HRVATSKA AKADEMIJA ZNANOSTI I UMJETNOSTI
CROATIAN ACADEMY OF SCIENCES AND ARTS

RAZRED ZA MEDICINSKE ZNANOSTI
THE DEPARTMENT OF MEDICAL SCIENCES

ODBOR ZA ANIMALNU I KOMPARATIVNU PATOLOGIJU
COMMITTEE OF ANIMAL AND COMPARATIVE PATHOLOGY

3. međunarodni veterinarski specijalistički simpozij

Hitna i intenzivna skrb u veterinarskoj medicini

3rd International Veterinary Specialties Symposium

Emergency and Critical Care in Veterinary Medicine

27. lipnja 2018. godine od 10:00 do 15:00 sati, dvorana Knjižnice Hrvatske akademije znanosti i umjetnosti na Strossmayerovom trgu 14 u Zagrebu

Wednesday, June 27th 2018 from 10:00 A.M. to 15:00 P.M., the Library Lecture Room of the Croatian Academy of Sciences and Arts, Strossmayer Square 14 in Zagreb

Znanstveni odbor / *Scientific Committee*

Redoviti članovi Razreda za medicinske znanosti Hrvatske akademije znanosti i umjetnosti / *Full members of the Department of Medical Sciences Croatian Academy of Sciences and Arts:*
Željko Cvetnić, Ivo Čikeš, Dragan Dekaris, Vida Demarin, Vjekoslav Jerolimov, Ivica Kostović, Zvonko Kusić, Josip Madić, Dražen Matičić, Davor Miličić, Marko Pećina, Ivan Prpić, Željko Reiner, Daniel Rukavina, Miroslav Samaržija, Marko Šarić, Mirna Šitum, Slobodan Vukičević

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Hrvatska veterinarska komora je bodovala skup sa 3 boda za učesnike i 6 bodova za pozvane predavače
Croatian Veterinary Chamber has awarded the conference with 3 credits for participants and 6 credits for invited lecturers.

Organizator

HRVATSKA AKADEMIJA ZNANOSTI I UMJETNOSTI

RAZRED ZA MEDICINSKE ZNANOSTI
ODBOR ZA ANIMALNU I KOMPARATIVNU PATOLOGIJU

PROGRAM SIMPOZIJA / *CONFERENCE PROGRAM:*

10:00 - 10:25 **Registracija sudionika / *Participants registration***

10:30 - 10:45 **Pozdravna riječ / *Welcome Address***

akademik Dražen Matičić

prof. dr. sc. Nenad Turk, *Dekan Veterinarskog fakulteta*

Moderatori / *Moderators:* Dražen Matičić, Boris Pirkić, Marko Stejskal

10:45 - 11:15 **Kardiopulmonalna reanimacija- sadašnji pristup liječenju i postupak RECOVER**
CPR- current best practises and a rewiev of RECOVER

Benjamin M. Brainard *VMD, Dipl ACVAA, ACVECC, Professor of Small Animal Critical Care, Department of Small Animal Medicine and Surgery, College of Veterinary Medicine, University of Georgia, USA.*

11:15 - 11:45 **Disemenirana intravaskularna koagulacija (DIK) rana dijagnoza doprinosi uspješnom liječenju**
Disseminated Intravascular Coagulation (DIC): early diagnosis leads to succesful treatment

Benjamin M. Brainard *VMD, Dipl ACVAA, ACVECC, Professor of Small Animal Critical Care, Department of Small Animal Medicine and Surgery, College of Veterinary Medicine, University of Georgia, USA.*

11:45 -12:45 **Aritmije u pacijenata liječenih u jedinici intenzivne skrbi**
Arrhythmias in the ER patients

Marin Torti, *DVM, PhD, Candidate ACVIM-Cardiology, Assistant Professor, Clinic for Internal Diseases, Faculty of Veterinary Medicine, University of Zagreb, Croatia.*

12:45 - 13:15 **Stanka / *Break***

13:20 - 13:50 **Kritično bolesni pacijent sa tumorom mozga**
Critically ill patient with a brain tumor

Marko Pipan, *DVM, Dipl ACVECC, Animal Hospital Postojna, Slovenia.*

13:50 - 14:20 **Kirurško liječenje kolike: kako donositi odluke**
Colic surgery: pre-operative, intra-operative, and post-operative decision making

Kira L. Epstein, *DVM, Dipl ACVS, ACVECC, Clinical Professor, Department of Large Animal Medicine, College of Veterinary Medicine, University of Georgia, USA.*

14:20 - 14:50 **Metabolički i oksidacijski stres u konja daljinskog jahanja**
Metabolic and oxidative stress in endurance horses

Nika Brkljača Bottegaro, *DVM, PhD, Assistant Professor, Clinic for Surgery, Orthopedics and Ophthalmology, Faculty of Veterinary Medicine, University of Zagreb, Croatia.*

14:50 - 15:00 **Završna rasprava / *Closing Remarks***

SAŽETCI / *ABSTRACTS*

CPR- current best practises and a review of RECOVER

Benjamin Brainard, *VMD, DACVAA, DACVECC, Professor*

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The RECOVER initiative represents the contributions of over 150 veterinarians and was conducted to establish evidence-based guidelines for cardiopulmonary resuscitation (CPR) in dogs and cats. Following the generation of specific questions, literature searches were performed, and culminated in 7 manuscripts that describe the process and provide recommendations for best practices during CPR of small animal patients. This discussion will touch on some of the highlights from this study.

