



IF MCDUFF THE SCOTTIE COULD TALK, HE WOULD TELL YOU HE HAS BLADDER CANCER. THE PROGNOSIS WASN'T GOOD, UNTIL HIS OWNERS BROUGHT HIM TO THE VETERINARY MEDICAL TEACHING HOSPITAL.



HE IS PARTICIPATING IN A CLINICAL TRIAL TESTING A HUMAN DRUG, TAVOCEPT, ON DOGS. THANKS TO TAVOCEPT INVENTOR FREDERICK HAUSHEER, MD '82, MCDUFF HAS A FIGHTING CHANCE.



STORY BY MARCUS WILKINS — PHOTOS BY NICHOLAS BENNER

ONE HEALTH  
ONE MEDICINE

mizzou advantage





**MEET MCDUFF**, a resilient dog with an unusual pedigree. Duff, as his owners Charlotte and Wayne Rowell call him, is a 10-year-old Scottie from Houston — a Scottish Texan, if you will. But as far as his kind goes, he's pretty typical. Four legs. Wagging tail. Spunky as they come.

Duff also has bladder cancer, a condition all too common in Scottish terriers. In fact, the Rowells have owned nine Scotties since 1968, and seven have died from the disease.

Despite the heartache of losing several beloved pets, the Rowells have hope for Duff. He is part of a Mizzou study testing the efficacy of Tavocept — a drug developed by Frederick Hausheer, MD '82 — when used in conjunction with the chemotherapy drug Cisplatin. Both drugs were originally designed for human therapy. Cisplatin treats small-cell lung cancer and ovarian cancer in people, and it also works on canine bladder cancer. Tavocept reduces the toxicity of Cisplatin as it moves through the human body, decreasing side effects and increasing the chemo's effectiveness and the patient's ability to tolerate it. It works the same way in dogs.

"The day Duff was diagnosed with transitional cell carcinoma, I got on the Internet, and I found this clinical trial," Charlotte says as the pooch happily surveys the waiting room aromas at the College of Veterinary Medicine's Small Animal Clinic. Duff's "brother" Mac, the Rowell's West Highland terrier, is along for moral support, clicking across the tile and grinning at staff members. "I gave Wayne a Scottish terrier as a wedding gift 43 years ago. We just love them."

As happy as Duff seems, the experience hasn't been all Milk-Bones and chew toys. When he first arrived at the facility, researchers drew blood, took X-rays, examined his pelvic area ultrasonically and performed an abdominal CAT scan. The day he was declared eligible for the trial, he began intravenously receiving first Tavocept, then saline, then Cisplatin. If the treatment works, Duff will be able to withstand larger doses of chemotherapy, ultimately slowing tumor growth — or even stopping it — and extending his life.

Although most drugs are tested on animals during the early stage of development, it is unusual for a drug in the final phase of human testing, such as Tavocept, to circle back to animals. But at Mizzou, where the One Health, One Medicine initiative champions the convergence of human and animal health, the study is an example of one such round trip.



**WHEN FREDERICK** Hausheer (pronounced "house-hair") lugged a tuba from his Independence, Mo., home to southern Iowa in 1973, he had no idea his trajectory would land him on the forefront of medical science. The driving force behind his career starts with the emerging concept of translational medicine. Widely interpreted as "going from the bench to the bedside," it means directly applying new ideas, new drugs and new diagnostics toward improving the patient's quality and span of life.

It didn't take the doctor long to discover he was destined to find his own route. Hausheer rode a concert tuba scholarship to Graceland University in Lamoni, Iowa, but



**Frederick Hausheer, MD '82, founder of BioNumerik Pharmaceuticals Inc., is dedicated to translational medicine, which moves new ideas from bench to bedside as quickly as possible.**

left with an undergraduate degree in biology. After his master's work at the University of Illinois Urbana-Champaign, he arrived at Mizzou in 1979, where he completed a four-year medical degree in three years, bypassing the first year by taking the national board exam early.

He also met Ann Benage, BSN '82, his wife of 26 years. The young couple stayed in Columbia while Hausheer finished his residency at MU, working with oncologists Mike Perry, John Yarbrow and Richard Schilsky, among others.

