

Frequently Asked Questions

courtesy of Dr. Ray Greek, Americans for Medical Advancement

Q: Didn't penicillin come from animal experimentation?

A: The fact is that animal tests sidetracked development of this important drug. In 1929, Alexander Fleming observed penicillin killing bacteria in a Petri dish. Intrigued, he administered the compound to bacteria-infected rabbits, hoping that it would do the same thing. Unfortunately, penicillin was ineffective against the rabbits' infection. (We now know that because rabbits rapidly excrete penicillin in their urine, the drug is not able to work prior to being eliminated.) Disappointed, Fleming set the drug aside for a decade, as the rabbits had "proved" the drug was useless as a systemic medication. Years later, he thought of the drug when he had a patient near death, for whom all other treatments had proved ineffectual. In desperation, he reached for the penicillin and performed a miracle. The rest is history. Fleming attributed his discovery to serendipity.

Fleming might have thrown penicillin away had he done his initial tests on guinea pigs or hamsters, since it kills those species. Fleming later told his students:

How fortunate we didn't have these animal tests in the 1940s, for penicillin would probably never have been granted a license, and possible the whole field of antibiotics might never have been realized.

Q: Didn't the polio vaccine come from animal experimentation?

A: Animal experimentation actually delayed this much-needed vaccine throughout the first half of the twentieth century.

Polio first broke out around 1835, with victims rapidly becoming paralyzed and dying. In 1840, an orthopedic surgeon wrote that the spinal cord was the seat of infection, a hypothesis that was proven twenty-three years later.

In 1908, scientists suggested that a virus was responsible, a virus that might be eradicated with a vaccine. In developing a vaccine, it is very important to determine how the infection enters the body and takes hold. You cannot interrupt its contagion unless you determine its path. Pathologists discovered the poliovirus in human intestines as early as 1912, which suggested it might enter humans through the digestive track.

Meanwhile researchers successfully infected animals with polio. This "triumph" wound up postponing the development of an efficacious vaccine by decades. As it turned out, our close relatives the monkeys contracted polio nasally (not through the digestive system), and the virus moved directly from the nose to the brain. Incredibly, the scientists working on the vaccine chose to ignore the human digestive data in favor of the monkey data!

The pro-animal experimenters are not incorrect when they claim that a polio vaccine was derived from animal experiments because in 1934, a polio vaccine manufactured from monkey tissue was released. What they fail to mention is that it resulted in *twelve people being paralyzed and six deaths*. In 1937, animal experiments led scientists to spray zinc sulfate and picric acid alum into children's noses, reasoning that if the human transmission route was via the nasal mucosa as it was in monkeys, this would kill the virus in the nose. The only result was that some children permanently lost their sense of smell. In 1941, thirty years after the original animal experiments, Dr. Albert Sabin worked with autopsy findings to demonstrate that the human nasal mucosa did not have virus. What he did find was that the virus was confined to the gastrointestinal tract, as had been determined nearly thirty years prior. Years later, Dr. Sabin recalled the folly of the monkey models for polio:

Paralytic polio could be dealt with only by preventing the irreversible destruction of the large number of motor nerve cells, and the work on prevention was long delayed by the erroneous conception of the nature of the human disease based on misleading experimental models of the disease in monkeys.

In 1949, John Enders grew the virus in tissue culture. This paved the way for vaccine. For this achievement he won the Nobel Prize in Physiology or Medicine in 1954.

The vaccine could have been produced from non-animal tissue, however manufacturers opted for monkey kidney tissue instead. The older animal-based vaccine contained live virus, causing 204 people to contract polio, and eleven documented deaths.

The polio vaccine is now grown in human diploid-cell culture instead of in animal tissue.

Q: Wasn't it through lab animals that scientists discovered diabetes and developed insulin?

A: Pro-animal experiment contingencies always cite the development of insulin as support for continued animal testing. They assert, with justification, that without insulin harvested from slaughterhouses many diabetics would have lost their lives. Whereas it is true that animals have figured largely in the history of diabetic research and therapy, their use has not been necessary and furthermore has not always advanced science.

