RACE required objectives

1. Describe the wildlife reservoirs for rabies in the United States
2. Discuss the importance of different strains of rabies in different hosts
3. Review the typical routes of transmission of rabies to domestic animals and humans
4. Describe the active role the practicing veterinarian plays in public health regarding rabies prophylaxis and response

Rabies is still a public health issue in the United States, despite the growing misperception among the public and some working in veterinary medicine, that it has disappeared. Veterinarians have a large role to play in the continued control and management of this nearly 100% fatal disease. Successful management of potential exposures in humans and companion animals depends largely upon good communication between the public health department, the practicing veterinarian, and the animal owner. Additionally, a thorough understanding of the basic fundamentals of the disease characteristics is a must for public health officials and veterinary medical professionals.

Key etiologic and pathophysiologic points
All warm-blooded mammals are susceptible to infection with rabies, however susceptibility is not equal among all species. Different wildlife reservoirs maintain rabies in different regions of the United States: skunk, fox, coyote, raccoon, and bat.

Rabies should always be on a differential list for an animal presenting with neurological symptoms – until a definitive diagnosis is made. Universal precautions should be mandatory for all animals of unknown vaccine history, especially those with a known potential wildlife exposure. Rabies has no effective clinical treatment or cure to date. Response centers on prevention of the onset of clinical symptoms with aggressive prophylaxis in humans and exposed pets. Vaccination prior to exposure is more effective than prophylaxis post-exposure.

Once symptoms appear, rabies is nearly 100% fatal. Exposure to potentially rabid wildlife does not guarantee illness if prophylaxis is up-to-date and post-exposure boosters are administered.

Summary

1. Rabies is still a threat to human health and to animals in the United States.
2. There is still no effective treatment or cure for rabies following the onset of clinical disease.
3. Routine communication between veterinarians and public health officials is necessary for appropriate rabies prevention.
4. Veterinarians need to recognize and communicate honestly about the risk of rabies to staff and clients.
5. Veterinarians should be vigilant in their own protection and follow-up with recommended titers and boosters.

References/Suggested reading
If You Cage Creatures Enough... How to Handle Escapes

Jennifer Chatfield, DVM, DACZM
Dade City, FL

The law of averages would dictate – if one puts something in a cage long enough, it will eventually get out. Escapes range from simple – a small bird flies out the door as the keeper enters – to complex – 3 adult orangutans have used a broken tree limb following a windstorm to bridge the moat in their exhibit and all three are out on zoo grounds with an elementary school class also on grounds. No matter how complex, the approach to response is fundamentally the same – the animal got out of its cage/enclosure, so we will put it back.

Escapes are much more likely to overwhelm zoo resources subsequent to a natural disaster. During an escape response, it is important to first determine how many animals are escaped, what species, and their relationship to each other (is it a family group, rival males, different species, prey/predator species, etc.) Then, the veterinarian(s) responding should work with the husbandry staff to establish an incident command structure and a capture plan.

The capture and restraint of zoo animals is one of the most critical skills necessary during a disaster response. Whether the animal has escaped or needs to be restrained for a clinical evaluation following a disease outbreak response protocol, the selected method of restraint is crucial to a positive outcome. When restraining any animal, the first priority must be to avoid human injury. Human injury could include bites and scratches or zoonotic disease transmission, thus, appropriate personal protective equipment (PPE) should be worn at all times when restraining animals. The second priority is to avoid animal injury, including disease transmission from the handler to the animal. Appropriate use of PPE should prevent this as well. Typically, if the animal is considered “Code Red” or extremely dangerous, a shoot team as well as a capture team will be deployed. The shoot team will be armed with live ammunition weapons to dispatch the animal if human injury is imminent. The capture team will employ chemical or physical methods to recapture/restrain the animal. Examples of typical “Code Red” animals are tigers, elephants, rhinos, bears, great apes, etc. Chemical methods of capture and restraint are preferred to chemical methods due to the inherent risk of anesthesia to the animal.

The most common remote delivery option for chemical restraint is a self-injecting dart shot from either a blow-pipe, pistol, or rifle. Many variables are important in order to dart animals effectively and consistently. Wind, humidity, distance, species targeted, dart weight, etc., all play an important role and can make or break a shot. Consistent and frequent practice are necessary to become proficient at darting multiple species at varying distances. However, some basic principles will serve the practitioner well when faced with the situation under less than ideal circumstances.

