

31 Years of Progress

How We Replaced Animals in Medical Student Training



1985

The Physicians Committee is founded. 87% of U.S. medical schools use animals (mostly dogs) in fatal training labs.

1992

University of Colorado student Safia Rubaii, with support from the Physicians Committee, sues school for requiring her to take part in deadly dog lab.

1995

Harvard Medical School ends use of dogs and rats for physiology courses. 62% of medical schools are still using animals for student education.

2005

Dean of University of California, Irvine School of Medicine, informs the Physicians Committee that he “summarily informed” his faculty to end its live animal lab. Medical schools’ use of animals declines to 24%.

2007

“AMSA strongly encourages the replacement of animal laboratories with non-animal alternatives in undergraduate medical education.”
– *Resolution passed by the American Medical Student Association*
18% of medical schools are still using animals.



2008

Case Western Reserve University, the last medical school using dogs, ends practice.

2010

Last medical school in Canada to use animals, Memorial University of Newfoundland, ends practice. 8% of medical schools are using animals.

2013

The U.S. military's medical school, Uniformed Services University, ends its animal labs. 5% of medical schools are still using animals.

2015

Three new U.S. medical schools are accredited. All 44 medical schools that have opened since 1979 have never used animals for student education.

2016

After legislative effort by the Physicians Committee, Johns Hopkins University ends animal use. Only one medical school continues to use animals.

2016

Citing the decision by Johns Hopkins, the University of Tennessee College of Medicine in Chattanooga undertakes a curriculum review and decides to end animal use for medical student training, making it the last school in the U.S. and Canada to do so.

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Introduction

The Physicians Committee for Responsible Medicine spent 31 years pushing the evolution of medical training in order to reach today's paradigm, in which medical student education is animal-free and human-relevant.

As recently as 1994, the majority of medical school curricula in the United States included live animal laboratory exercises. However, over the last 20 years that practice has steadily declined, and after 2005 the transition away from animal use accelerated.

By 2005, according to a survey conducted by the Physicians Committee, only 24 (19 percent) of the 126 allopathic (M.D.-granting) medical schools in the United States used animals to educate students. The Physicians Committee expanded this survey to include U.S. osteopathic (D.O.-granting) medical schools in 2006, and added all Canadian medical schools in 2007.

As of 2016, none of the 197 accredited medical schools in the United States or Canada is known to use live animals for student training. As recently as February 2015, four medical schools—the University of Mississippi, Rush University, Johns Hopkins University, and the University of Tennessee's campus in Chattanooga—used animals for this purpose, but all have since ended the practice.

The replacement of animal use for medical student education resulted primarily from the development of lifelike interactive and programmable simulators that better replicate human anatomy and physiology, the validation of these simulators as equivalent or superior to animal-based education, the recognition that human-based training transfers much better to clinical medicine, and the incorporation of medical ethics in medical school curricula.



Live animal labs have been steadily replaced by more human-relevant methods, such as the SimMan 3G mannequin, pictured above.

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How Animals Were Used

The use of animals in medical student education has predominantly occurred in two courses: physiology (including pharmacology) and surgery. The University of Mississippi, for example, was the last school to use live pigs to teach human cardiovascular physiology to first-year students. Meanwhile, the University of Tennessee College of Medicine in Chattanooga was the last medical school in the United States and Canada to end its animal use, which included using live pigs to teach surgical skills to third-year medical students.

Physiology

In physiology animal labs, students were typically instructed to place catheters into the arteries and veins of animals, to perform various interventions and manipulations, and to inject the animals with drugs, while measuring physiological responses such as blood pressure, heart rate, and cardiovascular performance. Students were then sometimes instructed to open the animals' chest cavities and massage the heart. The animals were killed after the training session, if they did not die during the experiments.

Surgery

In medical student animal labs designed to teach surgical skills, techniques such as incisions and organ identification, organ removal, suturing, and other basic surgical procedures were taught. In recent years, laparoscopic surgery has often been added to surgical skills training. Animal use in laparoscopic surgery labs involved making incisions in an animal's abdomen and then

inserting tubes with lighted cameras (endoscopes) and surgical instruments for the purpose of practicing surgical procedures. At the end of the training session, the animals were killed.



The most widely used surgical simulator in the world, Simulab's TraumaMan System is a partial-body mannequin with lifelike skin that allows for the training of advanced surgical procedures.

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Human-Based Training Methods

In recent years, numerous factors—including improvements in artificial tissue technology and an imperative to reduce and replace the use of animals in medical training courses—has expanded the number of adult and pediatric medical scenarios which can be effectively simulated and incorporated into curricula. More commonly referred to as medical simulation, these human-based training methods include screen-based computer models, partial-task and full-body trainers, high-fidelity simulators, and standardized patients (an individual trained to act like a real patient).