Diabetes is a very serious disease, even today affecting ten to fourteen million Americans. It is a leading cause of blindness, amputation, kidney failure and premature death. Although the clinical signs of human diabetes have been known since the first century AD, not until the late eighteenth century did physicians associate the disease with characteristic changes in the pancreas seen at autopsy. As this was difficult to reproduce in animals, many scientists disputed the role of the pancreas in the disease.

Nearly a century later, in 1869, scientists identified insulin-producing pancreatic cells that malfunction in diabetic patients. Other human pancreatic conditions, such as pancreatic cancer and pancreatitis (inflammation of the pancreas) were seen to produce diabetic symptoms, reinforcing the disease's link with the pancreas.

Animal experimenters continued to interrupt the nicely progressing course of knowledge regarding the pancreas and diabetes. When they removed pancreases from dogs, cats, and pigs, sure enough, the animals did become diabetic. However, the animals' symptoms led to conjecture that diabetes was a liver disease, linking sugar transport to the liver and glycogen. These animal studies threw diabetes research off track for many years.

In 1882, a physician named Dr. Marie noted the association between acromegaly, a pituitary disorder, and sugar in the urine, thus connecting sugar metabolism and the pituitary gland. Another doctor, Atkinson, published data in 1938 that revealed 32.8 per cent of all acromegalic patients suffered from diabetes. Bouchardat published similar findings in 1908. For some reason, the scientist who reproduced this in dogs, Bernardo Houssay, ended up winning the Nobel Prize in 1947. Obviously, it is hardly fair to say dogs were responsible for his kudos, since knowledge predated Houssay's experiments and any number of human-based methods would have produced the same findings.

In the early 1920s two scientists, John Macleod and Frederick Banting, isolated insulin by extracting it from a dog. For this they received a Nobel Prize. Macleod admitted that their contribution was not the discovery of insulin, but rather reproducing in the dog lab what had already been demonstrated in man. They were not obliged to extract insulin from dogs, because certainly there was ample tissue from humans. They merely did so because it was convenient. In that same year Banting and another experimenter named Best, gave dog insulin to a human patient with disastrous results. Note what scientists said about the dog experiments in 1922:

The production of insulin originated in a wrongly conceived, wrongly conducted, and wrongly interpreted series of experiments.

Banting, Best and other scientists modified the process using *in vitro* techniques and later mass-produced insulin from pig and cow pancreases collected at slaughterhouses.

In coming years scientists continued to refine the animal-derived substance. Though it is true that beef and pork insulin saved lives, it also created an allergic reaction in some patients. Beef insulin has three amino acids that differ from human amino acids while pork insulin has only one. Whereas this sounds negligible, it takes very little amino acid discrepancy to undermine health. (Only one deviant amino acid is enough to produce certain life threatening diseases, such as cystic fibrosis or sickle cell anemia.) Injecting animal-derived insulin also presented the sizable danger of transmitting viruses that cross from one species to another.

Had researchers then recognized these potentialities as well as the gulf of differences between humans and farm animals, scientists would have hastened to develop human insulin more quickly.

The ability to treat patients suffering from diabetes without giving them insulin injections was discovered by chance on humans. Today, the administration of oral anti-hyperglycemics, which arose from serendipity and self-experimentation, eliminates the need for insulin injections in many patients.

Diabetes is still stunningly enigmatic, in large part due to our continued reliance on the animal model. Most clinicians believe that strict glucose control through insulin injections offers advantages over a less regimented treatment plan. However, insulin is a treatment not a cure for diabetes. The exact biochemical process through which insulin regulates blood sugar is not yet known.

Q: Would drugs be safe for us without being tested first on animals?

A: Yes. Drugs would be just as safe and probably safer than they now are if the animal testing phase was eliminated. Presently, legal drugs kill more people per year than all illegal drugs combined.

