MY BEST FRIEND, MY SURROGATE:
PETS AS SENTINELS OF HUMAN HEALTH

December 15-16, 2023
University of Évora, Évora, PORTUGAL

BOOK OF ABSTRACTS

TITLE:

International Workshop - My best friend, my surrogate: pets as sentinels of human exposure

EDITORS:

Ana Catarina Sousa

M. Ramiro Pastorinho

ADDRESS:

Universidade de Évora, Largo dos Colegiais, 2, 7004-516 Évora

TABLE OF CONTENTS

ORGANIZING COMMITTEE

Ana Catarina Sousa (Chair)
Department of Biology, University of Évora & CHRC, Portugal

M. Ramiro Pastorinho (Co-Chair)
Department of Medical and Health Sciences, University of Évora & CHRC, Portugal

Katia Pinello
Abel Salazar Institute of Biomedical Sciences, Porto & EPIUnit-ISPUP, Portugal

Nadiya Bocharova
Comprehensive Health Research Centre (CHRC) Management Support, NOVA Medical School, Portugal

Sónia Namorado
Department of Epidemiology, National Institute of Health Dr. Ricardo Jorge & CHRC, Portugal

D. Maria Pia, the Cat

SCIENTIFIC COMMITTEE

Ana Catarina Sousa, PhD

Department of Biology, University of Évora & Comprehensive Health Research Centre (CHRC), Portugal

Christian Sonne, DMV, PhD

Department of Bioscience, Faculty of Science and Technology, Aarhus University & Arctic Research Centre, Roskilde, Denmark

João Niza Ribeiro, DMV, PhD

Abel Salazar Institute of Biomedical Sciences, University of Porto & Epidemiological Research Unit (EPIUnit), Public Health Institute of Porto University (ISPUP), Portugal

Luís Taborda-Barata, MD, PhD

Department of Medical Sciences, Faculty of Health Sciences & Health Sciences Research Center (CICS-UBI), University of Beira Interior, Portugal

Ramiro Pastorinho, PhD

Department of Medical and Health Sciences, University of Évora & Comprehensive Health Research Centre (CHRC), Portugal

Sónia Namorado, PhD

Department of Epidemiology, National Institute of Health Dr. Ricardo Jorge & CHRC, Portugal

Tomohiko Isobe, PhD

Health and Environmental Risk Division, National Institute for Environmental Studies (NIES), Japan

