

## *The 40<sup>th</sup> Symposium of Veterinary Medicine: Animal Welfare*

*Koret School of Veterinary Medicine,  
The Hebrew University of Jerusalem, Israel*

### *In Memory of Dr. Gila Zur*

*Our dear friend and colleague, Dr. Gila Zur, who was a board-certified Diplomate of the European College of Veterinary Dermatology, and the head dermatologist of the Koret School of Veterinary Medicine.*

*Dr. Zur inspired us all with her determination, strength, and love for all creatures.*

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## INVITED LECTURES

### Pain: The Neglected Adverse Event of Medical and Surgical Treatment

**Robertson, S.A.**

Senior medical director at Lap of Love, Florida, USA

In the world of healthcare, both human and veterinary, an adverse event (AE) can be defined as “a negative or bad outcome resulting from a diagnostic test, medical treatment or surgical intervention”. Most procedures performed on humans and animals cannot be achieved without causing tissue and nerve damage which will result in nociceptive, inflammatory and neuropathic pain. However, pain is rarely mentioned as an AE; for example, in a recent review of negative surgical outcomes in humans the most frequent problem listed was “hospital acquired infection”. In addition to patient suffering, pain has serious and widespread negative effects including but not limited to delayed return to normal activity, catabolic states, altered cardiovascular function and ileus.

We have the tools and knowledge to minimize and in some cases prevent pain but when post-operative pain is routinely assessed using validated pain scales we know they are not always effective. Are we failing to admit pain is an adverse event because it has been thought of as an unavoidable consequence of surgery for so long? Are we overlooking post-operative pain because we are not measuring or assessing it accurately and listing it as a “vital sign”? Is perioperative pain management being left entirely up to anesthesiologists, when in fact it needs a team approach, which includes surgeons and nursing staff? Exploring these questions and coming up with solutions will allow us to improve the care our patients deserve.

## How Do We Know They Hurt? Assessing Acute Pain in Cats

**Robertson, S.A.**

Senior medical director at Lap of Love, Florida, USA

Lord Kelvin stated that “if we cannot measure it we cannot improve it”. This quote applies very well to assessing pain in animals. Very young and cognitively impaired humans and animals cannot self-report how they feel. As animal care-givers, we are their proxy and advocates which means we decide how painful they are. If we get this wrong, many of our patients will suffer. This lecture will describe some of the objective measure of nociception and pain which are used in a laboratory setting. One technique is thermal threshold testing, a long-standing method for screening putative analgesics in rodents and how this was adapted for use in cats. Using this model information on several opioids provided doses, dosing intervals and optimal routes of administration that could be tested in cats in clinical settings. However, pain is a complex multidimensional experience with both sensory and emotional components and in a clinical setting must be measure by observing and analyzing behavior. The development of a validated composite measures pain scale for cats, which includes observation and interaction with the cat, and analysis of facial expressions will be discussed.

## Pain and Animal Welfare: Evidence and Methods for Alleviating Pain

**Shilo-Benjamini, Y.**

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As pain is a valuable physiological tool, which is essential for survival in all species, why do we need to “prove” that animals feel pain? Why isn't that obvious? The five freedoms for animal welfare include the freedom from pain, however, many animals experience pain while undergoing “essential” husbandry procedures, such as castration, dehorning, and tail docking. Many surgical husbandry procedures used on farm animals involve innervated tissues and are traditionally performed without anesthesia or analgesia. Reports and reviews on this subject concluded that these procedures induce physiological (increased cortisol concentrations, mean arterial blood pressure, heart and respiratory rates) and behavioral reactions (increased vocalization during the procedure, and reduced nursing, walking and lying down) indicative of pain. There are several approaches suggested to address welfare of painful procedures; I will describe the approach of providing the best analgesia management. Multimodal analgesia refers to the combination of several analgesic agents with different mechanisms of action. Therefore, in an ideal setting, we should use sedation to decrease animal's stress, and combine opioids, non-steroidal anti-inflammatory drugs (NSAIDs), and local anesthesia. NSAIDs were reported to decrease the stress response, and reduce behavioral changes in piglets, lambs, and calves undergoing various surgical procedures. Local anesthetics reversibly block nerve conduction, and therefore provide excellent analgesia. Local anesthesia decreased cortisol levels, and reduced vocalization during painful procedures. Even if animals are under general anesthesia, addition of local anesthesia decreases pain transmission, decreases the dose of general anesthetics and their side effects. The combination of local anesthesia with NSAID administration achieved the best pain reduction in comparison to each of these techniques by itself.