Human-based education methods that can replace the use of animals in physiology courses are readily available and widely implemented. These include full- and partial-body human patient simulators that can be programmed to react to drugs in the same way as a human patient. They can also be programmed to present numerous clinical scenarios that provide a wide range of learning experiences for students. Laerdal's SimMan 3G and CAE Healthcare's Human Patient Simulator provide students with the opportunity to observe physiological responses in many simulated clinical disorders and drug administrations—responses that are specific for humans, rather than for animals.

Other validated human-based physiology educational methods supplement simulation training and allow medical students to transfer knowledge to clinical medicine. These methods include class and small-group physiology exercises (ECGs, cardiovascular ultrasound/Doppler, pulmonary function tests, electromyography, etc.), case-based and problem-based learning exercises, standardized

patient examinations, and clinically focused mentored learning in hospital and ambulatory care settings.



A demonstration of SimMan on Capitol Hill.

Surgical skills can be taught using an array of hands-on task trainers and simulators, supplemented by mentored observation and participation in operating rooms. These training devices range from foundational skills trainers to advanced virtual programs that even provide tactile feedback (haptics) replicating human surgeries. Examples of these simulators include Sionix's LAP Mentor laparoscopic surgery simulator as well as the Limbs & Things' LapSim Laparoscopic Training and Surgical Science's LapSim System. Human-based simulators such as these provide students with anatomical and procedural knowledge necessary for advancement to hands-on learning with patients.

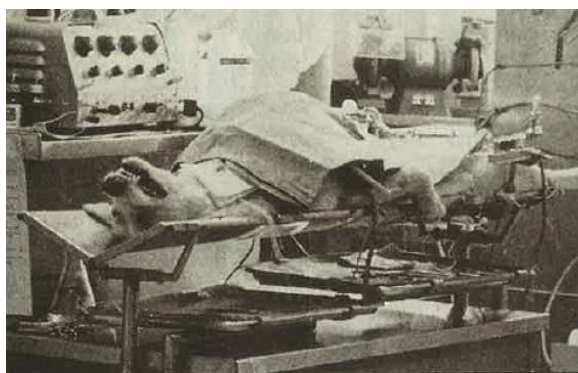
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Notable Developments in the Last 31 Years

Over the last three decades we have worked to increase the number of U.S. and Canadian medical schools using human-based training methods rather than animals for medical student education. This trend has been punctuated by some notable developments.

The End of Dog Labs

While most of the last universities to end animal use for medical student training were using pigs, the use of dogs to teach the same skills was once the norm. Some institutions in particular were resistant to replacing the use of dogs, even after nearly all medical schools had ended this practice. New York Medical College (NYMC), the Medical College of Wisconsin (MCW), and Case Western Reserve University School of Medicine (CWRU) continued to use live dogs to teach physiology to medical students after the practice had ended at all other U.S. and Canadian medical schools.



A dog lies on an operating table awaiting a non-survival medical student training lab at the University of Colorado School of Medicine.

MCW's use of dogs in physiology education ended in February 2007, but MCW replaced the use of dogs with pigs to teach students human physiology, a practice that continued until 2012. In an e-mail dated June 5, 2012, MCW's associate vice president for public affairs Richard Katschke wrote to John Pippin, M.D., F.A.C.C., of the Physicians Committee to inform him that first-year physiology course work would no longer include "any labs using animals."

NYMC then halted the use of dogs in November 2007, and the last medical school dog lab was ended shortly thereafter. On Dec. 7, 2007, Pamela Davis, M.D., Ph.D., dean of CWRU, informed the Physicians Committee that the school was ending the use of dogs in medical student surgery training and that she was "working closely with the university's administrative deans and department chairs to identify the most appropriate alternatives to the use of live animals such as O.R. time or simulations."

"Technology has ... provided alternative ways to display and simulate the heart's function. With a portable echocardiograph machine, the class will be able to attach an electrode to a student's chest and watch the heart's activity on a video monitor. Simulators with computerized models will be able to mimic things like cardiac arrest or the effect of a drug."

– Article in *The Journal News of Westchester County*, Nov. 27, 2007 on New York Medical College's decision to end animal use

After the last medical school dog lab ended in 2007, some institutions continued to use pigs or sheep. Today, every medical school exclusively

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employs human-based training methods to train future physicians.

