

The 42nd Symposium of Veterinary Medicine: Animal Welfare

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

In memory of Prof. Kalman Perk

Prof. Perk was the person that established the tradition of the Veterinary Symposium in Israel and was one of the founders of Koret School of Veterinary Medicine at The Hebrew University of Jerusalem.

The Symposium was kindly sponsored by Lynne and Phil Himmelstein, USA

INVITED LECTURES

The Role of Environmental Enrichment in Animal Welfare

Velarde, A.

Animal Welfare Program, Institute for Food and Agricultural Research and Technology (IRTA), Barcelona, Spain

Domestic animals under close confinement conditions frequently display abnormal behaviour, particularly if they are unable to escape from, or adapt to this situation. Environmental enrichment has been defined as the improvement in the biological functioning of captive animals resulting from modifications to their environment. Enriched environments aim to improve the welfare of animals by allowing them to perform more of their species-specific behaviour. They serve different functions such as rootable substrates or sensory and therefore have different effects on welfare.

With the increased interest in domestic farm animal welfare from both the political and societal agendas, environmental enrichment is becoming an interesting solution, offering an alternative not only to optimize the welfare of the animals but to improve the animals' performance. Cross-suckling among calves, generated by early weaning and the lack of satisfaction to a high motivation to suckle, can be alleviated with the use of artificial teats with low flow of milk, or the use of nursing cows. Another approach is to facilitate playing, through space availability, pen-mate familiarity and bedding substrates, which give the calves positive emotion activities during the extra time derived from a fast ingestion. Pigs in many intensive husbandry systems are often not provided with the proper foraging materials which can lead to stress, because they normally spend most of their active time rooting if given the possibility. Enrichment materials, such as straw or other suitable materials satisfy the behavioural needs of both rooting and nesting, and prevent tail biting.

Animal Welfare Assessment

Velarde, A.

Animal Welfare Program, Institute for Food and Agricultural Research and Technology (IRTA), Barcelona, Spain

Welfare comprises physical and mental health and includes aspects such as absence of thirst, hunger, discomfort, disease, pain, injuries, stress and the expression of normal behaviour, referred to as the Five Freedoms. A standardized method, scientifically sound and feasible to assess animal welfare is the Welfare Quality protocol. The awareness that welfare is multidimensional and that its overall assessment requires a multicriteria evaluation resulted in a decision to base the Welfare Quality assessment system on four principles of animal welfare: good housing, good feeding, good health and appropriate behaviour. Each of these four principles comprises several criteria, with an overall total of 12 criteria, which provide a very useful framework for understanding the components of animal welfare. Since welfare is a condition of the individual animal, wherever possible, the Welfare Quality[®] assessment system places its emphasis on animal-based measures (also called “outcome” measures) rather than on resources and management in an attempt to estimate the actual welfare state of the animals. Such physiological, health and behavioural measures have inherent advantages over input measures. The first advantage is clearly that, since welfare is a condition of the animal, outcomes measures are likely to be the most direct reflection of their actual welfare state. They permit evaluation of welfare by directly observing the animal, regardless of how and where it is kept. Second, as they are applicable to all farming conditions, animal-based measures allow the welfare of animals from different farms to be compared, and remain more transparent to stakeholders.

ABSTRACTS

Personalized Positive-Welfare: Using a Machine-Learning Based Computational Approach

Shen, L.,¹ Eden-Tsalik, D.,¹ Gunther, I.,² Honig, H.,³ Salzer, Y.,⁴ Klement, E.,² Rozenboim, I.¹ and Forkosh, O.¹

¹Department of Animal Sciences, The Hebrew University of Jerusalem, Rehovot, Israel

²Koret School of Veterinary Medicine, The Hebrew University of Jerusalem, Rehovot, Israel

³Institute of Animal Sciences, Agricultural Research Organization, Bet-Dagan, Israel

⁴Institute of Agricultural Engineering, Agricultural Research Organization, Bet-Dagan, Israel

One aspect of animal welfare that is often overlooked is that even seemingly similar individuals have consistent differences in their behavior. These differences often referred to as personality traits, not only require us to examine the behavior of each individual differently but also affects each animal’s specific needs. Here, we use the automatic tracking of a multitude of complex behaviors to infer personal welfare. With this aim, we are developing various automatic tracking approaches – from depth camera for inferring the location and body-posture of cows, chickens, and mice, to beacons for tracking large populations of feral cats over many months. These measurements allow us to quantify various complex behaviors such as agonistic and prosocial interactions, feeding, and exploration, which reveal the unique behavioral patterns of each animal. In our initial work, we

have found that even white lab mice display the same triadic behavioral strategies as those found in mice in nature. We show that very similar behavioral archetypes appear in other animals as well, which might indicate that they represent a basic design principle underlying behavior. We further show that these archetypes are also closely related to gene expression in the brain and are stable across development. We plan to use these patterns to both detect any deviations in the behavior of each animal that may indicate welfare issues, as well as to predict its specific needs. This approach will allow us to continuously and objectively track positive-welfare without requiring any human observer.