It is first important to recognize that drugs do not spring from lab animal to bottle. There are four methods of designing drugs. Scientists begin by one of the following methods:

- 1 Discovering new substances from nature
- 2 Uncovering a different curative value in an existing medication
- 3 Modifying the chemical structure of a similar medication
- 4 Designing a new medication from scratch based on anticipated chemical reactions

Once researchers have theorized about a substance's usefulness, they administer it to animals to see whether or not it works on them. They obtain plenty of feedback about the substance's effectiveness in the species tested. Positive animal results are reported in the popular press, generally mentioning only scantily the huge unbridged bridge between lab animal results and human cures. At this stage there is still no reliable information about what the substance will do in humans, because our metabolism is unique.

Though subjecting the substances to animal testing is designed to reveal anticipated effects and side effects in humans, very often the results differ dramatically between species. Substances that could save many human lives are not approved because they are harmful to animals. And substances that are therapeutic in animals get approved, then harm and sometimes kill humans. Instead of safeguarding human consumers, animal testing creates a false sense of security.

The proof of this is apparent in any thorough assessment of drug development history. Numerous of our most popular drugs including aspirin, acetaminophen (Tylenol) and ibuprofen (Advil or Motrin), can be quite detrimental to animals. Diuretic medications, a mainstay in the treatment of hypertension, were in common use before animal testing became the rage. Many of these drugs, safely used by millions, would be hard pressed to pass today's mandatory mouse tests.

There is justifiable concern that animal tests are preventing us from acquiring much-needed medications, one scientist stating:

...for the great majority of disease entities, the animal models either do not exist or are really very poor. The chance is of overlooking useful drugs because they do not give a response to the animal models commonly used.

Innumerable animal-tested drugs make it to market, and then cause problems. It is well accepted that legal drugs cause approximately 100,000 deaths per year, and approximately fifteen per cent of all hospital admissions are caused by adverse medication reactions. In one decade more than half of all newly approved medications were either withdrawn or relabeled

by the FDA secondary to severe unpredicted side effects. All of these drugs had undergone extensive animal testing!

Clearly, the animal testing protocol works against human safety. It also diverts valuable research dollars away from solid human-based testing methodologies.

Q: If we don't use animals, what will we use?

A: Note that this view assumes that animal experiments have been responsible for medical advances in the past. If this were true, the concern would be valid. But it is not. Benchmarks in medical history have relied on the following nonanimal-based methodologies, as will future developments:

In vitro research or test tube research on living tissue has been instrumental for many of the great discoveries. Though human tissue has not always been employed; it could have been, because it has always been in ample supply. Blood, tissue and organ cultures are ideal test-beds for the efficacy and toxicity of medications.

Epidemiology is the study of populations of humans to determine factors that could account for the prevalence of the disease among them, or for their disease immunity. Combined with genetic research and other non-animal methods enumerated here, it provides very accurate information about whole systems.

Bacteria, viruses, and fungi reveal basic cell properties.

Autopsy and cadavers are used for clarifying disease and teaching operating techniques such as fracture fixation, spine stabilization, ligament reconstruction, and other procedures.

Physical models can be made for studying the wear on joints and other physiology.

Genetic research has elucidated many genes that are responsible for specific diseases. Since physicians can now ascertain their patients' predisposition to certain diseases, they can monitor them more carefully as well as suggest optimal nutrition, lifestyle and medications.

Clinical research on patients shows how humans respond to different treatments and determines whether or not one treatment is superior to another. We can attribute our fundamental knowledge of disease and hospital care to clinical research.

Post-marketing drug surveillance (PMDS) is the reporting process whereby every effect and side effect of a new medication are reported to a monitoring agency, e.g. the FDA. (Despite its obvious benefits, post-marketing drug surveillance is presently practiced erratically as reporting methods are neither easy nor required.)

Mathematical and computer modeling is a complex research method that employs mathematics to simulate living systems and chemical reactions.