One of the major recommendations, based on evidence primarily from the human literature, is that it is no longer recommended to confirm lack of cardiac function in apneic, unresponsive patients, through attempted pulse palpation. Similar to the human CPR guidelines, it is now recommended to initiate CPR immediately. Recommendations for chest compression rate are between 100-120 compressions per minute, and for 6-10 breaths per minute. Compressions may be carried out in a number of different positions, depending on the conformation of the animal. For cats and small dogs, it is recommended to direct compressions in an area directly over the heart (generally located underneath the point of the elbow, or between rib spaces 3-5). In addition, for dogs with a keel-shaped chest (eg. sighthounds, German shepherd dogs, standard poodles), compressions may also be directed to the area over the heart. By contrast, in dogs with barrel chests (eg. Labrador Retrievers, spaniels) likely have the most effective chest compressions performed with the animal in lateral recumbency and the compressions directed over the widest part of the thorax (generally over rib spaces 7-10).

Chest compressions should be performed to compress the width of the chest by 1/2 to 1/3 of its width. The recoil period is important because it is the period when blood returns to the heart for the next compression. Based on human data, rescuer fatigue resulting in decreased strength of chest compressions occurs after approximately 2 minutes, and the same is likely true for veterinary CPR. If possible, rescuers should rapidly switch the person performing chest compressions when they are feeling fatigued or as 2 minutes approaches. The time period between rescuers should be minimized, and ideally CPR should not be stopped for more than 4-8 seconds.

End-tidal carbon dioxide ($ETCO_2$) is an easily measured monitor of the adequacy of CPR. As long as blood is circulating, CO_2 will be delivered to the lungs and exhaled, and the $ETCO_2$ is directly correlated to the cardiac output. When spontaneous circulation restarts, the $ETCO_2$ increases exponentially and so $ETCO_2$ provides a good indicator of the progress of CPR and can also indicate when there is a need to change rescuers or techniques.

Disseminated Intravascular Coagulation (DIC): early diagnosis leads to successful treatment

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Disseminated intravascular coagulation (DIC) is a condition of consumptive coagulopathy. It is triggered by inflammation from any source, and has been seen in animals with neoplasia, pancreatitis, immune-mediated disease, infections, and sepsis. Inflammation results in activation of circulating monocytes and platelets, which triggers the formation of microthrombi. When widespread formation of microthrombi occurs, coagulation factors and platelets are consumed, and if the condition progresses unchecked, animals will eventually develop the hemorrhagic phenotype associated with overt DIC. Non-overt DIC is the description of early DIC, before consumption has resulted in hemorrhage. Non-overt DIC is not only a treatable condition, but should be an indication to the clinician to identify a source of inflammation in the patient. While overt (hemorrhagic) DIC is characterized by a platelet count between 40-80 x 10^9/L, unmeasurable coagulation times (prothrombin [PT] and partial thromboplastin times [aPTT]), and low plasma fibrinogen concentration, non-overt DIC is characterized by a decreasing platelet count (40-100 x 10^9), with normal plasma fibrinogen concentration, normal PT, and only a mild prolongation of aPTT (1.5 -2 times normal values). When non-overt DIC is diagnosed, therapeutic workup should focus on identifying and treating the source of the inflammation. This may include imaging studies with radiography and ultrasonography (both abdominal and cardiac), assessment of organ function through serum biochemistry and urinalysis, serological studies for infectious diseases, and fine needle aspirates or biopsies of abnormalities. In particular, it is important to rule out the possibility of infection as a cause of the inflammation, and in some patients, culture of urine and blood may be indicated. If infection is highly suspected, it is reasonable to start treatment with broad spectrum antibiotics while further diagnostic tests progress. In the author's experience, the most common sites of infection that can result in non-over DIC include heart valves (endocarditis), urinary tract (pyelonephritis), and the liver (cholangiohepatitis).