©pedroluzelobos
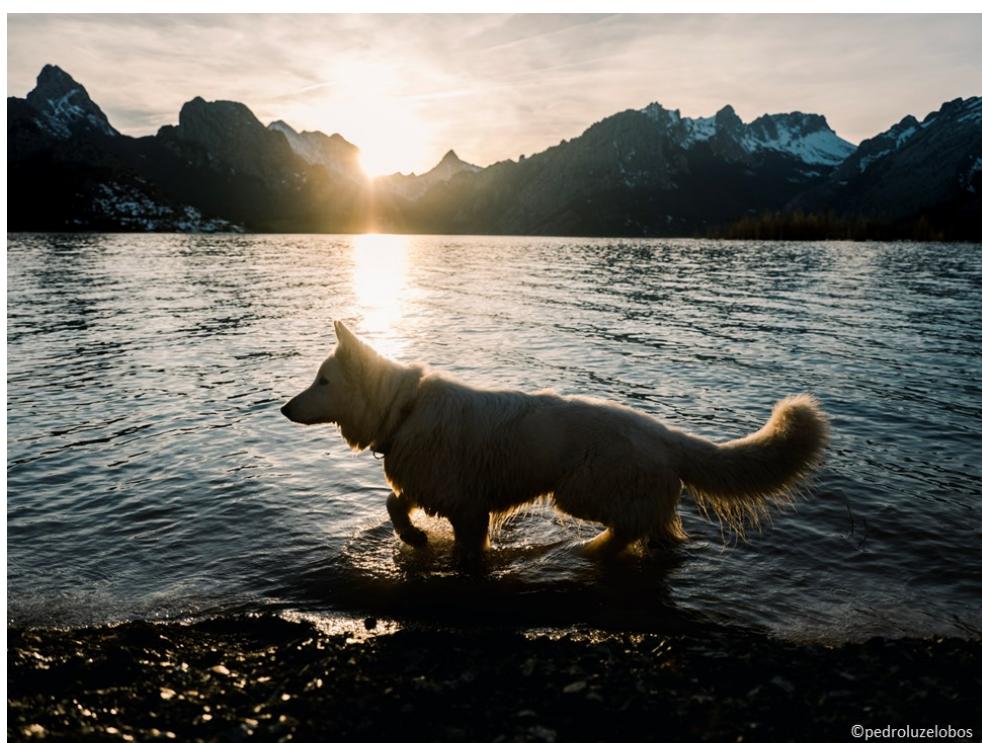
Bulma, the dog

WHAT WAS EXPECTED FROM THIS WORKSHOP?

AN OPEN EXCHANGE OF IDEAS ON THE CURRENT CHALLENGES AND OPPORTUNITIES IN USING PETS AS SENTINELS

Pets are exposed to the same chemicals and are affected by similar diseases as humans. One key advantage of pets is their shorter latency periods. This makes them exhibit signs of disease earlier, serving as early warning systems, enabling timely public health interventions. Yet, the use of pets as sentinels remains relatively underused, mostly due to the lack of a generalized consensus and harmonized methodologies. To address this limitation, top specialists in the field were gathered at Évora University during a two-day workshop.

©AnaSousa

D. Maria Pia, the Cat

WHAT DID YOU (H)EAR?

TOP RESEARCHERS DELIVERED KEYNOTE LECTURES AT THE OPENING OF EACH SESSION

These presentations were followed by invited communications and openly submitted oral communications.

A poster session was also held, and the first day of the Workshop ended with a wine tasting to foster networking amongst participants.

©RaquelVareda

Floki, the Dog

THE ONE HEALTH APPROACH AS THE LINCHPIN OF HUMAN/PET ENVIRONMENTAL EXPOSURE

The presence of a widely diverse array of researchers (MDs, DMVs, Environmental Scientists - physically and online) fostered an open exchange of ideas on the current challenges and opportunities in using pets as sentinels. To catalyse this exchange and collect all contributions, and to cement a consensus-driven approach that will promote the adoption of standardized methodologies among experts in this still-rarefied area of research, a Dialogue Living Lab was uphold on the 2nd day of the workshop. This created the basis for the materialization of a consortium, being its first tangible token the drafting of a Consensus Statement to be submitted to a high-profile Journal.

©pedroluzelobos

Bulma and her favourite human, Pedro

ACKNOWLEDGEMENTS

To all the pets that illuminate our lives…

Bulma and her favourite human, Pedro

To Pedro Lopes (@pedroluzelobos), photographer, proud friend of Bulma, the dog, for kindly sharing his pictures.

Volunteers

To all the student volunteers that contributed to the smooth running of the workshop and social events: Ana Carolina Lopes, Carolina Fatela, Catarina Duarte, Cíntia Dourado, Inês Viegas, Mariana Antunes and Susana Coelho.

Institutional supporters

Social program sponsors

DAY 1 - Friday, December 15th, 2023

08:30 - 9:00   Reception of the participants

09:00 - 9:15   OPENING SESSION

Workshop Chair, Ana Catarina Sousa

University of Évora Rector representative

IIFA (University of Évora Research Institute) Director, Rui Salgado

CHRC (Comprehensive Health Research Centre – Évora) Director, Armando Raimundo

SESSION I – CLIMBING INTO THE OCEAN: PETS, HUMANS AND CANCER

Chair: Katia Pinello, Institute of Biomedical Sciences Abel Salazar, University of Porto

9:15 - 10:00   KEYNOTE - Maria Lúcia Zaidan Dagli, School of Veterinary Medicine and Animal Science, University of São Paulo, Brazil
"Cancer, pets, and pollution - Experience from São Paulo, Brazil"