# Pain Recognition in Equine Patients: Focus on Colic

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Pain is a welfare issue as being free of pain is one of the five freedoms. Equine colic, a life-threatening disorder involving abdominal pain, is assessed intuitively. Since case management requires accurate assessment, a pain scale was needed. The Equine Adult Abdominal Pain Scale (EAAPS), a simple descriptive scale (SDS), based entirely on behaviors, was developed scientifically. Construction included; listing colic behaviors, choosing common behaviors that observers agree upon seeing, and assigning each behavior a score. Scientific validation tests reliability and validity. Reliability means the reproducibility of the results and validity means it measures what it is intended to measure. Construction involved two approaches; mathematical and judgemental. Mathematical: equine experts viewed films of horses exhibiting signs of colic, identified the behaviors seen and intuitively scored the severity of pain demonstrated. Judgemental: a panel of equine experts chose the most appropriate behaviors by an anonymous, reiterative, Delphi technique. Ten behaviors chosen were each assigned a score. The EAAPS was more reliable than intuition, and equally valid. In comparison to another SDS (Mair & Smith), the EAAPS had superior reliability and comparable validity. The Mair & Smith scale was better endorsed by experts, but was not more reliable than intuition. The EAAPS demonstrated feasibility (quick and easy-to-use). However, more behaviors indicate more pain, although the duration a behavior occurs, could indicate more pain (e.g. rolling) or less pain (e.g. sternal recumbency). In conclusion, scientific methodology is important in construction of a pain scale. EAAPS is a valid, rapid, feasible test to use.

## ABSTRACTS: ANIMAL WELFARE

## The Sickness Response at and Before Clinical Diagnosis of Spontaneous Bovine Respiratory Disease

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Bovine respiratory disease (BRD) is diagnosed from anorexia, fever, and other signs, but with poor accuracy. These and other sickness responses such as lower grooming need further characterization in early, spontaneous BRD especially during feedlot acclimation. We studied the BRD sickness response around diagnosis and acclimation effects, hypothesizing that sick heifers would have fever, anorexia and low grooming versus controls, and with feeding and brush-use increasing over time. Heifers were randomized to replicate and pen, balanced for body weight and monitored for 12 d, starting 2 d post-shipment. Loggers measured fever, while feeding and brush-use were video-recorded. Clinical examinations occurred daily: Controls (n=46) *remained healthy over all 12 d; those meeting set criteria* were BRD (n=21). Health effects were analyzed at diagnosis and 2 days before using analogous days for Controls. Acclimation effects were tested separately using all available behavioral data. BRD had a fever on d 0 and -2 ( $P<0.01$ ) but not on d -1 ( $P=0.10$ ). After excluding 4 outliers (all Controls; never observed at feedbunk), BRD had lower feeding time on d 0 ( $P=0.04$ ), but not on d-1 or -2 ( $P\geq 0.32$ ); or at all when outliers were included ( $P\geq 0.32$ ). BRD had no effect on brush-use ( $P=0.22$ ). While feeding was stable over time ( $P=0.28$ ), the outlier effect suggests that acclimation may hinder anorexia-based diagnosis. Brush use was higher on later versus earlier days ( $P<0.01$ ), indicating an acclimation effect. Fever and anorexia may be useful in BRD diagnosis, but acclimation effects should be considered when monitoring behavior for sickness detection.