Sheltering by the Numbers: Creating a Common Language and Comparing Criteria Shelters in Israel-Preliminary Observation

Assif, T.

Rishon LeZion Veterinary Municipal Service, Israel

Actual numbers of animal shelters in Israel are unknown, according to the Ministry of Agriculture database there are 43 municipal shelters and an unknown number of welfare organizations shelters. Shelter populations, intake and outcome rates are not reported on regular basis and sometimes may not be known to the shelters, authorities or the public. In attempt to create common criteria for shelter monitoring three parameters were compared in four different shelters based on their data from 2018. The first shelter was medium sized located in a large city in central Israel with an intake of 780 cats and dogs. The second was a large shelter located in a large city with 1289 intakes. The third was small, located in a medium city with 482 intakes. Both shelters were in southern Israel. The fourth shelter was small and located in a rural area in northern Israel with 195 intakes. The dogs' live release rates were 87% for the first shelter, 86%, 88% and 77% for the second, third and fourth shelters. Dogs' euthanasia rates were 1.6% for the first, 2%, 1.9% and 28% for the second, third and fourth shelters. Which are 0.027, 0.036, 0.078 and 1.22 euthanasia procedures per 1000 citizens accordingly. Cats in all shelters had lower live release rates and higher euthanasia rates. Creating a unite form of report allows shelters to set goals and compare achievements with others. It also allows a better track of animal trafficking and a more efficient distribution of government budgets for shelters.

The Prevalence and Molecular Characterization of Multi-Drug Resistant *Staphylococcus pseudintermedius* in Israel

Elad, D.,¹ Blum, S.E.,¹ Perreten, V.,² Fleker, M.,¹ Avni, Z.³ and Weisbelith, L.¹

¹ Kimron Veterinary Institute, Bet Dagan, Israel

² Institute of Veterinary Bacteriology, Vetsuisse Faculty, University of Bern, Bern, Switzerland

³ Israeli Veterinary Services, Bet Dagan, Israel

Staphylococcus pseudintermedius is a part of the flora of the skin and its adnexa in dogs and cats but may cause dermatitis, otitis or urinary tract infections. Starting 2006, *S. pseudintermedius* resistant to 9 to 11 antibacterial drugs, out of 11 tested, by disc susceptibility, were isolated at the Kimron Veterinary Institute. Most were susceptible to florfenicol (but not chloramphenicol) alone and rarely to tetracyclines or sulfamethoxazole-trimethoprim. Since no interpretation breakpoint standards for the susceptibility testing of *S. pseudintermedius*

it can only be assumed by the large (21-28mm) inhibition zone diameter measured. The proportion of these strains increased to 32.7% of *S. pseudintermedius* isolates in 2012, decreased subsequently and fluctuated, starting 2014, at rates between 7.4% and 12.1%. Seven of 9 isolates were classified by MLST as belonging to sequence type (ST) 45, previously found only in Thailand. Fifteen puppies were sampled upon arriving from Thailand in the airport quarantine. Thirteen isolates from nine puppies were classified as ST45 (n=6), ST181 (n=4), ST281 (n=2) and ST282 (n=1). Forty-two Israeli clinical and environmental (veterinary hospital) were sequenced with 27 (64.3%) classified as ST45, 2 as ST282 and 1 as ST181. Minor genetic differences between the Thai isolates and those cultured from the puppies at the airport were found, probably resulting from variations within the sequence type. One genetic variant, out of 7 found in Thailand, was predominant (13/16) in Israel (11cj). These findings highlight the risks of importing animals. Moreover, the use of florfenicol in cats and dogs should be studied.

