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Imagine climbing into a pool and trying to roll a dolphin onto its back to examine it, or physically lifting an elephant's foot to trim its toenails. Without the cooperation of the animal, these tasks would be virtually impossible – or would require sedation and restraint, which each have their own risks.

But what if, instead of sedating an elephant and laying them on their side for a foot examination, the elephant could be asked to lift its foot voluntarily? Over the past 30 years, zoo veterinarians have utilized behavioral conditioning to better care for animals in captivity. By using

positive reinforcement training to cue desirable behaviors from captive wildlife, preventative medicine tasks become much simpler, safer, and less stressful for the animal – often avoiding restraint and either avoiding or minimizing sedation, and thus allowing more frequent examination, preventative medicine, and earlier detection of disease.

Preventative medicine – which revolves around routine monitoring of an animal to help prevent or reduce the risk of diseases – is recognized in the veterinary world as a critical part of our domestic animals' care. Through routine check-ups, many debilitating and life-threatening conditions can be prevented, or detected early and treated before they severely compromise the animal. Indeed, preventative medicine is the reason that many of us go to the dentist to get our teeth cleaned even if we don't yet have a cavity, or get our flu shot in anticipation of becoming exposed to the virus.



These Asian Elephants at the Rosamond Gifford Zoo in Syracuse, New York, are trained to lift their feet onto a bar for examination by veterinarians. Foot conditions can be common in captive elephants, but with proper housing, nail trimming, and regular exams, disease can be prevented, or detected early and treated.

But when it comes to wildlife, whose first instinct is often "fight or flight," the goal of providing preventative care is complicated by the desire to minimize stress and negative side effects of capture, sedation, and restraint. Non-domestic ruminants, like antelope and deer, can die from the stress and exertion of being chased and captured. It is an enormous coordinated effort to sedate an elephant, and each procedure carries a certain level of risk to the elephant, as well as the people involved in the procedure. To work around these problems, zoo veterinarians turn to operant conditioning.



The red panda (*Ailurus fulgens*) isn't closely related to the famous giant panda, at all. This little raccoon-like mammal is an expert climber. Red pandas are endangered, primarily due to habitat destruction for logging and agriculture, which has pushed it out of much of its former range in China and Nepal. At the Rosamond Gifford Zoo, the red pandas have been trained to let veterinarians draw blood samples from the cephalic vein – the same vein in the front limb where blood is commonly drawn from dogs.

Operant conditioning: natural behaviors, on cue

Operant conditioning refers to a process of learning in which the performance of a behavior is influenced by its consequences – for example, a dog that learns to sit in order to receive a treat, or a cat that learns not to scratch the curtains after being sprayed with water. The former is positive reinforcement; the latter is negative reinforcement. When it comes to training zoo animals, zoo veterinarians only use positive reinforcement – if the behavior happens, the animal gets a reward. If the animal does not want to perform the behavior, the trainer simply asks them again later.

Through operant conditioning, a behavior that an animal naturally does in the wild can be linked to a verbal or visual cue, and a trainer can use this cue to recall the behavior at another time. This is called “capturing” a behavior. These behaviors can range from a lion lying on the ground and allowing his tail to be handled for blood sample collection, to a great ape sitting still for

radiographs without anesthesia, to marmosets urinating in a specific area so that their urine can be monitored over time for early signs of kidney disease. A tiger opening its mouth in a natural yawn can be trained to repeat that behavior on cue, allowing visual evaluation of its teeth by a veterinarian.

“The biggest misconception is that the animals are performing “tricks”, or that they are doing an unnatural behavior,” says Dr. Noha Abou-Madi, Associate Clinical Professor of Zoological Medicine at Cornell University College of Veterinary Medicine. Abou-Madi, a veteran in the field of wildlife medicine, is residency-trained in Anesthesiology and Zoological Medicine, and board-certified in Zoological Medicine. “They are doing their natural behaviors, we are just capturing those behaviors.” Not only that, but guests at zoos have probably seen evidence of this conditioning at work, without even realizing it.

Capturing simple actions for major benefits

Some of the most useful trained behaviors may not seem so remarkable at first glance, but can be critical to providing safe and consistent care to animals in captivity. “Just tolerating the presence of a human in close proximity, or training the animal to approach,” is crucial, says Abou-Madi. This way, veterinarians can more frequently assess an animal, establish what is normal for that animal when it is healthy and stress-free, monitor medical conditions, and detect any changes from “normal” much faster.

“Desensitizing animals to the sound of a truck or helicopter, the way you would do with a dog or cat afraid of thunder, or having animals walk in a certain direction, is very important for safe transport,” says Abou-Madi. “Additionally, if there is an emergency – for example, a fallen tree compromising a fence, or a tornado watch – you need to be able to bring the animal quickly inside to maintain the safety of both animal and guests.”



The takin is a 600-pound ruminant from the eastern Himalayas – closely related to sheep, but much larger! At the Rosamond Gifford Zoo, takin are trained to move from one area to another and to walk through a chute. Moving a herd of huge animals quickly and safely is critical in the case of an emergency, for the safety of the animals and of zoo guests.

In cases where sedating or anesthetizing an animal is necessary, such as prior to surgery or long-distance transport, training can significantly reduce the risks to the animal and the handler. If an animal allows a veterinarian to approach and directly inject an anesthetic drug into a specific site, the safety and efficacy of the drugs are improved, and the risks of chasing the animal and darting it long-range are eliminated. Not only can an animal injure itself trying to escape capture, but the use of high-pressure darts may carry the risk of trauma to the animal's skin and muscle, and could even accidentally hit a body cavity or other organs. And animals that are less stressed are more easily anesthetized – so a lower dose of the drug can be used to get the same effect.

"Medical care, assessment of the animal, and all aspects of the husbandry – cleaning, feeding, and moving – benefit from training," says Abou-Madi.

Even those behaviors that seem more like "tricks," such as elephants doing a head-stand, can be useful to a veterinarian. An elephant with dystocia – a condition where the fetus is malpositioned, which can make giving birth both difficult and life-threatening – can be asked to change the positioning of its body to help modify the position of the fetus. This motion is a natural behavior that has been captured. "In the wild, they put their head down to get minerals from the soil. Watch the youngsters play together, they already know this behavior." Abou-Madi says.

"Training really has changed our ability to better care for the animals in captivity, better understand them, and deliver treatment and care in much less stressful ways for them," she says.

Stay tuned for part 2 of this series, where we describe more ways in which training helps keep zoo animals healthy and safe.

-By Isabel Jimenez, third-year DVM student

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