## Establishment of Welfare Parameters for Audits in Dairy Farms

Weyl-Feinstein, S., Waiss-Bakal, M., Kahana, A., Baz'erano, N., Zamir, L., Glikman, G., Shmueli, A. and Ben-Dov, D.

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The subject of animal welfare is receiving growing attention in the field of farm animals. In addition to our moral obligation to food-animals, farmers are becoming aware to the correlation between good welfare and health and productivity. As a part of the Veterinary Services supervision in all animal premises, routine official audits have been implemented in dairy farms by the official animal welfare referees in the different districts. The aim of the audits is to verify that the minimal animal standards concerning cattle holding and rearing are being kept as demanded by the Animal Welfare Regulations (Protection of Animals) (Holding Calves) (Draft 2017). Nevertheless, the audits serve as a good opportunity for guidance of ongoing improvement of welfare.

These controls allow as establishing a national cattle welfare database. The Israeli dairy farms vary in size, husbandry, man-power and work methods. In order to conduct audits uniformly, general welfare standards were decided, based on international welfare protocols. These parameters were adapted to the Israeli farms based on professional knowledge “Shaham”, the milk board and the “Hachaklait”. During the audits animal based and non-animal based parameters, are being inspected. All relevant data are collected, and saved in designated inspection software of the Veterinary Services. Rejections and recommendations are being discussed with the farmers and the attending veterinarian. A special attention is given to shortcomings that are violations of the soon to be published regulations, and each problem is given a different considerable timeframe for corrections. Eventually, we estimate that the strength of the Israeli milk industry is in its ability to thrive following constructive criticism and on-going learning and updating.

## Can Neutering Improve Free-Roaming Cat Health and Welfare?

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‘Capture-Neutering by gonadectomy-Return’ (TNR) is currently the most common method for controlling free roaming cat (FRC) populations. However, data regarding its impact on cat welfare is limited. In order to determine the demographical risk factors for FRC morbidity, we followed FRC populations in the city of Rishon-Lezion during 2012-2014. FRC age status (kitten/adult), neutering status (neutered/intact), gender, body-conditioning-score (BCS 1-5/5), skin lesions, and external signs of disabilities and injuries were recorded and analyzed. Overall, 4615 cat-observations were recorded, of which 15% were kittens, 53.5% neutered adults and 50.3% females. In comparison to intact adults, kittens had higher prevalence of emaciation (BCS 1/5) and severe disability or injury. Among adult cats, neutered cats had higher prevalence of obesity (BCS 5/5), lower prevalence of skin lesions and severe disabilities or injuries, but higher prevalence of permanent disabilities. Higher ratio of neutered FRC in the geographical surroundings was correlated with reduced prevalence of emaciated and thin adult cats (BCS 1-2/5). The results imply that neutering has favorable influence on cat health; this effect potentially can occur directly on the neutered cats themselves, as well as indirectly, on intact cats. Probably by reduced competition of the neutered cats toward other cats, and by reducing number of kittens, which are more prone to health problems. Higher prevalence of permanent disabilities of the neutered FRCs might be due to the previously finding of elongated life expectancy of neutered cats in comparison to intact cats.

# Towards Automatic Support for Diagnosing and Treating Canine Behavioral Problems Affecting Dog's Welfare

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We describe our ongoing study, which aims to develop a video-based approach for automatic analysis and management of canine behavioral problems, such as anxiety, fear, lack of self-control or inhibition. The developed system uses state-of-the-art image processing techniques to extract movement-related data from a video recording of a dog moving freely in a room and interacting with people and objects. The system extracts from video footage spatio-temporal parameters such as percentage of motion (M-score), average speed, average distance from owner/stranger/toy, etc.