Technology is largely responsible for the high standard of care we receive today. MRI scanners, CAT scanners, PET scanners, X-rays, ultrasound, blood gas analysis machines, blood chemistry analysis machines, pulmonary artery catheters, arterial catheters, microscopes, monitoring devices, lasers, anesthesia machines and monitors, operating room equipment, computer based equipment, sutures, the heart-lung machine, pacemakers, electrocardiograms, electroencephalograms, bone and joint replacements, staplers, laparoscopic surgery, the artificial kidney machine and many more are examples of technological breakthroughs.

Specialization also saves countless lives. For example, the field of pathology allowed better understanding of diseases. Specialization of medical care into disciplines such as cardiology, oncology, orthopedic surgery, pediatrics, infectious diseases, etc. allows physicians to increase and share their understanding of one field. Specialized areas of care in the hospital, like the neonatal intensive care unit (ICU), cardiac ICU, and surgical ICU, improve patient care. Nurses, specially trained for the operating room or the ICU, better administer to patients.

Q: What about the claim that animal experimentation is necessary because there are no

other whole system models for metabolic processes other than animals?

A: This assertion suggests that *in vitro* research methodologies, though valuable, cannot predict what will happen in a whole living system, which is true. But history has proven that results in lab animals are even more inadequate. Though predicting what happens in particular animal tested, animal experiments do not predict what will happen in humans.

Given that metabolic processes differ greatly between species, information garnered in animal experiments is entirely unreliable. Since it has no predictive value, except for the species tested, it is wholly unscientific when applied to humans. It does not provide the results it professes to provide. Very often substances that have proven effective in animals do not demonstrate curative value in humans and may even harm them. Just as often, animal testing often works at cross-purposes to discovery when poor results bar medications that could alleviate pain and save lives from the market.

As this is the case, all drugs must eventually be tested on humans, and those humans are every bit the lab creatures that animals are. These "clinical phases" of drug testing, as they are called, submit human volunteers to what are at first very small dosages, monitor their reactions, and slowly increase dosage.

Clinical testing and subsequent non-animal methods provide what lab animals cannot - totally accurate readings of *human metabolic processes*. These include epidemiology, and post-marketing drug surveillance.

Q: How can we know that medications will not cause birth defects without testing them on animals?

A: A principle called Karnofsky's Law states that any substance can be teratogenic (cause birth defects) if given to the right species, at the right stage in development, in the right dose. Even common table salt and water are teratogens in some species if given at a vulnerable time in ample enough amount. In other words, all medications can cause birth defects in some creature. An immense amount of experimentation supports this rule.

Data also supports the fact that not all species are equally susceptible to teratogenic influences by any given chemical. Likewise, an agent that is teratogenic in some species may have little or no teratogenic effect in others. According to a respected treatise on birth defects, "because substances cross the placental membrane by a number of mechanisms, some differences in species reactivity to teratogens may be due to accessibility of the drug to the embryo." Of over 1,200 tested chemicals that cause birth defects in animals, only thirty cause them in humans, according to the *New England Journal of Medicine*. Articles in many other publications repeat these conclusions.

Many safe and useful drugs have been shown to cause birth defects in lab animals: Lovastatin

Chondroitin sulfate

Acetazolamide

Dichlorphenamide

Ethoxzolamide

Methazolamide

Furosemide

Clonidine

Diazoxide

Hydralazine

Reserpine

Guanabenz

Diltiazem

Nifedipine

Codeine

Hydrocodone

Hydromorphone

Meperidine (Demerol)

Morphine

Oxymorphone

Phenazocine

Propoxyphene
Colchicine
Allopurinol
Aspirin
Acetaminophen
Other non-steroidal anti-inflammatory drugs
Enflurane
Ether
Halothane
Isoflurane
Nitrous oxide
Sevoflurane
Procaine
Corticosteroids
Ampicillin
Cephalothin
Chloramphenicol
Erythromycin
Many antibiotics, antifungal medications and antiviral medications
Antiparasitics
Anthelmintics
Antimalarials
Anti-hyperglycemics
Insulin
Thyroxine
Triiodothyroacetic acid
Methylthiouracil
Propylthiouracil
Aminophylline

Most of the medications used to treat nausea and vomiting, allergic conditions, and respiratory ailments cause birth defects in animals, but not humans.

