

BY SUSAN I. FINKELSTEIN

He was called Bones after being discovered wandering, an emaciated 11-month-old puppy, onto a Missouri farm five years ago. That's when Sandy and Bob Owens, in Haverford, Pa., received a call from a friend whose property neighbored the land where the German shorthaired pointer was found. The dog needed a home—fast—or he would be shot; animal shelters were nonexistent in this remote, rural area, and that particular farmer had no desire for a dog. Two days and one trip to the airport later, the gangly pup had a new name and a new home: with the Owenses, Zeke had finally found his niche.

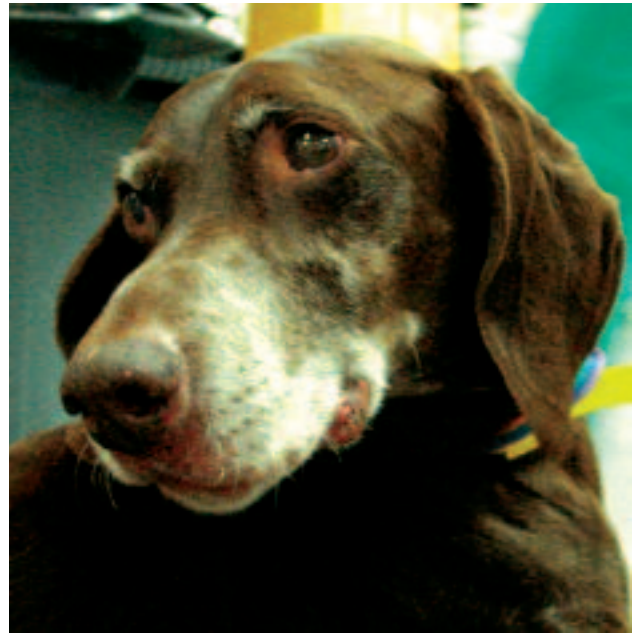
In his previous life, Zeke clearly had been mistreated. He was afraid of sudden movements or sounds. On trips away from the Owenses' four-acre property, he would become anxious and try to return home. His new owners had hopes of growing Zeke into a first-class bird dog, but when a shotgun was shown to him, he looked at it, dropped his tail and ears and ran to his doghouse. When

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introduced to game birds, Zeke had a very good nose, but seemed to be afraid of getting in trouble—smelling the bird, starting to point, then “blinking” or skirting away with his tail down. “We believe he was taken to the field when young, introduced to hunting with mistreatment and left in the country either deliberately or by accident,” Bob Owens said.

Finally, after much careful and gentle training, Zeke's self-confidence grew, as did his willingness to join in the hunt. A sweet-natured dog, he soon was given the run of the house and property (surrounded by an invisible fence). All was progressing well as Zeke settled into his role as helper and loving pet.

Then, one day in late August 2006, a power outage caused by work done at a neighbor's house caused an



Zeke

alarm to sound at the Owens' residence. A police officer responding to the call was taken off-guard by Zeke and, mistakenly believing himself to be in danger, fired his gun at the dog, hitting him once in his lower right jaw and once in his left shoulder. Stephanie Novak, pet-sitting for the Owenses while they were out of town, had been called when the alarm was reported, and immediately headed out to the Owens house. She arrived shortly after the shooting, grabbed Zeke, rushed him first to his local vet, then to Penn Vet, “saving his life,” Bob Owens recalled.