Preliminary evaluation results were obtained by analyzing data from 12 sessions of dogs recorded during sessions in two behavioral veterinary clinics. A Pearson product-moment correlation coefficient was computed to assess the relationship between the motion-based parameters detected by the system and scores provided by a veterinarian using the EDED scale (Evaluation of Dog's Emotional disorders) and AAAS scale (Evaluation of Attachment/ Anxiety/ Aggressiveness / Self Control). A negative correlation was found between the variable of M-score and the variable of AAAS Aggressiveness ( $r=-0.4067$ ,  $p=0.19035$ ), and a positive correlation between the variable of M-score and the variables AAAS Anxiety/Fear scores ( $r=0.4582$ ,  $p=0.134124$ ) and AAAS Attachment scores ( $r=0.4822$ ,  $p=0.11238$ ). While these correlations are not statistically significant at this point, this is due to the low initial  $n$  of 12, which will be increased in ongoing work. Nonetheless, the correlations found so far hint towards the potential of the approach for supporting the diagnosis and treatment of behavioral problems in which movement plays an important role (lack of self-control, anxiety, fear, inhibition, etc).

## ABSTRACTS: OTHER TOPICS

## Changes in D-Dimer Concentration in Dogs Following Soft Tissue and Orthopedic Surgery

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Surgical procedures may lead to activation of the coagulation cascade and clot formation, complicating the interpretation of increases in D-Dimer concentration in post-operative animals. The objective of this study was to examine D-dimer concentrations prior to, and following different surgical procedures in dogs. Dogs presented for elective neutering, elective orthopedic and post-traumatic orthopedic surgeries were enrolled. D-dimer concentrations, measured immediately prior to, immediately after, and 24 hours after surgery (T0, T1 and T24, respectively), were compared within and among study groups. The study included 45 dogs, 15 in each group. D-dimer was >250 ng/mL in eight dogs (18%) at T0, in nine (20%) at T1 and in five (11%) at T24. At T1 and T24, only 2 dogs had a D dimer concentration >500 ng/mL and it was <750 ng/mL in all dogs. There was no difference in the proportion of increased D-dimer concentration (>250 ng/mL) among the time points ( $P = 0.29$ ). There were no differences in median D-dimer concentration among the different time points, excluding the neutering group ( $P = 0.029$ ), in which post-hoc tests showed that it was higher at T1 vs. T0, and lower at T24 compared to T1, although both differences were insignificant ( $P = 0.065$  and  $P = 0.306$ , respectively). The results of this study suggest that surgery per se is unlikely to cause increased D-dimer concentration, regardless of its type; therefore, any post-operative increase in D-dimer concentration should be regarded as clinically significant and suspicious for thromboembolism.

## *Spirocerca lupi* Induced Oesophageal Neoplasia: Predictors of Surgical Outcome

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Canine spirocercosis is caused by the nematode *Spirocerca lupi*. Migration results in oesophageal fibro-inflammatory nodules that may undergo neoplastic transformation. No studies have assessed pre- or post-surgical prognostic indicators in dogs that undergo intervention. This study aimed to assess the outcome of dogs with *S. lupi*-induced sarcoma undergoing endoscopic-guided ablation ( $n=12$ ) or surgery ( $n=18$ ), and identify prognostic indicators. Evaluated variables included age, body weight, gender, presenting complaints, duration of clinical signs, results of complete blood count and serum chemistry, esophageal mass size, histopathological mitotic index, hospitalization time and chemotherapy administration. Kaplan-Meier survival curve showed no difference in survival between ablation and surgery {(median: 73.5 days (range: 0-1511)