Treatment of DIC is primarily supportive and can include intravenous crystalloid fluid therapy, antibiotics, oxygen in certain cases, and close monitoring of hematocrit, urine output, blood pressure, and blood oxygen content. Especially in non-overt DIC, anticoagulant treatment is not necessary, and resolution of the initial inflammatory problem is suitable to reverse the coagulopathy. Once DIC has progressed to a hemorrhagic disease, transfusions with fresh frozen plasma to normalize coagulation times and red blood cells to support hematocrit may be indicated, in addition to treatment of the initial inflammatory process.

Skipped beat - arrhythmias in the ER

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Cardiac arrhythmia or dysrhythmia can be defined as any disorder of cardiac rhythm that is not considered normal for a healthy dog or cat. All normal cardiac rhythms originate from the sinus node. In dogs normal rhythms include: sinus rhythm, respiratory sinus arrhythmia and second degree atrioventricular block; sinus bradycardia can be observed in healthy large-breed dogs at rest, and sinus tachycardia is seen with excitement/stress. With cats the situation is different – sinus rhythm and sinus tachycardia are considered as normal, and in cats at rest sinus arrhythmia and sinus bradycardia can be seen, rhythms that are rarely seen in veterinary practice environment.

There are two main groups of causes of cardiac arrhythmias: first group comprises primary cardiac diseases and the second group extracardiac diseases. The most common causes of cardiac arrhythmias are: trauma, splenic tumors, gastric dilatation volvulus, canine dilated cardiomyopathy, urethral obstruction in cats, heat stroke and feline cardiomyopathies. In regard to ventricular arrhythmias, in dogs severe systemic diseases often results in their development, whilst in cats with ventricular arrhythmias the commonest cause is an underlying myocardial disease.

Cardiac arrhythmias should be considered whenever an animal experiences syncope, weakness, or collapse, and sometimes the owners detect very fast/very slow heart rates, or an irregular heart rhythm. The history mainly reflects the signs of the disease that has led to the development of arrhythmia: in cases of systemic disease vomiting, hemoabdomen etc., or primary cardiac disease collapse, respiratory distress, weakness or exercise intolerance.

Identification of a tachycardia, bradycardia or irregular rhythm is essential to raise suspicion of arrhythmia and decision to obtain an ECG. Clinically, tachycardic animals often have pulse deficits and variable arterial pulses. In animals with an underlying cardiac disease a heart murmur or gallop can be heard. Furthermore, signs of congestive heart failure (respiratory distress, ascites, jugular distension and so on) may be present, and in animals in which a systemic disease has led to the development of arrhythmia clinical signs often reflect the disease.

The key diagnostic tool or, better put, diagnostic "gold standard" for identification and differentiation of cardiac arrhythmias is the ECG. In those animals with suspected underlying cardiac disease, in addition to the ECF, routine diagnostic work-up includes also echocardiography, and thoracic radiography. As in any other emergency patient baseline laboratory testing should be performed. In older cats thyroid testing is recommended and should also be done in dogs under thyroid supplementation therapy.

Additional (specialized) testing is appropriate based on suspected underlying diseases. Treatment of cardiac arrhythmias includes medical management, radioablation and pacemaker therapy. Generally speaking, in majority of tachyarrhythmias medical management with the use of antiarrhythmic drugs is indicated; bradyarrhythmias are rarely managed medically – therapy of choice is permanent pacemaker implantation.

Critically ill patient with a brain tumor

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With advanced imaging (i.e. computed tomography, magnetic resonance imaging) becoming widely available to veterinary practices, brain tumors are being commonly diagnosed as a cause of clinical neurological signs in dogs and cats. Symptomatic management, surgical excision via craniotomy and external beam radiation therapy are currently the most common treatments for intracranial neoplasia in veterinary medicine.

The main goals of the initial stabilization in a critically ill patient with a brain tumor are to normalize intracranial pressure (ICP) and stop life-threatening seizures. Brain tumor together with tumor-associated cerebral edema can lead to intracranial hypertension, decreased cerebral blood flow and, potentially, brain herniation and death. Hyperosmotic agents (i.e. mannitol, hypertonic saline) with their rheologic and osmotic effects will lower intracranial pressure and increase cerebral perfusion pressure, and cerebral blood flow. Head elevation to 30° facilitates the venous blood drainage and helps decrease ICP. Corticosteroid effect on the peritumoral edema has been well documented and steroids (e.g. dexamethasone) are widely used in the management of brain tumors with surrounding edema.

Seizures are common and potentially devastating complication of brain masses. Cluster seizures and status epilepticus must be aggressively treated with an appropriate anticonvulsant therapy to prevent systemic complications of uncontrolled seizures. Various intravenous drugs (e.g. diazepam, midazolam, phenobarbital, levetiracetam, propofol) can be used alone or in combination in repeated boluses or as a constant rate infusion.