Human safety is of primary consideration – if the dart misses the targeted animal, is there a danger of hitting a human? Animal safety is considered – ideally the dart should enter a large muscle mass such as the upper arm, thigh or rump. When possible, dart only isolated animals rather than one of many in a group. All responding team members should remember that the anesthetic process is the same and induction will generally take 5-10 minutes and in some cases up to 20 minutes. The dart is not a bullet; The drug takes time to be absorbed and to have an effect. Educate team members so that the animal is not rushed prematurely as people can be injured. It is important to have team members who are more experienced with darting animals perform this procedure. Bear in mind, the darted animal may attempt to flee the area after darting, or it may try to retaliate towards the shooter or any other visible team member. Additionally, the animal may run towards water. Drowning can be a real threat. It is best to try to steer/herd the animal away from bodies of water during induction. If the animal is in a tree, try to safely break any fall. Overall, darting can be difficult, but is a useful procedure when animals need to be captured from open areas.

Physical restraint is a good choice for immobilizing animals during a escape because immobilizing drugs may be in short supply and anesthetic risk is increased when an animal is stressed (such as following escape). Hand-grabbing, or hand catching, animals carries great risk for human injury and animal injury and so should only be executed by experienced personnel. However, it can allow for the best opportunity for a veterinary exam as the animal is not anesthetized and the veterinarian can lay hands directly on the animal. It is best to hand grab animals only in enclosed areas. A squeeze chute is utilized for hoofstock and can be used for primates. It also allows for direct contact during examination. A net can be used to catch small mammals and birds and to restrain them for an exam. All physical restraint methods present a risk for the animal and the person and so should only be executed by experienced personnel when appropriate. Each of these methods is best employed when an animal is already otherwise contained, either in a room, building, paddock, pen, etc. If the animal is free-roaming, then chemical restraint utilizing a remote delivery system is likely the best option for capture and restraint.

Many zoos maintain venomous (or hot) and non-venomous reptiles. Some facilities also store anti-venom on hand. If you are not sure if a reptile is “hot” or not, it is best to assume that it is and handle it as such. The buddy system is a must when handling reptiles. Never attempt to capture or handle a reptile alone. If you get bit, your buddy can ID the reptile to medical staff, but your buddy can also make sure that the reptile remains caged after the bite or is killed. Capturing a loose snake does present a risk, so a decision must be made whether to recapture loose snakes or simply kill on sight. During an escape, it is good to remember that reptiles are cold-
blooded. So, they will be attracted to warm areas during cold times and vice versa. Additionally, temperature control is very important to maintaining reptile health post-capture.

Many zoos hold non-human primates of varying species. Personnel safety and safety of any general public should be a primary consideration – which is why initial removal of public from any area for capture procedure is paramount! Appropriate personal protective equipment (PPE) should be worn by all personnel when handling primates.

Recommend further study and reference
Kreeger TJ and Arnemo JM. Handbook of Wildlife Chemical Immobilization.
Leptospirosis is one of the most exciting re-emerging pathogens in the USA. In fact, in the last 10 years, research indicates that the old dogma regarding risk of leptospirosis infection has been reversed. For example, recent investigations indicate that a risk factor for infection is a dog living in an urban area, rather than a rural dwelling dog as was historically thought to be at bigger risk. Additionally, small breed dogs have been identified as being at greater risk as well. Because of the zoonotic risk of leptospirosis, and the possibility of dogs becoming carriers, effective client communication and timely definitive diagnostics are important for regular practitioners to embrace.

Diagnostic options for leptospirosis include culture and antibody titer. However, as the initial presenting symptoms of leptospirosis are those of a simple urinary tract infection and most first-line empirical antibiotics are effective, most clinicians do not perform diagnostics. The advent of benchtop testing in recent months has made the option of definitive diagnosis more reasonable in regular practice.

Summary
1. Leptospirosis is a real infectious disease issue facing companion animals
2. Leptospirosis vaccination should be performed based on a risk assessment for each animal
3. Presenting symptoms of leptospirosis could mimic a simple urinary tract infection
4. Effective communication with veterinary practice staff and clients regarding zoonotic disease is important.

References/Suggested reading
Tuberculosis is an emerging concern among captive and free-ranging wildlife. The disease can have significant financial implications and poses a problem for regulatory officials for control. Compounding the issue is the fact that several species of wildlife can act as maintenance hosts for Mycobacterium bovis. Many captive species are also impacted by Mycobacterium tuberculosis which poses a more significant zoonotic threat.

Clinical diagnostics
More than 10 different diagnostic procedures exist to identify Mycobacterium infection in captive wildlife. This is because none of them is good. Most are indirect, measuring the body’s response to the presence of the pathogen rather than directly identifying it. Of course, these sorts of indirect identification procedures also deliver a “positive” result when the animal has merely been exposed to the pathogen in the absence of infection. Certainly, the absence of a reasonable, reliable diagnostic procedure for a regulatory disease is problematic to say the least.