vs. 108 days (0-1550), respectively ( $p=0.982$ }). When long-term survival was evaluated, the surgical survival has become borderline significantly longer {79 days (45-1550) vs. 250 days (80-1511), respectively,  $p=0.082$ }. Reduced survival was documented in dogs presenting weight loss ( $p=0.027$ ), hypochromasia ( $p=0.023$ ) or leukocytosis ( $p=0.017$ ). In the long-term survival group, hematocrit  $<36\%$  and leukocytosis  $>15.0 \times 10^9/L$  were associated with reduced survival ( $p=0.016$ ,  $p=0.021$  respectively). The hospitalization time of dogs undergoing ablation (median: 0 days, range: 0-4) was significantly shorter than dogs undergoing surgery (9 days, 1-21) ( $p<0.001$ ). In this study, surgery had no clear benefit. Thus, when ablation is technically possible it should be considered advantageous, as the resultant hospitalization time is significantly shorter. Weight loss, hypochromasia and leukocytosis at presentation were identified as long-term prognostic indicators. Chemotherapy post-intervention requires further investigation.

## Acute Organophosphates and Carbamates Intoxication in 102 Dogs – A Retrospective Study

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Organophosphates (OP) and carbamates are commonly used insecticides and are important intoxication sources of humans and animals. This retrospective study describes clinical and laboratory findings, treatment, and outcome of OP and carbamate toxicoses in 102 dogs. The medical records of dogs presented to the emergency department were reviewed retrospectively. Dogs were included in the study if acute OP or carbamate poisoning were definitely diagnosed based on compatible history and clinical signs, and at least one of the following: decreased serum BuChE activity, positive toxicological analysis of stomach content and solid evidence of exposure to a toxin. The presenting clinical signs most commonly included shivers, salivation, weakness, vomiting and diarrhea reported by owners, and tremors, salivation, myosis, weakness, diarrhea and tachypnea, exhibited at presentation to the clinic. Among the clinical signs, salivation, tremors, and tachypnea were significantly associated with survival ( $P < 0.05$ ), while weakness, apathy, anorexia, pale mucus membrane and paddling were significantly associated with worse outcome ( $P < 0.05$ ). Intoxicated dogs had lower cholinesterase, hypomagnesemia, hypochloremia, hyperbilirubinemia, elevated creatinine, alanine transaminase, aspartate aminotransferase, and creatine kinase, and activated partial thromboplastin time prolongation. Common treatments of intoxicated dogs included: diphenhydramine (80.2%), atropin sulphate (66.3%), antibiotics (65.3%), diazepam (53.5%), 2-PAM (51.5%). A few of the patients needed general anesthesia induced by propofol (42.6%) and isofluran (35.6%) and in some, ventilation was needed (19.2%). Dogs treated with gastric lavage (33%) or activated charcoal (33.7%) survived significantly more than dogs not treated by these measures, while mechanical ventilation was significantly associated with worse outcome.

# Urinary Heat Shock Protein-72: A Novel Marker for Acute Kidney Injury in Dogs

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Acute kidney injury (AKI) in cats is associated with high mortality, which is partially attributed to late recognition of the disease using the currently available markers. Early diagnosis allows timely therapeutic intervention, thereby potentially improving the outcome. Urinary heat shock protein-72 to urinary creatinine ratio (uHSP72/uCr) is a sensitive, specific AKI marker in dogs, and a prognostic measure. This study aimed to evaluate uHSP72/uCr as a diagnostic and prognostic marker of AKI in cats. Sixty-eight cats were enrolled and categorized into six groups: healthy controls ( $n=10$ ), urethral obstruction (UO;  $n=7$ ), chronic kidney disease (CKD;  $n=14$ ), AKI ( $n=16$ ), acute decompensating CKD (ACKD;  $n=15$ ) and cats at risk for developing AKI ( $n=6$ ). Medians uHSP72/uCr of healthy, UO, CKD, AKI, ACKD and cats at risk groups were 0.04pg/mg (range 0.03-0.11), 0.2pg/mg (range 0.06-1.19), 0.47pg/mg (range 0.16-2.22), 0.32pg/mg (range 0.04-1.09), 0.7pg/mg (range 0.28-2.1) and 0.69pg/mg (range 0.17-2.44), respectively, and were significantly ( $P<0.001$ ) different among groups. There were significant differences between the AKI and control groups, and between cats at risk for AKI and control groups ( $P=0.001$  and  $P<0.001$ , respectively). Receiver operator characteristic (ROC) analysis of uHSP72/uCr including the AKI and control groups showed an area under the curve of 0.93 (95% confidence interval 0.84-1.0). A cutoff point of 0.05pg/mg corresponded to sensitivity and specificity of 94% and 70%, respectively. In conclusion, uHSP72/uCr is a promising novel biomarker for early diagnosis of AKI in cats, warranting further evaluation.