Examples of Medical Schools that Have Ended Animal Use

Since the Physicians Committee launched its coordinated campaign in 2005, 31 medical schools have ended animal use. This list includes numerous prestigious programs, such as those at Duke, Case Western Reserve, Washington University (St. Louis), University of Virginia, Uniformed Services University, and Johns Hopkins. Other highly-ranked programs had ended animal use even earlier, including Harvard, Stanford, Michigan, Mayo Clinic, and the University of California medical school system.

Informative comments have accompanied the decisions of numerous schools to end medical student animal labs. From the Icahn School of Medicine at Mount Sinai:

“Last year was the last time this animal lab was offered. After an extensive nation-wide survey of medical schools, we determined that virtually every school in the U.S. had abandoned those experiences, instead opting to use human simulators or standardized patient exercises to teach fundamental physiological principles to pre-clerkship students.”

– Nancy Kheck, Ph.D., assistant dean for curriculum at the Icahn School of Medicine at Mount Sinai in a January 2007 correspondence

The University of Minnesota ended animal use in December 2009. The Physicians Committee was informed by e-mail: "Our students are being

taught using simulation models including some of those you cited in your communication."

Oregon Health & Science University (OHSU), like so many other medical schools, once used dogs to teach physiology and pharmacology to students. Eventually, pigs replaced dogs. However, in 2014 the school ended the use of pigs. Tracy Bumsted, M.D., M.P.H., F.A.A.P., associate dean for undergraduate medical education at OHSU, informed the Physicians Committee on June 9, 2014, that students who did not attend the pig lab "learned well and did as well in their course work as students who did participate."

“What we’ve learned in analyzing the outcomes from students and in our curriculum review is that there are alternatives to the use of live animals for teaching this aspect of physiology. Therefore, we have decided that the new curriculum will no longer include the use of live animals for teaching physiology.”

– Tracy Bumsted, M.D., M.P.H., F.A.A.P., on ending animal use at Oregon Health & Science University

Harvard Medical School ended its last student animal labs in 1996, when the physiology animal labs were replaced by human-relevant teaching methods. Course director Dr. Bruce Zetter commented in the *New York Times*: "[T]he decision to stop using dogs and rats in the course, a practice that began at Harvard 35 years ago, was made for educational reasons. 'We asked how in thinking about physiology in the 1990's we could design a course that emphasizes humans and teaches about the

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heart,' he said, 'and we came up with about 20 different ways.'"

The decade-long effort to replace the use of pigs for introductory surgery training at Johns Hopkins University met success in May 2016, when school officials stated: "Given that almost all medical schools have stopped using live animals in medical student education and that the experience is not essential, the School of Medicine has decided that the use of live animals in the surgical clerkship should stop."

The last medical school in Canada to end student animal use was the Memorial University of Newfoundland in October 2010. After reviewing the replacement methods available, Dean James Rourke stated in the Oct. 27, 2010, edition of *The Telegram* newspaper of St. John's, Newfoundland, that "across the country medical schools are phasing out animals for study for a whole variety of reasons, and we're just at the point where we feel we can provide alternative learning for our students."

The last medical school in the United States to end student animal use was the University of Tennessee College of Medicine Chattanooga campus. On June 24, 2016, the interim dean, Robert C. Fore, Ed.D., F.A.C.E.H.P., C.H.C.P., announced: "Effective immediately, the University of Tennessee College of Medicine Chattanooga has ceased to provide surgical skills training for medical students using live animals models. Accordingly, the surgical skills curriculum will rely on the utilization of models and simulation. The goal will remain to provide the highest quality training and educational experience for our medical students."

Animal-Free From the Start: New Medical Schools

As medical schools increasingly have replaced animal use with human-based educational methods, this shift has been starkly demonstrated by new medical schools. The 44 surveyed medical schools that have opened in the United States since 1979 have all implemented animal-free curricula from the beginning. The absence of animal use confirms that for a very long time the medical school standard of education has not included the use of animals.

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Where Progress Is Still Needed

As we mark the end of animal use in medical student education, we reflect on the decades of dedication and persistence that have ushered this shift in paradigm. While victories like these secure better training for physicians, safer care for their future patients—and respect the sanctity of all forms of life—there is still much work to be done.

We now focus our attention on the areas of specialized medical training and research where animals are still being used.

Emergency Medicine Residencies

Following medical school, physicians pursuing the specialty of emergency medicine will undergo an additional three, and occasionally four, years of residency training. Emergency medicine residency programs teach a broad range of advanced procedural skills to access, resuscitate, and stabilize acute trauma patients.

