

► a pet-therapy company in Leawood, Kansas. Now, pets are considered family members, often sharing beds with owners who are willing to pay hefty veterinary bills.

Many standard pet treatments are human drugs given at lower doses to account for animals' smaller size. But antibodies and cell therapies generally cannot be used across species without provoking an unwanted immune response. And some human treatments simply will not work in pets: many common pain medications are toxic to cats.

Nexvet, which has raised more than US\$80 million from investors since it was founded in 2011, takes antibodies that have been approved as human medicines and alters their structures to make them effective in cats or dogs. Moving from a drug lead to safety testing takes about 18 months, says chief executive Mark Heffernan, who estimates that Nexvet's antibody therapies for pain will cost around \$1,500 a year. The company is now looking into developing antibodies that block a protein called PD-1, thereby unleashing the immune system to fight cancer. This approach has shown tremendous promise for treating cancer in people.

Aratana is also developing antibody therapies for pets, and has applied for regulatory approval of a cancer vaccine that uses a bacterium to target malignant cells. The company

hopes to move into cell therapies, and to develop a way to manufacture stem cells from fat for use against joint pain. St. Peter wants his company to be the first to win approval from the US Food and Drug Administration for a stem-cell therapy — ahead of firms developing such treatments for people.

Other forms of cell therapy could also result in new veterinary remedies. Last July, veterinary oncologist Colleen O'Connor founded a cancer-treatment company in Houston, Texas, called CAVU Biotherapies. To treat lymphoma, CAVU aims to isolate a sick dog's immune cells, rejuvenate them in culture, and then infuse them back into the dog's blood to stimulate an immune response. O'Connor used a similar approach in 2011 to treat Dakota, a bichon frise that belonged to then-US Senator Kent Conrad (Democrat, North Dakota). The dog, a Capitol Hill fixture known as the '101st senator', entered remission but later died of cancer.

For many pet owners, cost is no object. Steven Suter, a veterinary oncologist at North Carolina State University in Raleigh, runs a bone-marrow transplant clinic for dogs that

claims to cure 33% of lymphomas. Suter's clinic was booked solid after it opened in 2008, despite offering treatment that can cost a dog owner up to \$24,000. Still, Suter has worked to drive down the cost of care: to filter stem cells from blood, his clinic uses second-hand machines that were donated by a physician with a soft spot for schnauzers. Earlier this year, several major pet-insurance companies added bone-marrow transplants to the lists of procedures that they will pay for.

But when it comes to the latest pet treatments, some animals might be more equal than others. Cats are "physiologically finicky", Suter says, noting that they may be too small to allow bone-marrow transplants using his usual machines. And O'Connor notes that cats' immune systems also differ wildly from those of both humans and dogs — meaning that more basic research must be done before sophisticated immunotherapies can be deployed against feline ailments.

At Lively's clinic, many dog and cat owners were grateful that their animals could participate in Nexvet's clinical trial. But about a month after the trial ended, the effects of the antibody therapy began to fade. Jonah's owner was among the clients who called Lively, desperate for a way to access the treatment again. "It's tough," Lively says. "They'll have to wait until this product comes to market." ■

"A generation ago, as beloved as Snoopy was, he lived in the backyard in the doghouse."

ASTRONOMY

France launches massive meteor-spotting network

Tracking space rocks that reach Earth will give insight into the early Solar System.

BY TRACI WATSON

Scientists in France have launched an unprecedented campaign to catch shooting stars, an effort that will rely on thousands of volunteers to comb the ground for bits of space rock.

The Fireball Recovery and InterPlanetary

Observation Network (FRIPON), inaugurated on 28 May, already includes 68 cameras that scan the skies for meteors, which are seen when bits of asteroid, comet or other planetary material streak through Earth's atmosphere. By the end of this year, some 100 cameras will blanket France, organizers say. That would make it one of the biggest

and densest meteor-spotting networks in the world.

"If tomorrow a meteorite falls in France, we will be able to know where it comes from and roughly where it has landed," says Jérémie Vaubaillon, an astronomer at the Paris Observatory and one of organizers of the system.

