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Pet projects need a helping hand

Clinical trials with cats and dogs offer great promise for animal and human medicine but risk being stifled by overzealous regulations.

For decades, the usual veterinary response to a pet's unbearable suffering has been the same: the dearly loved animal has been quietly and humanely put to sleep. Yet a new trend has emerged over the past decade or so: in search of hope, or just a few extra months of life, owners have been willing to enrol their pets in experimental trials of new therapies. Science and medicine recognize this, and see a splendid opportunity for both pets and people. Rules must now be adjusted to exploit this potential.

Clinical trials of drugs are increasingly being carried out on pets, particularly dogs and cats. Such trials are analogous to those conducted in people, and yield reliable data that can lead to swifter approval and marketing of new veterinary products. The results can also support the much tougher procedures to approve new treatments for related conditions in people.

It should be a win-win situation. When little Fritzi develops a nasty lump on her neck, or lovable Tom-tom starts walking with a painful limp, a vet can, after diagnosis, offer to recruit them into any relevant clinical trial — with the possibility of a better-than-standard treatment. Veterinary surgeons say that nearly all pet owners give eager informed consent to participate, either in the hope of exploiting that possibility or because, as serial pet owners, they hope that the research will help their next animal.

A forerunner of this trend, and a continuing gold standard, is the US National Cancer Institute's Comparative Oncology Trial Consortium, which has been running for 12 years and recruits pet dogs into specific cancer trials. A dozen trials have been completed and some have supported pharmaceutical-company decisions to drop or pursue candidate drugs for human use. In the past few years, ambitious veterinary institutions around the world have started their own pet trials for conditions from cancer to arthritis and diabetes — and their focus is on both veterinary and human therapies.

Veterinary surgeons are happy because the trials help to speed approval for treatments for their furry patients. Regulators of human medicines are also enthusiastic. They welcome relevant pet clinical-trial data as part of a drug-developer's evidence that a medicine is safe and effective. Pets also offer some very specific advantages. Most tests involve laboratory animals especially bred or modified to represent key aspects of a disease — but pet animals that actually have the condition are the real McCoy. They are genetically diverse, they develop the disease spontaneously and they share the human environment. So pet trials much more closely reflect the real-life situation for people.

Aside from publicly funded trials in some countries, pharmaceutical companies regularly approach veterinary schools for direct collaboration in their drug-discovery programmes. It's a problem, then, that a regulatory gap threatens this work. Unlike the rules for human clinical trials, regulations for veterinary trials are unclear and confused, especially in the European Union.

There are no international guidelines, so some EU countries,

including Austria and the United Kingdom, have chosen to classify pet clinical trials as animal experimentation. As such, they fall under the (rightly strict) 2010 EU directive on the protection of animals used for scientific purposes.

This adds complications that tie the authorities in knots, delaying approval of medicines. For example, the directive is designed for laboratory animals and sets out precise rules for their housing and routine care, something that by definition cannot be controlled for privately owned pets. Moreover, veterinary surgeons in Austria, a country with highly sensitive attitudes to animal rights, say that the definition of the work as an experiment rather than a trial prompts many pet owners to choose euthanasia.

Trial runners in other countries, including Germany and the United States, have more flexibility. One answer to the dilemma might be for the stricter EU countries to reconsider their rigid positions, and loosen their rules for pet trials.

Another is for scientists and veterinary surgeons to lobby for an amendment to the EU directive itself, so that it explicitly excludes pet clinical trials — in the same way that it already excludes trials required for marketing authorization. The legislation is currently under review, so now would be the right time to make the change.

Pet work attracts cute headlines, but it is no curiosity. The research is valuable and deserves support — from both researchers and policymakers. ■

Ebb and flow

Humans cause most changes in Earth's surface water, so its governance must become a priority.

“Human nature is like water,” the US poet Wallace Stevens wrote. “It takes the shape of its container.” As the political events of 2016 continue to raise questions about that shape and how it is changing, it might seem difficult to redirect attention to water. So delegates gathering in Rabat, Morocco, next month for the eighth meeting of the Water Governance Initiative, run by the Organisation for Economic Co-operation and Development (OECD), deserve acknowledgement at the very least. At the meeting, which falls in the week before the next US president is sworn into office, those hardy souls are set to discuss “raising the profile of water governance in the Global Agenda”.

Yet the importance of water governance, if not its political profile,

increases steadily year on year. And the politics of water — for that is what its governance involves — could yet hold a lesson for more-solid human affairs. Even the definition of water governance is political, and a hard-won human compromise, so it can seem a bit, well, fluid: the social, economic and political systems that control decision-making on water-resource development and management.

Its goal is surely one that all can agree on: to make sure that people do not have too much water, nor too little, and that it's not too polluted. But the ways of achieving that across the globe mirror the governance of water turned into snowflakes: no two circumstances are identical.

A 2013 study, for instance, reported on the introduction of sustainable practices to maintain water flow in the local environment (rather than piping it away for human use) at river basins in China and Australia (R. Q. Grafton *et al. Nature Clim. Change* 3, 315–321; 2013). Whereas changes to China's Yellow River were imposed by the central Communist government, improvements in the Murray–Darling River basin were the product of a market-based system that encouraged the trading (and non-use) of extraction permits.