After epidemiology or clinical observation links drugs to birth defects, animals can usually, though not always, be found to demonstrate that effect. Researchers have not been successful in reproducing birth defects in other animals for the following drugs that are teratogenic in humans: Captopril, Enalapril, Minoxidil, some calcium channel blockers, or Warfarin.

The popular lab animal, the rat, has been shown to get birth defects from almost every chemical that causes birth defects in humans. This is meaningless though. If chemicals that harm rat offspring do not cause birth defects in humans, the rat tests are not predictive.

What is teratogenicity testing good for and why does it continue? As Dr. Hawkins, professor of Obstetrics, pointed out,

The great majority of perinatal toxicological studies seem to be intended to convey medico-legal protection to the pharmaceutical houses and political protection to the official regulatory bodies, rather than produce information that might be of value in human therapeutics. Just as Karnofsky postulated, if researchers try hard enough they may eventually inflict birth defects on some animal species with a substance that is teratogenic in humans. But to what purpose? Animal experiments that are not *predictive* are of no value. They just use up money that might otherwise fund research of real medical value. There is no sense in "validating" something that is already known from human data.

Q: Didn't all winners of the Nobel Prize in Medicine and Physiology experiment on animals?

A: Yes, most did, but in no case does that mean the discoveries would not have occurred without animals. It only means that the market for lab animals was thriving and employing them was easy. In addition, from the second half of the nineteenth century forward, experimentation on animals became part of all medical curricula. So researchers were obliged to perform animal experiments to get their degrees. However, it is hardly accurate to deduce

that those experiments bore directly on the Nobel-winning results. In the instances wherein animals were used for the Nobel-winning results, they were not necessary. Though animal tissue research was the convention, human tissue was available and more viable, as many Nobel Prize winners have since remarked.

Q: How will we combat AIDS without animal experimentation?

A: Billions of dollars have been spent trying to inflict AIDS on animals over the last twenty years, and these efforts have been entirely futile. Though researchers have succeeded in infecting chimpanzees with HIV, none has progressed to AIDS. Given this inability to produce an adequate animal model, it is foolish to assume that animal experimentation will lead us to therapies and cures for this terrible disease. Some in the AIDS community, with lives hanging in the balance, have come to this conclusion and engage in political protests against animal experimentation. Even scientists who have supported the chimpanzee model now vehemently criticize its lack of scientific merit:

The chimpanzee model doesn't get a lot of support in the scientific community.

I just don't see much coming out of the chimp work that has convinced us that that is a particularly useful model... [an animal model] that takes 12-14 years to develop doesn't sound to me to be ideal.

Investing AIDS research dollars in lab animal science is wasteful and keeps AIDS patients ill. Anyway, animals are not our only test-beds for development of AIDS therapies and a vaccine. As many as 34 million humans are infected with HIV worldwide. Blood cells from these unfortunate people serve as our most illuminating research material.

In vitro research on human blood cells, not animal experimentation, revealed the following idiosyncrasies. HIV's efficiency in humans relies on very specific and minuscule aspects of human white blood cells called helper T-cells. These cells have portals on their surface called receptors. These receptors work in tandem with precise proteins to invite HIV into the white blood cell where the virus then reproduces. Receptors can be very species-specific and sometimes vary even within species, which explains why chimpanzees and even some people whose helper T-cells are exposed to HIV never progress to AIDS.

HIV-infected humans who do *not* progress to AIDS offer very good insights into possible ways of countermending the disease. Their identity is epidemiologically derived, and *in vitro* research has isolated the human gene believed responsible for their immunity. The sequencing of the HIV genome was also accomplished via *in vitro* research. The animal experimentation community claims that AZT and other anti-AIDS medications were developed as a result of animal experiments. However, a look at the history of these drugs' development proves the contrary. All this human data has reliably informed the development of HIV medications and the effort to produce a vaccine.