Meteorites — chunks of stone that have



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fallen from space and reached Earth's surface — provide valuable insights into everything from the history of the Solar System to the identity of asteroids that could potentially collide with Earth. Snagging such objects is “the one chance you get to see Solar System material in your hands,” says David Clark, who studies meteors at the University of Western Ontario in London, Canada. “We simply don't have enough of this stuff.”

FIRE IN THE SKY

Especially prized are meteorites that were tracked on their inward journey. Scientists can use data about the journey to reconstruct the object's trajectory and reveal where in the Solar System it came from. People manage to retrieve just one to three meteorites with known trajectories each year, says Peter Jenniskens, an astronomer at the SETI Institute in Mountain View, California.

FRIPON's organizers dream of collecting one tracked meteorite per year from the French landscape. By comparison, researchers with the large and dense Spanish Meteor Network have scored 2 in the past 12 years.

The French network's cameras are very densely and evenly spaced, sitting roughly 70–80 kilometres apart at laboratories, science museums and other buildings — close enough together to yield good information about where meteorites land. “That increases your chance of finding something,” says Jenniskens.

FRIPON is also the first fully connected and automated network, says principal investigator François Colas, of the Paris Observatory.



Fisheye cameras will cover France as part of the meteor-spotting network.

When a camera detects a meteor, it sends a message to a central computer in Paris. If two or more cameras spot the fireball, FRIPON scientists receive an e-mail describing where it was seen. Eventually, the e-mail will include automatically generated information about the object's probable landing zone, pinpointing it to an area roughly 1 kilometre by 10 kilometres.

The researchers will then face the arduous job of searching this area to find the object. At first, scientists will conduct the ground searches. But in the next few years, FRIPON organizers plan to train an army of citizen

scientists to walk the French landscape looking for bits of meteorite — and to hand over any finds.

Perhaps one in 1,000 volunteers will actually turn up for a search, estimates Brigitte Zanda, a meteorite specialist at the National Museum of Natural History in Paris, who heads the volunteer effort. Organizers hope to field a search team of 30 people in every part of France, so they will have to recruit hundreds of thousands of people, she says. “It's ambitious.” But hundreds of people have already signed up, even though the official recruitment drive is just getting under way. ■

DRUG PRICING

Gene therapies pose million-dollar conundrum

Economists, investors and medical insurers can't work out how to pay for cutting-edge drugs.

BY ERIKA CHECK HAYDEN

Drugs that act by modifying a patient's genes are close to approval in the United States, and one is already available in Europe. The developments mark a triumph for the field of gene therapy, once considered controversial.

But with estimated price tags of at least US\$1 million per patient, how will anyone pay for these treatments? The question is just one in a broader debate about how to finance a range of super-expensive drugs that are now

available, thanks to an explosion in genetic and molecular-biology research over the past 20 years.

“Advances in science are presenting a social affordability question like never before,” says economist Mark Trusheim at the Massachusetts Institute of Technology in Cambridge. “Do we want to convert the science into therapies that we actually would have to pay for?”

Trusheim spoke at the Biotechnology Innovation Organization (BIO) meeting in San Francisco, California, on 6–9 June, which featured much discussion about how society

will pay for the rising costs of new drugs. At the American Society of Clinical Oncology meeting in Chicago, Illinois, on 3–7 June, dozens of talks and abstracts focused specifically on the growing cost of cancer care. Cancer drugs that unleash the power of the immune system cost up to \$40,000 per month.

Gene therapies that are close to US approval include treatments for haemophilia B, sickle-cell anaemia and the neurodegenerative disease cerebral adrenoleukodystrophy. A therapy under development at Spark Therapeutics in Philadelphia, Pennsylvania, for a type of ▶

CORRECTION

The News story 'Gene therapies pose million-dollar conundrum' (*Nature* **534**, 305–306; 2016) should have said that cancer drugs that unleash the power of the immune system cost up to \$40,000 per month, not per year.