Those are the (limited) success stories. But the harsher reality of politics frequently pours into water governance. And as a microcosm of the wider world, different attempts to manage water resources often serve only to make other options seem more attractive. Perhaps more than for any other natural resource, the various groups in society can see something different reflected back when they look at water. It's a source of life, hygiene, crops, leisure, industry, livelihood — or just a pretty view — and those interpretations often collide. It's easy to see why scholars of water governance typically prefer to focus on the actors rather than on the actions that are needed.

That's another reason why the Morocco conference next month should be recognized. It is the latest in a long process that aims to guide policies of water governance. Run under the umbrella of the OECD, the Water Governance Initiative works to set principles and share good practice. It aims, for example, to increase the number of river basins

that are assessed and given management plans, and to encourage countries to identify and crack down on corruption in the water business.

It is making progress. Last year, the initiative agreed on a dozen principles to guide water governance, and is now consulting on suitable indicators that could be used to measure progress. Scientists can do their bit here: one of the key principles is the need for policy-relevant and timely data and information on water use and resources.

“Many lakes and rivers have disappeared in our own lifetimes.”

Indeed, some such information appears in a *Nature* research paper published online this week (J.-F. Pekel *et al. Nature* <http://dx.doi.org/10.1038/nature20584>; 2016) that offers the most comprehensive picture yet of the planet's water resource. The study collects and collates more than 3 million satellite images of

Earth's surface taken over the past three decades, and shows how surface water — rivers, lakes and wetlands — has ebbed and flowed. If there is, or was until recently, a pool of open water at least 30 square metres near you, then it's probably included in this map. The pictures reveal some big numbers: nearly 4.5 million square kilometres of the planet's land surface has been under water at some point since 1984 (still just 3%). More than half of this is in the global north, above a latitude of 44° N.

Although we think of lakes and rivers as features of the landscape, many have disappeared in our own lifetimes. More than 90,000 km² of water bodies thought to be permanent have disappeared — including giant chunks of the Aral Sea — and a further 72,000 km² is now classed as only seasonally flooded. But overall, there has been more flow onto the land than away from it: almost 213,000 km² of land that was dry in 1984 is now covered in water for some periods, often inside new reservoirs.

Climate change has a role in these shifts, but the biggest cause of water movement is direct human activity. Some regions have too much, others too little. Water governance deserves its place on the global agenda before it's too late. ■

Word power

How the books children read can trigger a lifelong fascination with science.

Even *Nature* editors were young once. And in a Books & Arts special this week, *Nature* readers can get a little insight into what makes those editors tick — or, at least, what helped to turn them on to science (see page 194). Forget virtual-reality goggles and computer-simulated, movement-sensitive interactions. These were the olden days, and stories of the world reached our young editors from inside the covers of books.

Ask someone what reading material inspired them as a child, and few will be honest enough to say that it was comics such as the *Beano*. So we have to trust our editors when they say they spent their formative years curled up with childhood investigations of chemistry, physics, mathematics and, chiefly, the natural world. But reading their recollections — and, indeed, how some read more-modern works with their own children — it's easy to see why they did so.

The pages they describe tell science as opportunity and discovery, learning without instruction, and of fascination and imagination. More, it is science as embedded in society and the world, science as a relevant, integral, natural and core ingredient for a curious and active mind. With a foundation like that, it's easy to see why *Nature* editors and readers sometimes struggle to understand how anyone would choose to see the world in any other way.

To analyse the content of children's science books can be like pulling the beard of Father Christmas to see if it's real. Some of the magic is

lost in the process. But there is a serious — and an educational — side to children's books. Their influence is great, and as such their style and content have been scrutinized over everything from their depictions of violence and gender roles, to people's attitudes to the environment and recycling. If books leave such a lasting impression on people, then should scientists and researchers do more to make sure that those read to and by children are accurate? Where, for example, does fiction tip into fantasy — and should young readers be made aware of the difference?

These concerns can seem overblown and ripe for ridicule. Does the anthropomorphism of cats and dogs in stories make children believe that their pets can talk? (Probably not.) But can representations of humans as superior and somehow distinct from other animal species fuel misconceptions about our origins? (Perhaps.)

For an example of the power of children's literature to mislead, simply look up at the sky. The phases of the Moon is a tricky concept to grasp at first, and studies show that even university science graduates mistakenly attribute them to Earth's shadow. (In fact, as you know, the Moon's phases reflect how much of its sunlit half is visible from Earth.) Educationists put much of the blame for this on the way in which the Moon is shown in children's books, including the much-loved Eric Carle classic *Papa, Please Get the Moon for Me*.

The literary lunar laxness goes even deeper. If children and many adults are sometimes surprised to see the Moon in the daytime, then some of the blame for that can be placed on kids' books, too. (And so, but less commonly, can the expectation that a cow will leap over it.)

The Moon aside, children's books are rightly viewed as a greatly valued resource of science. Yes, even those of Eric Carle. Kids may not grasp celestial mechanics, but most know the life cycle of the butterfly. That's assuming, of course, they have read Carle's *The Very Hungry Caterpillar*. ■