal research helps researchers study the science behind the diseases, which leads them to pinpoint possible treatments.
2. Because of animal research, scientists can identify and create new drugs for people and animals.
3. To make sure the drug is safe, scientists again depend on animal research.
4. Companies then submit their first application to the FDA.
5. Based on the results, the FDA decides whether the drug should proceed to clinical trials to evaluate safety and efficacy in the people and animals that the drug was intended for.
6. Companies submit a second application to the FDA which includes the results from studies in people and animals.
7. The FDA reviews all results and documents.
8. If the FDA is satisfied, they conduct a facility inspection to make sure that wherever the drug is made, it is a safe environment.
9. The FDA may offer final approval if the drug meets all safety and efficacy guidelines.

Pharmaceutical Drugs Depend on Animal Research

Many of the drugs you are familiar with started with animal research, helping us to live healthier lives. In several cases, humans and animals develop the same diseases, so we and our pets are prescribed the same medication.

Here are some of the most common medicines you see on television:

Drug	FDA Approved	Animal	Treatment/ Prevention of	Prescribed for...	
				People	Animals
Restasis	2002	Dog, Mouse, Rabbit	Dry eye	✔	✔
Abilify	2002	Rat, Rabbit	Schizophrenia, Bipolar Disorder, Tourette Syndrome	✔	
Crestor	2003	Rat, Mouse, Rabbit, Dog	High cholesterol	✔	
Lyrica	2004	Rat, Mouse	Nerve pain due to: Fibromyalgia, Spinal cord injury, Diabetes	✔	✔
Chantix	2006	Rat, Mouse, Nonhuman Primate	Tobacco/smoking addiction	✔	✔
Xeljanz	2012	Rat, Mouse, Rabbit, Nonhuman Primate	Rheumatoid arthritis, Psoriasis, Ulcerative Colitis	✔	
Truvada	2012	Mouse, Nonhuman Primate	HIV/AIDS	✔	
Otezla	2014	Mouse, Rat, Rabbit, Nonhuman Primate	Psoriatic Arthritis, Plaque Psoriasis	✔	✔
Eliquis	2014	Rat, Rabbit, Dog	Blood clots associated with Atrial Fibrillation	✔	
Jardiance	2014	Rat, Dog	Type 2 Diabetes	✔	

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