

should therefore be cautioned to not change their dogs' diets while on KBr therapy and to avoid giving salty treats. Swimming in the ocean has also been associated with breakthrough seizures in some KBr-treated dogs.

## Expanding the Use of Endoscopic Procedures Encouraged

Written by Muriel Cunningham

MaryAnn G. Radlinsky, DVM, University of Georgia, Athens, Georgia, USA, gave a presentation in which she encouraged veterinarians to consider using endoscopy for more procedures. In addition to providing a clear view of internal structures, endoscopic procedures can reduce morbidity and damage to target sites and lead to more rapid recovery times. The equipment consists of a tower that includes a strong light source, a high-definition camera, a capable image processor, and recording equipment. In addition, instruments on a long, narrow delivery system must be used for sampling or treatment.

Several types of endoscopic procedures were reviewed. Rhinoscopy requires control and patience. Dr. Radlinsky emphasized that small, deliberate movements are imperative for any endoscopic procedure. This is particularly true during rhinoscopy because any misguided movements in these rigid surroundings can result in hemorrhage. A 30° endoscope will enable the veterinarian to visualize structures within the confines of the nasal cavity. Biopsies can be obtained with the small biopsy channel, but better samples are obtained with forceps passed adjacent to endoscope. To avoid aspiration pneumonia, Dr. Radlinsky recommended using a properly sized endotracheal tube with a functioning cuff inflated to 20 cm H<sub>2</sub>O. While the use of the angled endoscope will take some practice, Dr. Radlinsky believes that it is worth the effort.

Cystoscopy can also be performed endoscopically. It is very important to visualize the lumen at all times to avoid perforation to the tract. Dr. Radlinsky further stressed that fluid cannot be under pressure during irrigation, as this will cause severe diffuse trauma and hemorrhage to the bladder. This is another procedure that is best performed with the angled endoscope. Since small biopsy samples are taken via the channel, many must be made to obtain an accurate diagnosis. Veterinarians can move on to therapeutic procedures, such as calculi removal and the treatment of small polyps, once they have mastered diagnostic cystoscopy.

Performing otoscopy with an endoscopy tower has several advantages. The video otoscope works very well for ear flushes and deep ear cleanings and is faster than typical methods. Biopsies can be obtained; stricture,

hyperplasia, neoplasia, and foreign bodies can be diagnosed; and polyps can be removed. The risks with otoscopy include tympanic membrane rupture, middle ear hemorrhage, and deafness.

Performing laparoscopy and thoracoscopy requires the development of many new skills. These abilities include the safe placement of ports without damaging internal organs, triangulation, organ manipulation, and hemorrhage control. Appropriate monitoring equipment is required as well. Veterinarians must be comfortable with the open procedure before moving on to endoscopic procedures, and it is best to start with diagnostic procedures, such as collection of samples. Dr. Radlinsky emphasized that these skills are achievable, and she encouraged veterinarians—particularly those who have already invested in endoscopy equipment—to obtain adequate training and perform procedures regularly to maintain their expertise.

## Multimodal Analgesia in Field Restraint

Written by Muriel Cunningham

Hans Coetzee, PhD, Iowa State University, Ames, Iowa, USA, gave an overview of multimodal analgesia in large animal field restraint. The opioid nalbuphine has several advantages as an alternative to butorphanol. Because nalbuphine is an opioid  $\kappa$  agonist/ $\mu$  antagonist, it has very low abuse potential. It is currently a nonscheduled drug in the United States except in Kentucky where it is scheduled because of abuse potential in equines. It is also less expensive than butorphanol, costing \$2.50 per mL compared with \$8.60 per mL for butorphanol. In addition, its use is not associated with any cardiovascular, respiratory, or gastrointestinal adverse effects. All opioids, including nalbuphine, have very short half-lives in ruminants. "Opioids in my experience have not necessarily been my mainstay analgesic drug when it comes to ruminants. I use them as an adjunctive therapy in combination with xylazine and ketamine," Dr. Coetzee said.

The Ketamine Stun is a combination of the dissociative anesthetic ketamine and the  $\alpha$ -2 agonist xylazine, with butorphanol added if needed. For large groups of cattle, a stock solution for a standing stun can be made (Table 1). This solution should not be stored for future use.

