Animal Research Has Led to Medical Breakthroughs

Seriously Ill for Medical Research (SIMR) is an independent, voluntary patients' group formed to voice support for humane research into disabling, incurable, and progressive diseases. The organization is based in Britain.

> Despite the inflammatory rhetoric of animal rights' spokespeople, the benefits of animal experimentation to humans and other animals outweigh the costs in terms of the number of animals used in research. The information garnered from experimenting on these animals has proved invaluable in treating and curing human ailments. From developing vaccines to treating Alzheimer's disease, animal research has aided doctors in countering numerous illnesses.

We are fortunate to live in a time when we no longer have to fear the many common diseases which were the main causes of childhood death only a century ago. These diseases have been conquered by medical research. Despite the enormous medical advances of the last 100 years, there are still many serious illnesses for which no effective treatment is known, from cystic fibrosis to Alzheimer's disease. Continuing medical research is the hope for future generations. A great many medical breakthroughs have depended on the use of laboratory animals and much of the medical research being done today still depends on them. Yet this research faces increasingly hostile campaigns by those who, through lack of understanding, would seek to ban all animal research. It is very important that we examine the facts.

For every £1 spent on medical research, only 5p [5 percent of £1] is spent on animal experiments, which are vital and complement computer studies, test tube experiments and studying people. If we look at the number of laboratory animals used, and the potential improvements in quality of life for both humans and other animals arising from such research, then we can see that the benefits far outweigh the costs. The following facts bring animal experimentation into a realistic focus:

- It is estimated that 2 million cats and dogs are abandoned as unwanted pets every year, and even more animals are destroyed as vermin. The RSPCA alone has to handle 2,000 cats and dogs every day.
- Last year 500 million animals were slaughtered for human consumption but less than 3 million animals were used in medical research. That's roughly equivalent to one mouse per person every 20 years.
- Of all the areas of animal use, including agriculture, pets, sports and animal research, the standards of welfare and veterinary care laid down are the highest for animals kept in laboratories for research.

In this article we detail the role played—and still being played—by animal research in the development of treatments for a range of diseases.

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

Vaccines and viral infections

Human viral diseases include the common cold, influenza, and more recently AIDS. Other viral diseases like smallpox, polio, mumps and measles are preventable due to vaccines developed with animal experiments. Viruses can invade many parts of the body, causing serious harm to vital organs such as kidney, liver or brain. The emergence of AIDS illustrates the constant and urgent need for ways of combatting new viral infections. In Britain about 16,000 people are HIV positive. Several animal species are infected by similar immuno-deficiency viruses and the study of these is vital to the understanding of HIV and AIDS that will lead to effective treatments or vaccines. Already more than 150 drugs exist or are under development and 13 potential vaccines are being developed. The current aim is to stop the virus multiplying and hopefully disarm it without harming the host cells.

Since 1978, not a single person in the world has caught smallpox. That's because almost everyone was vaccinated against it. Now that smallpox has disappeared children today don't need to be vaccinated against it. The vaccine had to be obtained from calves and was tested on animals to make sure it was safe.

Before children were given polio vaccinations about 30,000 children in North America and Europe caught polio every year. There are about a million people alive today who would have caught polio if they had not been vaccinated. The vaccine was developed using animals in the 1950s and then finally tested on monkeys, to make sure it was effective and safe.

Vaccines for immunisation against the six most common childhood diseases—measles, diphtheria, whooping cough, tetanus, polio and tuberculosis—are saving the lives of over 3 million children every year, or six every minute, says UNICEF. In 1990 more than 100 million children under the age of one year were successfully immunised, and the UN Secretary General announced that eight out of every ten of the world's children are now immunised. That still leaves 2 million children who die each year because they are not immunised. A target of immunising 9 out of every 10 children throughout the world has been set for the year 2000.