AIDS kills at the cellular level in humans, and that is where it needs to be studied. According to one scientist, we will only know which animal model is useful after "we understand the pathogenesis of AIDS, and when we have the vaccines and therapies to prevent it." Why would we need the animal model if we already have the cure?

Q: How will we ever cure cancer without animals?

A: The "War on Cancer" dates from the Nixon administration, and though information regarding cancer in animals is an expanding volume, researchers have not yet won the war. In fact, deaths from cancer are higher than ever. One major reason we have not yet stemmed mortality from cancer is this: Animal cancer is not the same as human cancer.

Cancer is not one disease. It is many. In humans alone, there are over 200 different forms of cancer afflicting different organs, tissues, and cells. Though comparable animal organs, tissues, and cells may become cancerous, the cancers are never identical to human carcinomas.

Susceptibility to cancer may be genetic. Exposures, diet, and lifestyles can also increase vulnerability. To turn animals into pseudohumans, researchers implant them with human

genes, then expose them to known human carcinogens. The key word here is "known." If we already have significant human evidence that a substance, diet, or lifestyle is carcinogenic, why do we tool up to repeat that episode in animals?

In any event, different substances are not necessarily carcinogenic to all species. Though one would expect rats and mice to acquire cancers similarly, studies conducted on both species found that forty-six percent of chemicals found to be cancer-causing in rats were not cancer-causing in mice. Since species as closely related as mice and rats do not acquire cancer in the same way, it is not surprising that of twenty compounds known not to cause cancer in humans, nineteen did cause cancer in animals. The National Cancer Institute treated mice that were growing forty-eight different "human" cancers with a dozen different drugs that were already used successfully in humans. In thirty out of the forty-eight, the drugs did not work. Sixty-three percent of the time the mouse models were wrong.

The National Cancer Institute also undertook a twenty-five-year screening program, testing 40,000 plant species on animals for anti-tumor activity. Out of this very expensive research, many positive results surfaced in animal models, but not a single antitumor drug emerged for humans. As a consequence, the NCI now uses human cancer cells for cytotoxic screening.

As Dr. Richard Klausner, the director of the National Cancer Institute itself said,

The history of cancer research has been a history of curing cancer in the mouse...We have cured mice of cancer for decades--and it simply didn't work in humans.

Q: Isn't it true that animals are just like people on a cellular level? They are made up of cells and don't all cells act alike?

A: Whereas all animal cells have properties in common - a nucleus, ribosomes, mitochondria and so forth - we now know that even smaller idiosyncrasies distinguish the way the cells of different species react to food, environment and medications. These idiosyncrasies, visible only through an electron microscope, are both the cause and the result of the evolution that created dissimilar creatures.

Failed animal experimentation has irrevocably proven that tiny differences can prevent or enable disease. White blood cell surface receptors, for example, leave humans vulnerable to AIDS. Among primates, only humans have sialic acid, a glycoprotein molecule on the cell surface. Scientists now suggest that this explains why other primates are immune to diseases like malaria, prostate cancer, and cholera.

In struggling to learn why animal experimentation does not lead to the same results [in humans], scientists are slowly defining the microscopic factors - such as enzymes, glycoproteins receptors, and beta-chemokines - that create variability between human and non-human cells. All cells do not act alike because they are different. And very small differences between humans and animals lead to lethal errors when applying animal data to humans.

Even the book widely regarded as a sort of Bible for animal experimenters, The Handbook of Laboratory Animal Science, states,

It is impossible to give reliable general rules for the validity of extrapolation from one species to another. This...can often only be verified after the first trials in the target species (humans)... *Extrapolation from animal models...will always remain a matter of hindsight...* (Emphasis added.)

Q: Don't surgeons train on animals before operating on humans?