Typically, because of the regulatory nature of Mycobacterium, depopulation is promoted by officials as the response to a positive test result. In higher profile species, such as great apes and elephants, where depopulation for regulatory reasons is not as politically palatable for the public, multimodal antibiotic therapy can be attempted. Typically cost is a prohibitive component, however, and animal movement is severely restricted following resolution.

The prognosis for captive wildlife infected with Mycobacterium sp. is complex. Naturally, regulatory-driven depopulation has a poor prognosis. Therapy, if attempted, is typically long-term and complicated, carrying movement restrictions for the life-time of the animal. Additionally, therapy is not successful in 100% of cases due to antimicrobial resistance, animal compliance, cost of therapy, risk of exposure to caretakers, etc.

Summary
1. Mycobacterium sp. infect may different commonly held captive wildlife species.
2. There is no good ante mortem test for tuberculosis in any species.
3. Antimicrobial therapy for tuberculosis infection in captive wildlife is complicated, at best.
4. Practitioners should have a good understanding of the complications associated with administering tuberculosis diagnostics, regardless of the result.

References/Suggested reading
3. USDA - Bovine Tuberculosis. Found at: https://www.aphis.usda.gov/wps/portal/aphis/ourfocus/animalhealth/sa_animal_disease_information/sa_cattle_health/sa_tuberculosis/ct_bovine_tuberculosis_disease_information/!ut/p/a0/04_Sj9CPykssy0xPLMnMz0vMAFgjxOK0_D2MDj0MjDzdg1dDTz9wxc8LXzMrj0f09TPQLsh0VAzilhgl/!. Accessed 11/5/15.
Conservation efforts target increasing overall population numbers in general, but is this always appropriate? Conversely, are concerns about limited space a legitimate reason to stifle reproduction among exotic animals? What role does veterinary medicine and chemical or surgical sterilization play? Veterinarians have an ethical obligation to provide options to animal owners. Captive breeding programs have long-served as a safe repository for species whose native habitat is under threat from anthropological events, such as war or famine, to stochastic naturally occurring events such as a cyclone or a tsunami. The captive populations not only serve as a potential source of animals for reintroduction once the threats in the native habitat have been mitigated, but these captive animals also serve as a genetic bank of sorts to preserve genetic diversity among a species. Opponents of captive breeding programs are concerned that support of captive populations detracts from in situ conservation efforts such as habitat preservation. However, 21st century conservation efforts require that an integrated approach be embraced to include both in situ efforts and a robust captive breeding program. Genetic isolation (inbreeding) can produce specimens that are not of great fitness and can, overtime, decrease the overall long-term viability of a population or species. Successful captive breeding programs require free movement of animals between collections to avoid the phenomenon of genetic isolation. Successful breeding of captive endangered species should also provide for appropriate levels of care for specimens which may include expansion of possible pool of locations for collections.

References
Influenza transmission is through aerosolized droplets and other respiratory secretions. Influenza survives in the environment, even under some less favorable conditions. Animals and humans are able to shed influenza prior to the onset of clinical symptoms for up to 72 hours, making biosecurity difficult to perform effectively.

**Diagnostic and therapeutic points**

Diagnosis can be based on clinical presentation or in conjunction with a variety of diagnostic tests. Supportive care shouldn’t be overlooked in non-food animals. Early supportive care and isolation from cohorts should be definitive. Additionally, personnel should be careful and maintain good hygiene practices to prevent cross-species transmission. Antivirals are sometimes effective in animals, but must be given very early in infection to be effective. Some resistant influenzas do exist. Vaccinate!

Early response to supportive care with less severe fever, decreased respiratory secretions, etc., are generally good prognostic indicators. Treatment in commercial production operations is not possible and all influenza infections in animals should be treated as significant.

Given the likelihood that the next influenza pandemic will be the result of a recently adapted animal strain infecting humans, veterinary medical professionals should be vigilant in their own disease prevention and get routine annual influenza immunizations.

**“Take home” points**

1. Influenza is unpredictable and cross-species transmission does occur.
2. Virus shedding is possible for 48-72 hours prior to the onset of clinical symptoms, so good biosecurity should be practiced when bringing new animals into an existing group.
3. Influenza is not new – it has just evolved.
4. Antivirals are most effective when initiated early in disease onset.
5. Veterinarians and their staff should be vaccinated annually to prevent influenza transmission.

**References/Suggested reading**