# Artificial Feeding and Successful Reproduction *in vitro* of *Ornithodoros tholozani*

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The tick *Ornithodoros tholozani* is the natural vector of *Borrelia persica*, which is the causative agent of tick-borne relapsing fever (TBRF) in humans in Eurasia. *Borrelia persica* infection has been described in cats and dogs from Israel, with clinical findings that included lethargy, anorexia, anemia and thrombocytopenia. The dynamics of infection of *B. persica* was studied in laboratory rodents; however little current research has been published on its tick vector. An artificial rearing system was developed in order to obtain a *Borrelia*-free colony of *O. tholozani* for additional studies. We were successful in feeding adult and nymphal stages with heparinized bovine blood through Parafilm<sup>®</sup> sealing material and adding dog hair extract as stimuli. Larvae were fed directly without using a membrane. The tick breeding was carried out at 25° C and 80% relative humidity. The life cycle of the tick was completed in 317 days and the average eggs per female tick of the first generation was 57 with a hatch rate of 50%. In addition, the average eggs per female tick of the second generation was 164 with a hatch rate of 88%. The average engorgement rate for all the stages was 82% and the average molting rate was 47%. The creation of a standardized artificial breeding system will allow us to obtain an age-synchronized colony of ticks without feeding on live hosts. To our best knowledge, this is the first description of artificial membrane-feeding and completion of the life cycle of *O. tholozani*.

## An Unknown Lethal Disease in *Pipistrellus kuhlii* Bats in Captivity

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Kuhl's pipistrelle (*Pipistrellus kuhlii*) is a species of vesper bat that inhabits large areas of North Africa, Southern Europe, and Western Asia, and is probably the most common insectivore bat in Israel. During the past three years, among a colony of 70 *Pipistrellus kuhlii* bats held in captivity, we have observed in a lethal disease with distinct clinical characteristics. The disease was common (affecting 20 [29%] bats) and invariably resulted in death within a couple of months. In all cases, the first manifestations were uni- or bilateral blepharophimosis with yellow thick discharge and corneal opacity, followed by rostral mazal swelling in 7 bats (35%), upper respiratory signs (25%), loss of appetite (50%), and skin rash (5%). In most cases, viral, bacterial (aerobic and anaerobic), protozoal and fungal pathogens were not identified at repeated testing, but in two cases, *Pseudomonas aeruginosa* was isolated from direct smears from organs (liver, heart, kidneys, eyes, intestine) on MacConkey blood agar plates, in one case together with *Proteus*. We verified optimal abiotic conditions and isolated every new case. At diagnosis, we immediately started local (gentamicin eye drops) and systemic treatment (oral ciprofloxacin or trimethoprim-sulphamethoxazole for 7 days) and modified treatment if culture and sensitivity results were available. 10 of the 20 affected bats (50%) progressed despite this treatment and subsequently died. The other 10 bats initially recovered, but subsequently also died within 12 weeks, with only half ( $n=5$ ) showing clinical signs of disease recurrence. 10 bats (14%) died or were euthanized for other reasons, and the remaining 40 bats (57%) were released back to nature. In conclusion, we describe an invariably lethal disease of unknown pathogenesis with characteristic clinical manifestations in *Pipistrellus kuhlii* bats held in captivity.