To enable appropriate blood perfusion and nutrition of the brain normotension, normocapnia, adequate blood oxygenation, euvolemia, normolactatemia and euglycemia must be maintained. In critically ill neurological patient with inappropriate breathing pattern and inadequate ventilation and/or oxygenation, severely compromised mentation or increased risk for aspiration pneumonia controlled positive pressure ventilation may be necessary.

Dogs with palliatively treated primary brain tumors, particularly those with infratentorial tumors (i.e. tumors in the cerebellum, pons, or medulla), have a poor prognosis, while those with supratentorial tumors have reported survival times of more than 3 months. Compared to palliative therapy alone, substantially better survival times have been reported when brain tumors were treated with radiotherapy and surgery, with little difference between survival after surgery versus radiotherapy. Furthermore, radiotherapy used in the early phase of the treatment can help with the stabilization of

neurological signs. In conclusion, whenever feasible, surgical treatment or/and radiation therapy should be pursued after successful medical stabilization of a critically ill patient with a brain tumor.

Colic surgery: pre-operative, intra-operative, and post-operative decision making

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Colic is a common emergency that continues to be associated with significant morbidity and mortality of horses. While rapid identification and intervention is lifesaving in horses with surgical lesions, colic surgery carries financial and emotional costs as well as risks. There are a number of decisions that must be made when treating horses with colic from is surgery required to how to manage incisional infections postoperatively. A case study will be used to highlight some of the factors that can be used to make the difficult decisions surrounding colic surgery.

The key questions to answer when deciding whether to recommend surgical exploration are: where is the location of the lesion and what is the underlying mechanism? Colic evaluation begins with consideration of signalment and history and continues with a basic colic exam including physical examination, examination per rectum, and nasogastric intubation. Further information can be gained by additional diagnostics including ultrasound, abdominocentesis, and bloodwork.

The key questions to answer during surgery are: what is the best surgical treatment for the lesion and what are the best techniques for minimizing post-operative complications? For both small and large intestinal strangulating lesions, the decision whether or not to resect and how to perform a resection remain controversial. A variety of risk factors for and methods to minimize the risk of adhesions, post-operative ileus, and incisional infections have been evaluated.

The key questions to answer during post-operative management are: how to minimize and manage post-operative complications and how/if to return the horse to their previous diet and activity? Management of the common post-operative complications like post-operative ileus, adhesions, incisional infection, and recurrent colic remain challenging. In horses that recover from colic surgery, prognosis for return to previous level of activity has been shown to be good. However, there is little information on the best rehabilitation program.

Oxidative stress in endurance horses

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Endurance riding is the most demanding equine discipline since horses compete over distances of 80–160 km in a day. In the last decade, the popularity of this discipline has raised significantly not just among riders but also among researchers. An endurance ride is divided into several phases of 20 to 40 km each followed by a mandatory resting period. Before the ride, as well as after each phase, horses have to pass a veterinary examination. Veterinarians can eliminate the horse at any stage of the ride if their metabolic status or orthopaedic condition are found inadequate to enable them to continue the ride. Orthopaedic injuries occur frequently during races, in particular in exhausted horses. Despite rigorous veterinary controls every year, there are about ten cases of equine fatalities associated with endurance rides, therefore a lot of efforts is put in research in order to better understand the influence of the race on the horse body.

Endurance riding is characterized as a prolonged submaximal aerobic exercise with an increased consumption of oxygen providing energy for homeostasis. Most of the oxygen is reduced and forms carbon dioxide, however, a 1 to 2% of the oxygen forms reactive oxygen species (ROS). Antioxidants prevent oxidant damage by scavenging of ROS, increasing the conversion of less reactive ROS, and facilitating repair of the caused damage. Oxidative stress reflects an imbalance between the systemic manifestation of ROS and a biological system's anti-oxidative response and can be assessed by measuring different biomarkers. When pro oxidants overcome antioxidative defence, oxidative stress negatively affects health and performance of horses. Oxidative stress causes immediate and/or cumulative deleterious effects contributing to several equine diseases like osteochondrosis disecans, exertional rhabdomyolysis, exercise-induced pulmonary haemorrhage, and degenerative motor neuron disease.

Endurance race induces increased values of selected oxidative stress biomarkers in horses indicating an enhanced oxidative damage. Concurrently, endurance exercise causes an increase in antioxidants as a response to an increased amount of ROS. Interestingly, an increase in both prooxidants and antioxidants is evident also during shorter, qualification races where younger and less experienced horses are competing. Since the antioxidant response is more pronounced in relation to endurance races, antioxidant supplementation in sport horses could be beneficial. However, oxidative stress biomarkers are still not completely understood and there are possible physiologic variations that can be influenced by unknown determinates. Besides, in order to better understand the influence of oxidative stress on injuries in endurance horses further

studies are needed. Considering the growing interest in this equine discipline it is even more important to ensure the best possible understanding of the race influence on horse's body and consequently minimize the negative effects.