Characterization of *Theileria equi* in Different Equid Hosts

Tirosh-Levy, S.,¹ Gottlieb, Y.,¹ Arieli, O.,¹ Mazuz, M.L.,² King, R.,³ Horowitz, I.,⁴ and Steinman, A.¹

¹ Koret School of Veterinary Medicine, The Hebrew University of Jerusalem, Rehovot, Israel

² Division of Parasitology, Kimron Veterinary Institute, Bet Dagan, Israel

³ Israel Nature and Parks Authority, Jerusalem, Israel

⁴ Zoological Center Tel Aviv-Ramat Gan & Israeli Wildlife Hospital at the Zoological Center Tel Aviv-Ramat Gan, Israel

Theileria equi is an important tick-borne pathogen of equids, which causes equine piroplasmiasis (EP). It is endemic in most parts of the world, including Israel, and has clinical and economic consequences. This study was set to evaluate the presence of *T. equi* in different equine hosts in Israel. DNA was extracted from the blood of 268 horses (*Equus caballus*), 98 domestic donkeys (*Equus africanus asinus*), 9 Asiatic wild donkeys (*Equus hemionus*), 8 zebras (*Equus quagga*), 7 African wild donkeys (*Equus africanus*) and 5 mules, and infection with *T. equi* was determined using PCR and qPCR. *Theileria equi* genotype was characterized by amplification and sequencing of 1600-bp fragment of the 18S rRNA gene. *Theileria equi* was detected in 57% of the horses, 32% of the donkeys, 89% of Asiatic wild donkeys, 57% of African wild donkeys, 62% of zebras and none of the mules. Parasitemia was low in all of the positive samples. The sequences of the 18S rRNA gene from horses revealed prevalence of three genotypes (D, A and C). Sequences from domestic donkeys were all similar, and belonged to the *T. equi* genotype D, similar to the genotype from horses, while sequences from wild donkeys were unique and belonged to the *T. equi* genotype A. Verification of the *T. equi* genotype in zebras could not be concluded, suggesting major genetic variation. The role of donkeys and wild equids in the epidemiology of EP in Israel should be considered.

Use of the Superficial Gluteal Muscle for the Repair of Ventral Perineal Hernia in Dogs. A Cadaveric Study and Case Reports

Milgram, J. and Keinan, Y.

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

The variety of techniques used to repair ventral perineal hernias in dogs reflects the difficulty of the surgical repair. The aim of this study was to describe a technique for mobilization of the superficial gluteal muscles

(SGM), and to test their use for repairing ventral perineal hernia in canine cadavers. In addition, the technique was used in 3 clinical cases of ventral perineal hernia. Ten male dog cadavers, weighing 5 to 42 kg, and 3 clinical cases of ventral perineal hernia were used. Cadavers were positioned in right and left lateral recumbency, and the ipsilateral superficial gluteal muscle was approached laterally. Both SGM were freed from their origins and insertions, except for muscle fibers originating on the first tail vertebra and sacrotuberous ligament. The caudal gluteal arteries supplying the SGM were preserved. The perineum was approached with the cadavers in ventral recumbency. Muscle flaps were rotated into the perineum and the insertions were placed ventral to the anal sphincter muscle and sutured to one another. Length of insertion overlap was measured. The origins of the SGM on the sacrum could be cut without damage to the blood supply in all dogs. Flap overlap ventral to the anal sphincter ranged between 0 to 2.4 cm. Three dogs presenting with recurrence of ventral perineal hernia after previous surgical repair were revised using this technique. Dogs were positioned in ventral recumbency and their position was not changed during surgery. No recurrence was observed in any of the cases 6 months after repair.

Two Novel Techniques for the Advancement of the Preputium of the Dog

Atamna, R., Gan El, M. and Milgram, J.

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

Severe cases of paraphimosis can't be surgically solved using standard advancement of the prepuce, partial penile amputation is indicated as a salvage procedure in these cases. This study describes and tests 2 novel methods of preputial advancement. Ten male cadavers were placed in dorsal recumbency, a urinary catheter with a millimeter scale attached to it was secured in the urethra with a suture, and a phallopexy was performed caudal to the os penis and lateral to the retractor penis muscle. The standard technique was performed by freeing the cranial, lateral and dorsal aspects of the prepuce. Then 2 modifications of the technique were tested by extending caudally the skin incision to meet on the midline at the caudal aspect of the bulb of the penis, and by undermining the skin of the penis in a caudal to cranial direction after cutting the tunica albuginea, along its entire circumference. Tightening of 3 preplaced sutures, between the prepuce and the lineal alba cranial to the prepuce, caused the prepuce to advance cranially relative to the penis. The advancement of the prepuce was tested, by sequentially tightening each of the sutures, after performing each technique. There was a significant increase in the cranial advancement of the prepuce for each of the novel procedures ($P=0.001$, $P=0.002$) when compared to the standard procedure. The significant increase in cranial advancement was found for each suture tested. The novel procedures were more effective in advancing the prepuce than the standard technique.