Antibiotics and bacterial infections

Bacterial infection occurs when harmful bacteria enter the body and avoid destruction by the body's defense system. Examples of bacterial infection are pneumonia, typhoid, cholera, scarlet fever and legionnaires disease. Antibiotics have revolutionized the treatment of these life threatening conditions and now they can be treated with a good rate of recovery. The introduction of the first antibiotic, penicillin, in 1941, saved millions of lives. Animals have played an important role in our understanding of bacterial disease and in developing antibiotics.

Nowadays, potential new antibiotics are investigated initially in test-tubes. But they must be evaluated for safety and effectiveness in animals before being tested and used in people.

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

Cancer

In Britain, 440 people die from cancer every day; three of them will be children under 15.

However two main advances have increased chances of survival. One of the first breakthroughs was the development of radiotherapy, in which radiation kills the tumour without causing too much damage to the rest of the body. Then came chemotherapy—drugs that kill the rapidly dividing cancer cells. Both of these techniques were developed and tested with the help of animal experiments.

For the 700 or so people in the UK this year who will develop a type of cancer called Hodgkin's disease, the advances in treatment mean that 500 of them will still be alive in five years. Without any treatment people with Hodgkin's disease always die. Similar progress has occurred in other cancer studies. Today 6 out of every 10 children with leukaemia can be cured. Overall 4 out of 10 people who develop cancer are now cured. Twenty years ago, the figure was 2 out of 10. Further effective research means more people being successfully treated.

Genetic diseases

The recent intensification of research in the field of genetic diseases will open the door to finding treatments for a wide range of disorders, not just the obviously inherited ones but also those thought to have a genetic background, e.g., diabetes, cardiovascular disease, common cancers, the major mental illnesses and many more. The diseases known to be caused by a single gene defeat will probably be tackled first. Since these affect one in every hundred infants born, that alone is a massive task.

Work on the mouse has made major contributions to knowledge of human genetics. The genetic constitution of mouse and man are surprisingly similar. The recently developed technique of trans-genesis, which enables, for example, a disease-causing human gene mutation to be replicated in a mouse, or a normal human gene to be placed in a diseased animal, is opening new horizons in the study of inherited diseases. It is remarkable that, over a period of less than ten years, the genes responsible for nearly all the relatively common inherited diseases have been located, and many of them have been isolated by cloning. For example, Duchenne muscular dystrophy, cystic fibrosis, haemophilia, neurofibromatosis, Huntingdon's disease, infantile spinal muscular atrophy and many others. Genetic research, using mostly the mouse, is set to revolutionise our medical understanding and gives hope of finding cures where previous hope did not exist.

Two male children are born with Duchenne muscular dystrophy every week in Britain. Their muscle cells lack an essential substance so they gradually develop muscular weakness in infancy and will probably die in their mid-20s. The exact genetic abnormality found in sufferers is also found in some mice, and research using these mice is providing valuable clues to the condition and to potential treatments.

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

At present the life expectancy of cystic fibrosis is only slightly better, and it affects 1 in 2,000 children. CF robs victims of lung, heart and pancreas functions, and often triggers pneumonia. At the moment, heart-lung transplants offer the only hope of long-term survival.

Recent reports of successful gene therapy in mice may lead to simple, more effective treatment in [the] future.

Haemoglobin abnormalities cause potentially fatal anaemia, as the red blood cells cannot deliver enough oxygen to different parts of the body. They are the most common inherited disorders caused by a single gene defect. By the year 2000 it has been estimated that seven people in every hundred will be carriers of the two important haemoglobin disorders, sickle cell anaemia and thalassaemia. Although these diseases are relatively uncommon in this country, they are a major public health problem in other parts of the world as they affect people of Mediterranean, African and Asian descent. At present, the only satisfactory treatment is repeated transfusions, although the diseases can be prevented by carrier detection and prenatal diagnosis. The recent development, by genetic engineering, of a mouse model of sickle cell disease should enable doctors to understand why the red blood cells become deformed and to develop new approaches to treatment.

Autoimmune disorders

Several serious disorders are the result, either wholly or partially, of the defences of the body turning on themselves. These disorders have proved particularly difficult to understand and treat. With the help of animal models, doctors are now making progress on many fronts.