A: Many surgeons do trials on pigs and other lab animals. Many other surgeons - both present day and past - have admitted that work on animals confuses procedures. Even with limited medical knowledge, common sense suggests that orthopedic surgeries will be much different in a dog, for example, than in a human. Ophthalmologists perfected radial keratotomy on rabbits, then tried them out on humans. Only after completely blinding several humans, did they finally correct the procedure.

The field of neurosurgery offers another example. Extracranial-intracranial (EC-IC) bypass procedures for inoperable carotid artery disease were tested and perfected on dogs and rabbits. Neurosurgeons performed thousands of EC-ICs before it was discovered the operation did more harm than good. More patients died or suffered strokes because of the operation than were saved as a result of it.

Transplantation surgeries are much the same story. Hundreds and hundreds of cats, dogs, pigs and primates have been sacrificed as surgeons tried to fashion surgeries that move organs from one creature to another. No matter the number of practice surgeries on animals, the first human operations fail. Carrying the animal data over to the human body always proves deceiving. Only conducting procedures on humans provides dependable techniques.

Q: Don't all doctors support the concept of animal experimentation?

A: No, but many medical professionals endorse lab animal research, as a matter of principle rather than informed conviction. With busy specialized careers and only thin information to the contrary, few physicians are willing to shoulder the burden of publicly dissenting with their peers. This dissent requires too much research and too much risk. However, if consulted privately, they will admit that they study human data, not animal data to determine how best to treat their patients. The Physicians Committee for Responsible Medicine and The Medical Research Modernization Committee are two physician-based organizations that agree with AFMA that experiments on animals do not lead to cures for human disease.

Animal experimentation is part of the curricula at some medical schools. Moreover, many medical schools are associated with research institutes; these rely on animal experimentation for grant money. This style of education, therefore, leads physicians to believe that experiments on animals are associated with medical progress. Note, this does not mean animals are responsible for medical progress. Animal experiments provide results; however, physicians themselves will have to admit that the results they themselves were exposed to did not provide new data of relevance to humans. When pressed to provide examples of how animal experimentation has contributed to their field, these professionals invariably come up short. They may hold onto the possibility that the animal model, though not germane to their field, is of use in other disciplines.

In this litigious climate, doctors would be reluctant to prescribe drugs if they knew that the animal-testing aspect of the drug's development worked against, rather than for, patient health. Hence, pharmaceutical companies promote the belief that animal testing assures the safety and effectiveness of medications that physicians rely upon. This "bill of goods" is another reason why physicians support animal experimentation.

It must be added that physicians, if not proactively in pursuit of facts to the contrary, are also very easily persuaded by the steady influx of public relations perpetrated by animal experimenters. Animal experimentation has a long history, and with tens of thousands of people and some of the world's largest corporations entirely devoted to maintaining the status quo, it would take a brave physician, and one with a lot of time on his or her hands, to speak out against it.

Q: How did animal experimentation become so established to begin with?

A: However unreliable, subjecting animals to experiments for which humans would never volunteer has immeasurable plusses, evident throughout time. Animals cannot dissent.

There have always been abundant human bodies, tissue and blood to illuminate our knowledge base. However, in the West, Christianity pervaded, and papal decree forbade autopsy. During the second century AD, a Roman physician named Galen performed endless animal experiments to inform his over-500 treatises that drew conclusions about human physiology. Many of these conclusions were entirely faulty and contributed to the "darkness" we now associate with medieval times, during which powerful Church officials continued to frown on autopsy.

The Renaissance offered a slight reprieve. Competitive intellectual inquiry emerged to overwhelm Church injunctions. Autopsies revealed medical inaccuracies that had prevailed for 1,300 years since Galen. They began to cast light on real causes of disease.

In the mid-nineteenth century a man who had failed as a playwright, Claude Bernard, took up animal experimentation. His tremendous zeal and the sheer volume of results - accurate or not - that issued from his subjugation of animals effectively created an animal experimentation business. Medical research would henceforward extend beyond the purlieu of physicians; people who could not make it as doctors could still make a living as animal experimenters, as well as wield wide influence. In fact, the machine of animal experimentation generated such an abundance of conclusions that those conclusions very often overwhelmed human evidence to the contrary.