His fast track then took him to Johns Hopkins University in Baltimore, where he moved through a three-year oncology fellowship in two years and became a faculty member at age 31 in 1987. Later, he joined the National Cancer Institute's Review Board in Bethesda, Md.

"My research had taken off, and I wanted to integrate computer simulation — translational-medicine-type research —

with a heavy emphasis on pharmacology,” Hausheer says. “But I was frustrated because of the disconnect between the clinic and the lab. Folks in the clinic see the patients with the problem, and the people working in the lab don’t always get all the information in order to solve the problem.”

Hausheer decided the industry wasn’t quite ready for his integrated approach, so he moved to San Antonio in 1989 and became the associate director of the Institute for Drug Development. His frustration continued when he witnessed the competition for corporate funding and the lack of cooperation between pharmaceutical “silos” that had been acquired by major companies.

“After two years, it was bothering me because we weren’t going to get anything accomplished,” Hausheer says. “I figured I’d be better off trying on my own, but I could fall flat on my face.”

Despite the risk, he founded BioNumerik Pharmaceuticals Inc. in 1991 and assembled a group of research scientists and physicians who shared his interdisciplinary philosophy. Nearly 20 years later, the company has two cancer-fighting drugs in the final phase of development: Karenitecin and Tavocept.

“Tavocept basically removes the armor from [cancer cells] so that when the chemotherapy is given, it can more selectively kill the tumor,” Hausheer says. “I’m not aware of another drug that does that and at the same time prevents side effects.”



**DURING A SERENDIPITOUS** visit to Columbia in 2009, Hausheer met with Carolyn Henry, professor of veterinary oncology and Mizzou Advantage facilitator of One Health, One Medicine. For more than 10 years, Henry has been challenged by the lack of treatment options for canine bladder cancer.

The disease is more easily treated in humans because a person can describe urinary discomfort to a doctor when it begins. Because a dog can’t articulate its pain, the cancer often goes undetected until it has metastasized, or moved to other surrounding areas.



**Carolyn Henry, professor of veterinary oncology, and Hausheer check on McDuff, a Scottie taking the drug Tavocept to treat his bladder cancer.**

Henry was familiar with a 2000 study at Purdue University that combined Cisplatin with the aspirin-like drug Piroxicam to successfully treat canine bladder cancer. But most of the dogs developed renal disease.

“When [Hausheer] started talking about a drug that could prevent that, I said, ‘We’ve got a treatment that would work great if we could get around the toxicity,’” Henry says. “And he was excited because [the dogs] are a good model for human disease.”

Tavocept also reduces the time patients (animal and human) must spend receiving treatment. Whereas doctors would normally allow six-and-a-half hours due to kidney concerns, researchers at Mizzou have shortened the treatment time for the dogs.

“It will make it a lot more practical for us to do treatments like this out at your local veterinarian’s office,” Henry says.

For Duff and the Rowells, taking part in this study means a 14-hour drive from the Lone Star State. They stay at Barkley House, the dog-friendly suite at Columbia’s Stony Creek Inn, which has nonporous floors and easy lawn access for families with pets

receiving treatment at MU.

“There was a skunk outside the room at 4 this morning,” says Charlotte, laughing as she describes her dogs’ territorial excitement. “I got a great urine sample, though!”

After only two treatments, the dog’s tumor had decreased by 55 percent and the blood in his urine had completely disappeared. On Jan. 25, 2011, Duff received his final round of chemotherapy.

“He’s lost a little weight, but he was a bit heavy, so that’s OK. Our dog groomer of 22 years said he looks better than ever,” Charlotte says. “He’s gone back to guarding our house and barking at the door. We call him the Sheriff.”

The Rowells were told after his initial diagnosis on Oct. 28, 2010, that without treatment, Duff might only live for three months. The clinical trial has changed everything.

“Part of the value of this is that it’s applied translational medicine,” Hausheer says. “We’re taking animals and humans, and we’re learning as much as we can about the optimal way to be giving treatment to a mammal.”

For those who appreciate man’s best friend, it’s comforting to know the relationship is a two-way street. ■■