Rheumatic disease is the biggest single cause of disablement, and it can affect the whole of people's lives: even maintaining independence can be an anxious and continual battle. There are as many as 200 different kinds of rheumatic disease: the better known ones being rheumatoid arthritis (with a million sufferers in the UK), osteoarthritis (with 5-10 million sufferers), gout and ankylosing spondylitis. Great advances have been made, although there is as yet no cure for rheumatic disease.

Research is aimed at different aspects of the problem; understanding the causes and mechanisms of the disease, new surgical techniques, new materials for replacing affected joints (there are about 40,000 hip replacements every year in the UK) and new medicines to control and alleviate symptoms. Rats, rabbits and guinea pigs have been used to increase understanding of rheumatic disease.

Multiple sclerosis (MS) is a disease of the central nervous system that strips the protective myelin insulation from nerves within the body. This causes deterioration of body functions, such as muscle movement, balance, strength, speech and vision. It is estimated that about 80,000 people have MS in Britain.

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

Researchers have learned a lot about MS through a disease called experimental autoimmune encephalomyelitis. This laboratory induced disease, very similar to MS, occurs in rats, mice and guinea pigs. Using these animal models, researchers have studied the basic biological problems related to MS, and have shown that it may be possible to 'switch off' the disease by treatment with antibodies, and to transplant myelin-making cells, which can repair damaged nerves. These models have also been used to test whether potential MS drugs are effective and safe.

Diabetes is thought to be caused by a number of different factors— environmental, genetic and autoimmune. Seventy years ago, to be diagnosed diabetic was a death sentence. If you were young, you probably had less than a year to live. It is estimated that over 10 million diabetes sufferers have been saved from death since insulin was introduced. Today, in Britain alone, there are 600,000 people with diagnosed diabetes, of whom about 200,000 are insulin dependent. Another 600,000 people don't yet know they're diabetic. In diabetes, the pancreas cannot produce its own insulin, the hormone that enables the body to use sugar.

Insulin was first isolated from the pancreas of dogs by Frederick Banting and Charles Best at the University of Toronto in 1921. Insulin is a protein found in all animals, and, up until recently, diabetics used insulin produced from the cow and pig pancreas. It is purified, and then standardized by testing in mice. For each animal used, enough insulin is produced to treat 70 diabetics for a year. Insulin saves lives, every day, by controlling diabetes and enabling people to live more or less normally. But it is a treatment, not a cure.

Research continues, using mouse and rat models, with the aim of finding safe and effective treatments which do not require daily injections. Ultimately, the aim of the research is to find a prevention or cure: current studies indicate that transplants of insulin producing cells from animals may be possible in the future.

Heart disease

Coronary heart disease is a major cause of suffering and premature death. It kills 1 person in 4 in Western societies despite significant advances in treatment over the last 30 years or so. The development of the heart-lung machine in the 1940s made open heart surgery possible. About a third of a million pacemakers are implanted annually worldwide to regulate faltering heart beats, and in this country about 6,000 operations are carried out every year to repair or replace faulty heart valves. In the 1960s a major new surgical technique was developed to by-pass damaged arteries and some 13,000 coronary by-pass operations are now performed in Britain every year. More recently, heart transplants have enabled some patients to enjoy many more years of active life: about 450 are carried out every year, with a 90% success rate. This is helped by immunosuppressive drugs which are used to prevent rejection after all organ transplant operations. Beta-blocking drugs to reduce high blood pressure and prevent heart attacks were developed in the late 1950s. Animal research was essential in the development of all these treatments.

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

Tropical diseases

Thanks to vaccines and antibiotics, infectious diseases are no longer life threatening, in the UK at least. But in the third world, parasitic disease is still a major killer. Malaria has increased dramatically in recent years. Nearly 300 million people are infected with malaria and 2 million die every year. Treatment and control are difficult because of drug-resistant strains of malaria and insecticide-resistant strains of mosquito. Finding a vaccine is the top priority but potential vaccines must be safe. Animal tests are the vital link between the test-tube and people in this research.