Is it Necessary to Wait Several Minutes between Different Topical Ophthalmic Drugs? A Prospective Study to Examine the Application of Two Types of Eye Drops at Different Time Intervals

Arad, D., Dekel, R., Ross, M. and Ofri, R.

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

When treating eyes topically with multiple drugs, it is common practice to wait several minutes between applications of different ophthalmic solutions. We tested this axiom in eight healthy, ophthalmologically normal Labrador and Golden retriever dogs. The effect of tropicamide on pupillary diameter (PD) was measured over 4 hours when administered alone (baseline), then 1 and 5 minutes prior to, and following, application of saline. The same study design was repeated to study the effect of latanoprost on intraocular pressure (IOP). Data were analyzed using repeated measures ANOVA and Tukey post-hoc test. At all timepoints in the tropicamide trial, there were no significant differences in PD between baseline readings to those obtained when the drug was administered 1 or 5 minutes prior to, or following, application of saline ($P>0.05$). In all five sessions, maximal PD was reached 30 min after tropicamide application, and maintained 180 minutes ($P<0.05$). In the latanoprost trial, there were significant differences in just 12/90 multiple comparisons between the five sessions, and in no case was the drug's hypotensive (baseline) effect attenuated by addition of a saline drop. At 240 minutes post latanoprost application, when IOP reached its trough, there were no significant differences between the five sessions ($P>0.05$). Our results suggest that a waiting period of one minute between applications of different ophthalmic solutions may be sufficient for maximal drug effect. Care should be taken when extrapolating these results to other species, different ophthalmic formulations such as oil, or to drugs that may have a synergistic effect.

Identification of Prognostic Factors and Survival Rate of Cats with Acute on Chronic Kidney Disease: A Retrospective Study

Dunaevich, A., Chen, H., Apfelbaum, N. and Segev G.

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

Chronic kidney disease (CKD) is the most common disease of the urinary system in cats, with increasing prevalence in recent years. CKD is a major risk factor for developing acute kidney injury (AKI), however, the prognosis and risk factors for death have not been described for acute on chronic kidney disease. This retrospective study included 102 client owned cats admitted and hospitalized at the Koret School of Veterinary Medicine Teaching Hospital with acute on chronic kidney disease. Eighty percent were mixed breed, 57 were males and 45 females. Median age was 11 years (range, 2-20 years). The survival rate was 60%. Non-survivors had lower temperature at admission compared with survivors (36.5°C vs. 37.4°C , $P=0.003$), lower respiratory rate (20 bpm vs. 28 bpm, $P=0.007$), higher creatinine, urea, and phosphorous concentrations (8.5 mg/dL vs. 7.0 mg/dL, $P=0.01$; 343 mg/dL vs. 258 mg/dL, $P=0.003$, and 15.4 mg/dL vs. 9.6 mg/dL, $P=0.002$, respectively) and higher degree of metabolic acidosis (pH, 7.11 vs. 7.21, $P=0.002$; bicarbonate, 11.6 mEq/L vs. 13.2 mEq/L, $P=0.024$). Median survival time of surviving cats was 40 days, with 15% surviving 365 days. In conclusion, short-term survival of cats with acute on chronic kidney disease is comparable to the

survival rate of AKI, however long-term prognosis is poor with only 15% of cats surviving to a year. Severity of azotemia as well as metabolic acidosis, lower body temperature and lower respiratory rate at presentation are all negative prognostic factors.

Cystatin-B as a Marker of Urinary Tract Diseases in Dogs

Chen, H.,¹ Avital, Y.,¹ Aroch, I.,¹ Farace, G.,² Peterson, S.,² Quinn, J.,² Yerramilli, M.,² Yerramilli, M.,² Zhang, Y.² and Segev, G.¹

¹ Koret School of Veterinary Medicine, The Hebrew University of Jerusalem, Rehovot, Israel

² IDEXX Laboratories, Research & Development, 1-IDEXX Drive, Westbrook, ME 04092, USA

Early diagnosis of acute kidney injury (AKI) and chronic kidney disease (CKD) is challenging due to lack of sensitive and specific biomarkers.

The aim of this study is to develop and evaluate an assay for urinary cystatin B (uCysB) and to investigate its diagnostic utility in dogs with various urinary tract conditions.

Eighty-eight client owned dogs were prospectively enrolled.