The procedural skills taught in emergency medicine residency animal labs often involve making an incision in the neck to relieve an obstructed airway, inserting needles into the chest to remove fluid from the sac surrounding the heart, inserting a tube in the chest cavity to drain blood, fluid or air to allow the lung to fully expand, and/or splitting open the breastbone in order to access the heart for various cardiac procedures. The animals are killed after the training session, and in some cases, public records obtained by the Physicians Committee have revealed that the procedures continue even if the animals die while on the operating table.

Currently, 88 percent of emergency medicine residency programs in the United States (123 of 139) surveyed by the Physicians Committee use only human-relevant training methods. However, we have identified 16 programs that still use animals despite the fact that the vast majority of peers have adopted nonanimal training methods.

For example, at Hennepin County Medical Center, a teaching hospital in Minneapolis, live rabbits and sheep are used to teach 20 invasive procedures to emergency medicine residents. From splitting open the breastbone in order to access the heart to drilling holes into the skull, all of these procedures can be taught using human-based methods.

Advanced Trauma Life Support

To manage some of the most acute trauma injuries, the American College of Surgeons (ACS) developed Advanced Trauma Life Support (ATLS) courses. During ATLS animal labs, trainees are instructed to perform many of the same procedures that emergency medicine residents practice, including establishing an emergency airway, removing fluid from the sac surrounding the heart, and draining fluid or air from the lungs.

In 2001, the ACS approved the use of the TraumaMan simulator for ATLS training. Many ATLS programs subsequently halted animal use, and the Department of Defense phased out the use of animals in ATLS training courses in 2015.

Today, 99 percent of surveyed ATLS programs in the United States (275 of 277) exclusively use human-based training methods. However, Baystate Medical Center (Massachusetts) and North Dakota State University-Sanford Health

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continue to use live pigs in their ATLS courses. The animals are killed at the end of the training session.

Pediatrics Residencies

The primary emergency procedures taught in pediatrics residency training are endotracheal intubation (a medical procedure in which a tube is placed into the trachea through the mouth, or sometimes through the nose) and chest drainage with a needle or tube. These procedures are often practiced repeatedly by multiple trainees on a live cat, ferret, piglet, or rabbit, which can cause tracheal bruising, bleeding, scarring, severe pain, permanent injury, and even death.

At Washington University in St. Louis, trainees are instructed to perform the emergency airway procedure on live cats and ferrets. The animals are repeatedly used for training purposes, until they are adopted or euthanized. Meanwhile, at Laval University in Quebec, live piglets are used to train pediatrics residents and are killed once training is complete.

In the past, most pediatrics residencies used animals to train their residents in this procedure. However, today, 99 percent of surveyed pediatrics residency programs in the United States and Canada (208 of 210) use only human-based medical simulation.

A wide variety of human-based methods are available to simulate pediatric training scenarios. For example, CAE Healthcare's BabySIM is an infant-sized simulator featuring advanced physiology for trauma management and critical care. With features that include seesaw breathing, variable pupil size, and secretions from the eyes, ears, and mouth, BabySim offers

simulation scenarios for airway trauma or obstruction, cardiac events, the insertion of chest tubes, and other emergency procedural skills.

The American Heart Association, the American Academy of Pediatrics, and the Emergency Nurses Association have endorsed the use of simulators rather than animals. In addition, the U.S. Department of Defense phased out the use of animals in pediatrics residency courses as of January 2015, concluding that "sufficient simulation models [are] available to meet medical education and training needs."

Combat Trauma Training

Further, the U.S. Department of Defense continues to train medical personnel in combat trauma courses using animals despite the widespread availability of human-relevant methods. The animals—more than 8,500 goats and pigs each year—are subjected to severe injuries, including stab wounds, gunshot wounds, burns, and amputations, before being killed. The Physicians Committee has led an effort in the U.S. Congress to pass legislation phasing out this animal use and modernizing the military's medical training. As of the 114th Congress (2015-2016), the BEST (Battlefield Excellence through Superior Training) Practices Act had been introduced and was pending in the Senate and House of Representatives. The bill would replace animal use over three years.

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Conclusion

Beginning with the founding of the Physicians Committee in 1985, and accelerating after the introduction of a focused campaign in 2005, a new era has been established in medical school education practices.

It is now widely accepted that the use of pigs, dogs, and other animals is neither essential nor optimal for medical student education. Simulators and other validated nonanimal methods have replaced animal use in medical education throughout the United States and Canada.

The same educational and ethical arguments apply to post-medical school residencies, civilian and military trauma training, paramedic and EMT training, and medical device training. The Physicians Committee continues to work toward the day when all such training will be accomplished without using animals.