Kidney disease

Over 3,000 people a year in the UK develop kidney failure. A third of these would die without regular dialysis on a kidney machine, or a kidney transplant.

The kidney machine, which removes toxic waste products from the blood, was a direct result of work on rabbits and dogs. It is vital during dialysis to prevent the blood clotting as it passes through the machine, and this is achieved by adding the drug heparin. The anti-clotting action of heparin was discovered by experiments in dogs, and today the drug is obtained from beef liver.

Transplant surgery often offers the only real hope for kidney patients, and over 20,000 successful kidney transplants have been carried out in the UK since the technique was first developed using dogs in the 1950s. Again, anti-rejection drugs, developed by testing their ability to prevent rejection of grafts in mice, are vital to the survival of the transplanted organ. Now, nearly 2,000 kidney transplants are performed every year in Britain.

Asthma

More than two million people suffer from asthma in Britain. It affects 1 in every 10 children though many cases are not being properly diagnosed. Severe asthma causes tremendous suffering and can be lethal; last year it killed 2,000.

There are drugs which relieve the symptoms of asthma, but do little to prevent the underlying worsening of the disease. New drugs will require very thorough development, refinement and research on animals for both effectiveness and safety. Animal research is continuing to improve our understanding of asthma and its treatment.

Alzheimer's disease

Alzheimer's disease is a progressive brain disorder affecting about 500,000 people in Britain. It is very disturbing to see the elderly, and sometimes the not so elderly, suffering from almost complete memory loss, a symptom of this illness. Research on mice has already demonstrated that abnormalities (structures called plaques) seen in the brains of Alzheimer's patients are due to the formation of a particular protein. This mouse model of Alzheimer's

Seriously Ill for Medical Research: "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.

disease, produced by genetic engineering, will prove invaluable in developing ways of treating or preventing the disease.

Epilepsy

Most people have heard of epilepsy. This unpredictable condition afflicts about 300,000 men, women and children in Britain: that's about 1 in every 200 people. Today's medicines offer several effective treatments. Usually just one medicine is sufficient, but sometimes a combination has to be used. Even so, in 1 in 5 cases, no treatment seems to work. This means that around 60,000 people in Britain alone face the possibility of a sudden attack at any time with no means of alleviating it. Research into understanding the function of the brain and the changes which occur during epileptic seizures must go on, if new anti-epileptic medicines are to be discovered. Much of what is known today about epilepsy has been gained by studying animals, particularly the mouse.

Veterinary medicine

The tremendous benefit that all animals receive from veterinary research is often overlooked, not just for our pets but also for farm animals. Dogs in particular suffer from a variety of diseases: distemper, infectious hepatitis, leptospirosis, kennel cough and parvovirus infection can be controlled by vaccines which were all developed with animal experiments. A typical example of the efficiency of such research is that for each laboratory animal used in the research, 75,000 dogs can now be protected for life against distemper. Cats suffer from cat flu, feline enteritis and leukaemia, all of which can be prevented by vaccinations. Many of the medicines used to treat animals—antibiotics, pain killers, anaesthetics, tranquilisers—are exactly the same as those used to treat people.

The voice of the sufferers

These examples should make it perfectly clear to everyone just how much we owe to the use of animals in medical research. Not only for past and present treatments but also for future research to conquer currently incurable illnesses.

SIMR is an independent, voluntary organisation formed to promote research into crippling, debilitating and progressive diseases and to support the humane use of animals in medical research. SIMR is the voice of the sufferers, the people who actually have the highest stakes at risk—their lives.

If you would like to support SIMR, why not join us today?

Seriously Ill for Medical Research. "Animal Research Has Led to Medical Breakthroughs." *Animal Experimentation*. Ed. David M. Haugen. San Diego: Greenhaven Press, 2000. At Issue. Rpt. from "Serious Illness and Medical Research: The Role of Animal Experiments." *www.simr.dircon.co.uk/research.html*. *Opposing Viewpoints in Context*. Web. 2 July 2014.