The Fight to Save Zeke

When Zeke first presented at the Ryan Veterinary Hospital, **Dr. John Lewis, V'97**, assistant professor of dentistry and oral surgery, happened to be in Ryan's Emergency Service consulting on another patient. Dr. Lewis remembered that “blood was pouring out” of the dog's mouth—in fact, Zeke almost bled to death. Packed red blood cells and other blood products were provided to the dog from Penn's Animal Blood Bank. Cardiology resident **Dr. Steven Cole**, who was working E.S. that day, intubated the dog to protect the airway and provide anesthesia, and Dr. Lewis assisted the emergency team in locating and ligating the bleeding artery. Under anesthesia, Zeke was brought to the Radiology Service for a CT scan before surgery, where doctors noted that the area of injury to the jaw was comminuted (nearly pulverized) and rid-

dled with bullet and tooth fragments. Zeke also sustained soft-tissue injuries, including damage to the right side of the face, underside of the tongue and the muscle over the left shoulder. (**Dr. David Holt**, chief of surgery and professor of surgery, explored the gunshot wound to Zeke's shoulder and removed lacerated tissue from that area.)

Zeke also exhibited some uncharacteristic bleeding from lesser wounds in his mouth; he had anesthetic complications of arrhythmias and pressure problems, so the surgeons quickly removed the severely comminuted segment of mandible, including pieces of tooth, bone and metal.

As a result of the wound, Zeke had a two-inch gap in his jaw; bone loss this severe is extremely hard to manage, often requiring a graft from the rib or hip bone—and even then it can be very difficult to heal. **Dr. Robert Gilley**, assistant professor of surgery, who managed the orthopedic surgical aspect of the case, consulted with Dr. Randy Boudrieau, a colleague at Tufts University in North Grafton, Mass., who specializes in this type of injury. The two agreed that a new type of tissue engineering—a technique using a substance called bone morphogenetic protein (BMP) to create bone from soft tissue around the defect—would provide the best outcome after the insertion of reconstructive plates in the jaw.

First, a mini-plate was placed along the dorsolateral surface of the lower jaw to maintain normal occlusion (rela-

tionship between the upper and lower jaws). Doctors then placed a larger, special locking plate in the region. The screws and plates not only screwed into the bone, but a separate set of threads locked into the plate itself to allow for increased stability especially for cases like Zeke's, where there is a gap to span in the bone. Then, a calcium-phosphate sponge was created to fit in the area of the bony defect, and this sponge was impregnated with BMP. The sponge acts as a matrix for bone cells to traverse the area, and the BMP recruits new bone cells to produce a callus in the area of the defect.

"I did my Ph.D. work with BMP and it is amazing how effective and quickly it forms bone," Dr. Gilley stated. "The only difficulty is that it is extremely expensive (about \$5,000 for one dose)." Wyeth Pharmaceuticals, which manufactures BMP for human use, donated the BMP for use in Zeke. In addition, Dr. Boudrieau traveled from Tufts with specialized instruments to help perform the surgery with Dr. Gilley and his team, which included Dr. Lewis, **Dr. Alexander Reiter** (assistant professor of dentistry and oral surgery) and **Dr. Mary Mesich** (surgery resident). Zeke became only the fifth clinical canine patient ever to have had mandibular reconstruction efforts using BMP.

Each time Zeke has been in for follow-up exams at the Ryan Veterinary Hospital, he has showed signs of consistent and speedy healing. In November 2006, Dr. Lewis reported on the pointer's status; he was doing well at home and new bone was being produced at an amazing rate, but he still had some cosmetic issues. "Due to the large callus forming at the defect site, he currently looks like Rocky Balboa," Dr. Lewis joked, "but this callus will remodel with time to provide function and a relatively normal appearance." In December, the callus had shrunk noticeably, and dental radiographs showed replacement of the calcium-phosphate sponge with bone.

Zeke has since visited Dr. Lewis for his 12- and 16-week post-operative rechecks, and the callus continues to become more consolidated. Zeke's occlusion continues to be perfect, and Sandy and Bob Owens are very pleased with his recovery. Zeke has even sneaked out with Bob for some hunting (not entirely with the blessing of his doctors at this early stage), and despite all he has been through, appears to show no signs of reverting to the gun-shy ways of his youth. 🐾

Drs. Lewis (center) and Cole (to Dr. Lewis's left) try to staunch the flow of blood shortly after Zeke's arrival at Ryan's Emergency Service.