10:00 - 10:20   Chiara Palmieri, School of Veterinary Science, University of Queensland, Australia (Online)
"The geospatial distribution of canine cancers can inform potential association with environmental risk factors: the Australian experience"

10:20 - 10:40   João Niza Ribeiro & Katia Pinello, Institute of Biomedical Sciences Abel Salazar, University of Porto, Portugal
"Vet-OncoNet: Developing a Network of Veterinary Oncology and Reporting a Pioneering Portuguese Experience"

10:40 - 11:00   Hugo Vilhena, Department of Veterinary Medicine, Vasco da Gama Universitary School, Coimbra, Portugal
"Canine and Feline Spontaneous Mammary Tumors as Models of Human Breast Cancer"

11:00 - 11:30   Coffee break and Poster Session

SESSION II - THE GIFT THAT KEEPS ON GIVING: PETS AS SENTINELS OF HUMAN EXPOSURE

Chair: Ana Catarina Sousa, Department of Biology & CHRC, University of Évora

11:30 - 12:15   KEYNOTE - Jana Weiss, Department of Environmental Science and Analytical Chemistry, Stockholm University, Stockholm, Sweden
"One Health: Chemical Exposure and Endocrine Challenges in Cats and Children"

12:15 - 12:35   Catherine Wise, Duke University, Durham, United States (Online)
"Comparative Assessment of Pesticide Exposures in Domestic Dogs and Their Owners Using Silicone Passive Samplers and Biomonitoring"

| 12:35 - 12.55 | Julianna Thuroczy, Gamma-VET Ltd, Hungary "Radiopharmaceutical research and development using spontaneously occurring canine patients " |
| 13:00 - 14:30 | Lunch |

SESSION III - THE GREAT OUTDOORS: SENTINELS AND PARASITES AT WORK

Chair: Sónia Namorado, National Institute of Health & CHRC

14:30 - 15:15	KEYNOTE - Emilie A.-Ranberg & Christian Sonne, Department of Clinical Veterinary Medicine, University of Copenhagen, Denmark and Aarhus University, Faculty of Science and Technology, Department of Bioscience, Arctic Research Centre, Aarhus, Denmark "Sled Dogs as Sentinel Species for Monitoring Arctic Ecosystem Health"
15:15 - 15:35	Margarida Simões, CHRC, University of Évora, Portugal; Humanimal Trust, UK "One Medicine in practice, the Humanimal Trust pledge"
15:35 – 15:55	Helder Cortes, Victor Caeiro Laboratory of Parasitology, Department of Veterinary Medicine, MED, University of Évora, Portugal; Institute of Parasitology, Vetsuisse, University of Bern, Switzerland "Foxes as sentinels of animal and human health"
16:00 - 16:30	Coffee break and Poster Session

SESSION IV: MIRROR, MIRROR ON THE WALL: PETS AS FORECASTERS AND PROMOTERS

Chair: Ramiro Pastorinho, Department of Medical Sciences & CHRC, University of Évora

16:30 - 17:15	KEYNOTE - Asta Tvarijonaviciute & Elsa Lamy, University of Murcia, Spain; MED, University of Évora, Portugal "Metabolic disorders in pets and their tutors"
17:15 - 17:35	Ana Rita Matias, CHRC, University of Évora, Portugal "Equine Assisted Therapy: horse in relation"
17:35 – 17:55	Sara Bastos, University of Évora, Portugal "Patém Calma - A Catalyst for Mental Well-Being in Portuguese Academic and Corporate Settings"
17:55 - 18:30	Round Table
18:30	**Wine Tasting** Vinho Monte das Bagas, *Sommelier* João Silva

Poster 1   Tiago Carvalho, Vet-OncoNet, Departamento de Estudo de Populações, ICBAS, Instituto de Ciências Biomédicas Abel Salazar, University of Porto, Portugal

