Close-up on lab animal microsurgery

Robert Hoyt offers advice on how to get an edge in a growing field

Critical to a variety of complex procedures including limb reattachments and organ transplantation, microsurgery has long been used in human clinical medicine. The use of magnifiers, such as surgical loupes or operating microscopes, allows surgeons to operate on structures too tiny to be seen clearly with the human eye.

In recent years, microsurgery has become increasingly important in biomedical research. With the surge in research involving rodents—especially transgenic and knockout mice—comes an increased need to be able to perform procedures on these small animals. The use of microsurgical techniques allows researchers to use mice as surgical models, despite their tiny size. By applying microsurgical techniques, researchers have performed otherwise impossible feats; examples include ligation of a coronary artery to induce myocardial infarction in the rat, and drug delivery to the liver via the portal vein in the mouse. As an additional benefit, the ability to perform surgical procedures on rodents has the potential to decrease the need for experimentation on more traditional surgical models, such as dogs and pigs.

Sound interesting? Wondering how you can make microsurgery a part of your future? To get answers to these and other questions, we turned to a specialist in the field. Robert F. Hoyt, Jr., DVM, MS, DACLAM is Chief of the Laboratory of Animal Medicine and Surgery at the National Heart, Lung, and Blood Institute, National Institutes of Health, in Bethesda, MD where he and a team of veterinarians and technicians continue to do innovative work in this emerging field.

How did you get your start in microsurgery?

My interest in obtaining skills in microsurgery was a progression from my training in small animal surgery at Colorado State and application of those skills as an investigator at the Walter Reed Army Institute of Research in the Department of Respiratory Research. I was always intrigued at how vascular and neurosurgeons could repair small structures and was curious how they did it. When given the opportunity to take a two-week human microsurgery course at the Uniformed Services University of the Health Sciences in the mid-1980s, I did so. The skills I gained from this course have been invaluable in implementing them with a wide range of procedures on research animals, from dissecting coronary arteries in nonhuman primates to stem cell delivery in genetically engineered mice.

What kind of educational/professional background would someone need to break into this specialty in lab animal science?

That is a tough question for me to answer. It would be easy to say only veterinarians or physicians with specialty training in surgery can do this, but that is not really true. Microsurgery is really another component discipline of surgery. Basically it involves using magnification to better visualize small anatomic structures and to apply acquired fine motor skills to perform manipulative procedures on those structures. I feel anyone with a biomedical interest and patience is capable of being successful. Generally, it takes practicing several times a week for 9 months to a year to really get proficient. First and foremost, as with any other discipline, I recommend taking a formalized training course in microsurgery as opposed to pursuing the "self-taught" approach. Posture, hand-position and good hand-to-eye coordination while looking through a microscope are key to success.

What kinds of skills make someone successful at microsurgery?

A person with good clinical skills will be successful using microsurgery. Not only does this person need to master microsurgery techniques, he/she needs to be cognizant of all aspects of anesthesia, aseptic technique, and perioperative care—especially when performing these procedures on rodents.

What educational resources are available for people looking to learn microsurgical techniques?

There are number of good references on microsurgery available. We published two articles in *Lab Animal* in October 2001(Hoyt *et al.*, **30(9)**, 26–35 (2001); Hoyt *et al.*, **30(9)**, 38–45 (2001)), which may be useful for someone getting started. There are also several human microsurgery courses offered around the country, which can be found on the web. At this time we are also planning to offer the two workshops again at the 2006 AALAS meeting in Salt Lake City.

Where do you see this field in the future?

To date my staff and I have trained more than 200 people in our basic and advanced microsurgery workshops held at the National AALAS meeting over the past six years. This continued popularity only reflects the ever-increasing rise in using small animal and rodent models in biomedical research, and the necessity for being able to perform surgical procedures on their small structures, using magnification. I see the need for the use of microsurgery in biomedical research continuing to expand in the future.