This combination can be modified if a recumbent stun is needed, as follows: xylazine 0.025 to 0.05 mg/kg (same as standing stun), butorphanol 0.05 to 0.1 mg/kg (10× standing stun), and ketamine 0.3 to 0.5 mg/kg intravenously (IV; 5× standing stun). Animals become recumbent gracefully in approximately 1 minute and the effect lasts for 15 to 25 minutes. For 15 minutes of anesthesia,



Table 1. Ketamine Stun 5 mL Stock Solution for Standing Restraint

Drug	Amount
Ketamine (100 mg/mL solution)	1 mL
Small-animal <sup>a</sup> xylazine (20 mg/mL solution)	2 mL
Butorphanol (10 mg/mL solution)	2 mL
Dosing	
Docile (dairy) cattle	1 mL/400 kg (880 lbs)
Fractious (beef) cattle	1 mL/200 kg (440 lbs)
Speed of Onset: IV > IM > SC	
Duration of effect: SC > IM > IV	
Risk of recumbency: IV > IM > SC (high dose > low dose)	

IM=intramuscular; IV=intravenous; SC=subcutaneous.

<sup>a</sup>Because of concentration differences, it is important to use the small-animal formulation of xylazine for this stock solution, not the large-animal formulation.

xylazine 0.05 mg/kg IV is administered first followed by ketamine 2 mg/kg IV (20×standing stun) once sedated. In cases where longer anesthesia is required, the combination of xylazine 0.05 to 0.1 mg/kg intramuscularly (IM) and ketamine 4 mg/kg IM provides 30 to 40 minutes of recumbency. Animals do not need to be fasted before the standing stun or recumbent stun, but should be fasted 24 to 48 hours before anesthesia.

Dr. Coetzee also provided some alternatives to xylazine alone. Romifidine 0.05 mg/kg can be used for recumbency in sheep and a dose of 2 to 3 mg IV provides excellent standing restraint in adult cows. Detomidine 2.5 to 10 µg/kg IV provides sedation and recumbency in cattle lasting 30 to 60 minutes. Medetomidine at a dose of 30 µg/kg IM produces recumbency in calves and a dose of 10 µg/kg IV produces recumbency in sheep for approximately 1 hour.

The acidic properties of lidocaine produce a painful injection in animals. Because of this, Dr. Coetzee highly recommends the use of lidocaine buffered with sodium bicarbonate, using a 10:1 ratio of 2% lidocaine to a commercially available 8.4% sodium bicarbonate solution. This practice is supported by published reports that buffered lidocaine reduces injection pain [McKay et al. *Anes Analg* 1987], may enhance analgesia [Curatolo M et al. *Anes Analg* 1998], and may reduce nerve block onset time [Sinnott CJ et al. *Anesthesiology* 2000].

## Diagnosis and Treatment of Tick-Borne Diseases in Horses

Written by Toni Rizzo

Clinical recognition of tick-borne diseases can be a challenge, because tick-horse interactions are not as well studied as tick interactions with humans and dogs. In addition, clinical signs of equine tick-borne diseases are nonspecific. Julia H. Wilson, DVM, Turner Wilson Equine Consulting, Stillwater, Minnesota, USA, discussed tick identification, characteristics of equine tick-borne diseases, and strategies for prevention and tick avoidance.

Ticks can carry the agents of 3 important equine infectious diseases in North America: anaplasmosis, borreliosis (Lyme disease), and piroplasmiasis. The most common ticks found on horses are the black-legged tick (*Ixodes scapularis*) and Western black-legged tick (*Ixodes pacificus*), also known as deer ticks, and the American dog tick (*Dermacentor variabilis*). Both *Ixodes* species transmit anaplasmosis and Lyme disease, but *D. variabilis* is not an important transmitter of disease in horses. *Dermacentor nitens* and *Amblyomma cajennense* have been implicated in equine piroplasmiasis transmission.

Tick-borne diseases are transmitted when nymphs and adults attach to a host and feed on blood. A tick needs to stay attached for 12 hours to transmit disease. Nonspecific signs that might suggest a tick-borne disease include fever, lethargy, weakness, limb edema, edema under the abdomen, poor appetite, and the presence of ticks. Making a differential diagnosis involves a physical examination; tick identification; a review of associated factors, including the herd history, vectors, exposure, age, and breed; and laboratory tests.

Equine anaplasmosis, also known as ehrlichiosis, is caused by *Anaplasma phagocytophilum*, primarily transmitted by *Ixodes*. Reservoirs include rodents and deer. *A. phagocytophilum* also infects humans and other animals. Incubation takes from 1 to 9 days. The diagnosis is made on the clinical signs and identification of the organism (Table 1).

Most horses recover from anaplasmosis in 1 to 4 weeks with antibiotic treatment. The most effective is intravenous oxytetracycline. Oral doxycycline is another option. Supportive care includes limb bandages, easily chewed food, and nonsteroidal anti-inflammatory drugs (NSAIDs) for fever.

Lyme disease is caused by the spirochete bacteria, *Borrelia burgdorferi*, transmitted primarily by *Ixodes* species. Clinical signs are widely variable (Table 1). Diseases with similar symptoms include anaplasmosis,



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