An ELISA assay for CysB was developed. Urine samples from healthy dogs, dogs with urinary tract infection (UTI), CKD, and AKI, were collected and stored pending analysis. uCysB was measured using the novel assay. Dogs with AKI and CKD had uCysB concentrations significantly higher compared with the control and the UTI groups ($P < 0.002$ for both). Dogs with AKI had higher uCysB compared with CKD but the difference did not remain significant after applying Bonferroni's correction ($P = 0.032$). Receiver operating characteristic curve (ROC) analysis of uCysB as an AKI predictor compared with healthy controls had an area under the curve (AUC) of 0.91 (CI_{95%} 0.82-0.99) and a cut-off point of 130 ng/mL corresponded to 89% sensitivity and 100% specificity. There was a difference in uCysB concentrations between survivors and non-survivors of AKI ($P = 0.018$) with an area under the ROC of 0.79 (CI_{95%} 0.60-0.98) and a cut-off point of 935 ng/mL corresponded to sensitivity and specificity of 83% and 67% respectively.

A novel uCysB assay has been developed and was found to be a sensitive diagnostic marker and an outcome predictor in dogs with AKI.

Use of Therapeutic Plasma Exchange for the Management of Immune Mediated Vasculitis in a Dog

Chen, H., Segev, G. and Klainbart, S.

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

A 3-year-old male neutered mixed breed dog was diagnosed with severe immune mediated vasculitis causing fever, significant hypoalbuminemia, edemas and coagulopathy two weeks after receiving human albumin due to severe hypoalbuminemia as a result of septic peritonitis. The dog was treated with fresh frozen plasma (FFP) and steroids but remained severely hypoalbuminemic and developed acute kidney injury (AKI). Over the course of four days, three therapeutic plasma exchange (TPE) treatments were performed, with a total of 2.7 plasma volumes exchanged. Replacement fluids consisted of a combination of FFP, hydroxyethyl starch 6% and 0.9% saline solution (46%, 17% and 37% respectively). Following the TPE treatments serum albumin increased (from 1.8 g/dL to 2.5 g/dL, RI: 3.0-4.4 g/dL), serum creatinine decreased (from 3.9 mg/dL to 0.98

mg/dL, RI: 0.3-1.2 mg/dL), clotting times normalized (activated partial thromboplastin time from 33 seconds to 14.5 seconds, RI: 11.0-17.4 seconds) and there was a gradual improvement of the edema and overall clinical demeanor. No significant adverse effects were noted during the TPE treatments and the dog was discharged after 6 days of hospitalization. Following discharge, the dog had complete resolution of vasculitis, edemas and AKI. In conclusion, TPE was successfully used for the management of an immune mediated reaction (type III hypersensitivity) following human albumin administration causing severe vasculitis and subsequent complications.

Tarsal, Metatarsal and Phalanx's Deformation of Captivity in Egyptian Fruit Bats (*Rousettus aegyptiacus*)

Weinberg, M.

Department of Zoology, Tel Aviv University, Tel-Aviv, Israel

Bats sleep and spend the daily hours hanging with their feet on stay apparatus, using ligaments allowing hanging without using muscle force and ATP consumption. This mechanism is maintained by locking the phalanx and their sharp round nails towards a round grip on cave and cement ceiling slots, which also allows constant wearing of the nails. As *Rousettus aegyptiacus* becomes a common species in captivity, as a research animal model and at zoos worldwide, feet deformations of varying severity are increasing more frequently encountered. These lesions possibly occur with use of the wrong bedding, resulting in insufficient nail wearing, leading to gradual nail straightening, and eventually, the metatarsal and tarsal bones and ligaments deform in a manner precluding hanging, mostly due to ligament elongation and partial tarsal joint dislocation, which eventually leads to death. This might develop to the worst condition within few weeks of an inappropriate housing only. The severity of this syndrome varies among individuals, probably due to different location in the sleeping cluster and individual disposition. Its average incidence in a captive colony is 20%, with no frequency and rate of progression differences between sexes or ages. In one adult colony housed for several months, 5/28 bats (18%) developed abnormal nail elongation of low severity and, all were released. In another adult colony, 6/30 bats (20%) developed nail elongation (low severity, 3; moderate severity, 2; marked severity, 1). One bat, with severe lesions could not hang at all, and due to bedsore related injuries was euthanized. In a third colony, consisting exclusively of independent pups, 3/5 bats (60%) developed similar lesion, of which in two, it was of low severity, and the bats were then released, and in one, lesions were of moderate severity and it was released after close follow-up for weight gain and proof that it could manage. This syndrome has never been described in nature. Nevertheless, the possibility that individual bats sustaining this lesion or have tendency to develop it are the first to be captured cannot be ruled out. It is yet unknown whether this condition is reversible or can be repaired. It is recommended to frequently monitor the condition of bats' feet, and individuals in which nail elongation is identified should be released back to nature as soon as this is detected.