Soon animal experimenters were asking for and receiving money for their research. Animal breeders began to profit. Suppliers of lab equipment enjoyed their expanding market. And so forth. The growing new industry seemed useful for the study of diseases, even though there were huge disparities in results between animal species, and between animals and humans. Then, in the 1930s a single incidence of a drug [diethylene glycol] effecting an animal the same as a human effectively routinized the use of animals for drug development too. Of course, the same problems persisted: Animals often reacted differently to the same chemical substances.

However, the pharmaceutical industry was off and running, developing strong ties with animal experimenters and using their results to boost profits. The disaster of thalidomide, a drug designed to suppress morning sickness that led to over 10,000 babies with birth defects, spurred the US Congress to offer the American public every possible guarantee of medication safety. That "guarantee" took the form of animal testing.

Nevermind that thalidomide itself had been tested on animals prior to release and had not imposed birth defects on them. And that even after scientists knew what to look for, they found birth defects from thalidomide only occasionally.

In approximately 10 strains of rats, 15 strains of mice, 11 breeds of rabbits, 2 breeds of dogs, 3 strains of hamsters, 8 species of primates and in other such varied species as cats, armadillos, guinea pigs, swine and ferrets in which thalidomide has been tested, teratogenic effects have been induced only occasionally.

Nevermind also that there was already ample evidence that chemicals react very differently in different species. By legislating that all drugs must prove safe and effective in animals prior to release, the government created a legal safehouse for pharmaceutical companies and any other industry with a product of questionable medical safety. Ever since, when lawsuits occur, big business can justifiably claim that they acted with due diligence to the full extent of the law. Inevitably, big business' enthusiasm over this legal safety net has played a large role in making animal experimentation a sacred cow.

Q: Since all this is true, why does animal experimentation continue?

A: Many factors perpetuate animal experimentation, the most obvious of which is momentum. The practice is now very engrained and the systems are resistant to change. Egos are on the line. Scientists who have devoted their entire lives to animal experimentation are reluctant to admit that those methods were useless, much less dangerous.

Some research scientists do not even realize their travesty. They are far removed from patient care. If their investigations are compelling enough, they may never think beyond to question applicability. They often revel in the glory of discovery, never pausing to consider the human patients who are deprived of useful remedies while they squander money on knowledge for knowledge's sake. Animal experiments fuel the scientific papers they are obliged to write, and these result in promotion. Animal experimentation works for them, if not for humankind. Imagine the guilt these PhDs would feel if they were to face the true consequences of their work, if only in terms of its costly wastefulness and its effect on patient victims.

Simply put, animal experimentation continues because it is highly profitable. All the following constituencies make money: scientists, physicians, hospitals, regulation agency bureaucrats, pharmaceutical companies, medical conglomerates, politicians, animal farmers and vendors, lawyers, reporters, and news media, to name a few. Other companies, whose products may or may not pose human health problems, use animal testing to secure themselves against

litigation too. Think asbestos. Think tobacco. None of these constituencies can afford for the public to lose confidence in the idea that animal testing protects them.

Their interdependency is finely tuned: The more animal experiments the researcher does, the more articles he or she publishes. The more articles published, the more grant money received. The more grant money, the more money the university or research facility receives. The more money the university or research facility receives, the less liable big business is and the more products big business can sell. The more big business sells, the more money for advertising and hence the more compliant is the media. Anytime animal testing is questioned, there are outcries from many vested quarters. All hasten to shore up their positions and keep clear of litigation.

And on the other side of this cabal is the unwitting American consumer, paying through the nose for, at best, nothing and worse, ill health. Trillions of taxpayer and charity dollars continue to be funneled into wasteful experiments that are of no use to the consumer who supports them. Animal experimentation is a kind of "white coat welfare." But the animal testing machine, now large and in perpetual motion, will be difficult to stop.

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