

TECHNIQUES

An evolving science

The equine limb is a marvel of engineering. A column of bone, sinew and skin no larger than six inches in diameter, it supports thousands of pounds of force at high speed, absorbing shock and adapting to footing that can change in an instant. Replacing a horse's leg with a device that is equally versatile is not yet possible, but prosthetists—the professionals who make artificial limbs for people and animals—work to incorporate the latest technological advances into devices that do more than simply offer support.

"The idea is to mimic the mechanics of the leg as much as possible," says Barrie Grant, DVM, of San Luis Rey Equine Clinic in Bonsall, California. "It's important that a device be able to bear the weight of the horse and have some shock absorption, which cuts down on pressure on the stump." The more comfortable the prosthesis is, Grant continues, the more weight the horse will put on it, meaning the less stress the opposite limb will have to bear.

Virtually all of the prosthetists who work with equine surgeons construct artificial limbs primarily for people. "The real advances in prosthetic limbs, such as spring-loaded devices, are being made in the human field," Grant explains. "And a good prosthetist will try to incorporate them into an equine device."

The first step in creating an equine prosthesis is to make a cast or mold of the stump so that a socket can be custom built. Fit is very important for the comfort of the horse and the health of the stump. Most equine prostheses are made from various combinations of carbon graphite, fiberglass, stainless steel and various plastics. They usually are suspended from the joint above the amputation site and secured with straps and/or harness systems.

Ted Vlahos, DVM, of Sheridan, Wyoming, has worked with a local prosthetist to develop an equine prosthesis that is intended to be more comfortable for the horse and less complicated for the owner to remove and replace. "Our boot has clamps to hold it in place, much like a ski boot," Vlahos says. "We think it's much easier to work with."

FOR MORE INFORMATION:

To read an account of an earlier effort to fit a horse with a prosthetic limb, go to "Boitron: The Horse With the 'Bionic' Leg," EQUUS 100.

to be in the best physical condition. "In those cases, the horse commonly has overused the good limb; it's been bearing more than its share of the weight for a while," Vlahos says.

Immediately after amputation that good leg is under even more stress, which can have disastrous consequences. "When horses founder in the opposite leg after amputation, it's typically because that leg was already damaged from overuse," Vlahos continues. "That's one of the biggest reasons why the decision to amputate needs to be made sooner in the course of chronic conditions, rather than later.

"Amputation is still a salvage procedure—something you do when there is no other way to save the horse. But waiting too long to reach that decision can really reduce the odds of success." Vlahos adds that since surgeons have begun amputating limbs earlier in the progression of chronic conditions, the incidence of laminitis in the opposite leg—one of the more common complications of the procedure—has dropped dramatically.

Several additional factors contribute to the success of an amputation and prosthetic repair:

■ **The location of the amputation:** In general, hind-limb amputations are less taxing for a horse because his rear legs bear a smaller percentage of his overall weight. In addition, the lower on the leg an amputation is performed, the better the likely outcome because more of the limb's joints remain intact. That makes it easier for the horse to maintain his natural gait and to get up and down. Amputations above the knee or hock currently aren't feasible. "But we will eventually get there," Redden says.

■ **The horse's breed and size:** "The best breeds for the procedure are the smaller, lighter breeds," says Gayle Trotter, DVM, an orthopedist at Colorado State University. "The larger breeds are more vulnerable to breakdown of the soft tissue in the support limb while they are adapting to the prosthesis."

■ **The horse's attitude:** "Those who have long-term success with a prosthesis are able to adapt quickly to rapidly changing situations and stimuli," says Grant. For instance, periodically in the months following surgery, the horse will be positioned in a hanging sling for cast changes and prosthesis adjustments. He'll also have to learn how to lie down, stand up and move with a prosthetic limb. "Unfortunately, it's tough to know how a horse is going to adapt until you're actually in the situation," says Grant.

■ **The owner's wherewithal:** The initial surgery