"Comparative epidemiological study of breast cancer in humans and canine mammary tumors in Portugal: dogs as sentinels of cancer in a common environment"

Poster 2   Lajos Balogh, Gamma-VET Ltd, Budapest, Hungary

"Spontaneously occurring canine oncological patients as models of surgical developments"

Poster 3   Cañadas-Vidal, Interdisciplinary Laboratory of Clinical Analysis Interlab-UMU, Regional Campus of International Excellence 'Campus Mare Nostrum', University of Murcia, Spain

"Validation of a spectrophotometric automated assay for the measurement of Adenosine Deaminase in feline saliva"

Poster 4   Alberto Muñoz-Prieto, Interdisciplinary Laboratory of Clinical Analysis Interlab-UMU, Regional Campus of International Excellence 'Campus Mare Nostrum', University of Murcia, Spain

"Ammonia in the saliva of horses with equine gastric ulcer syndrome (EGUS): a possible role in their development as occurs in human gastric ulcers"

DAY 2 - Saturday, December 16th, 2023

LIVING LABS - The ONE HEALTH approach as the linchpin of human/pet environmental exposure

Guided Collective Debate (with a record of contributions that will inform the Consensus Paper)

Creation of the consortium and draft of the Consensus Paper

09:30 - 09:45	Scope and Content Proposal
09:45 - 11:00	Speed-Science-Debating, Session 1
11:00 – 11:30	Coffee break
11:30 - 13:00	Speed-Science-Debating, Session 2
13:00 – 14:00	Lunch
14:00 - 16:00	Focused Group Elaboration and Reporting
16:00 – 17:00	Plenary Session and Drafting of the Consensus

KEYNOTE SPEAKERS

Maria Lúcia Dagli

Full professor, School of Veterinary Medicine and Animal Science, University of São Paulo, Brazil.

Dr. Dagli main research interests include animal and toxicological pathology, carcinogenesis, cancer chemoprevention, and new cancer therapies. She is currently the vice president of the National Technical Committee on Biosafety (CTNBio, Ministry of Science and Technology, Brazil), vice president of the International Federation of Societies of Toxicologic Pathology (IFSTP), and coordinator of the Graduate Program on Biotechnology of the University of São Paulo. Since 2009, she is a member of the Expert Panel for Fragrance Safety.

Jana Weiss

Associate Professor, Department of Environmental Science and Analytical Chemistry, Stockholm University, Stockholm, Sweden.

Dr. Weiss is an environmental chemist with expertise in the analysis of organic contaminants. Her research has primarily focused on identifying new and emerging risk chemicals and examining the exposure to endocrine-disrupting compounds commonly found in indoor environments shared by both humans and pet animals. Her projects involve conducting risk assessments of complex chemical mixtures, particularly using pet animals as models for understanding small children's exposure.

Emilie A.-Ranberg

Senior Veterinarian and Scientific Assistant, Department of Clinical Veterinary Medicine, Section of Surgery, Neurology and Cardiology, University of Copenhagen, Denmark.

Dr. Ranberg works with a broad array of subjects related to Arctic marine and terrestrial mammals, such as zoonoses, epizootiology, health, climate change, and environmental contaminants. She also works on neurology related topics.

Asta Tvarijonaviciute

Lecturer at Animal Medicine and Surgery, Veterinary Scholl, University of Murcia.

Her main teaching areas are Clinical Propaedeutics and Small Animal Internal Medicine. Her research activity is focused on the use of non-invasive samples for health and welfare assessment in a wide range of animal species as well as humans within the concept of "One-Health".

Olivia, the Cat

KEYNOTE PRESENTATION

CANCER, PETS AND AIR POLLUTION: EXPERIENCE FROM SÃO PAULO, BRAZIL

Dagli M.L.[1]

University of São Paulo, School of Veterinary Medicine and Animal Science, São Paulo, SP, Brazil
mlzdagli@usp.br

Cancer is an important public health problem in humans and also in companion animals, such as dogs and cats. Among the risk factors for human and animal cancers are chemical, physical and biological agents. Atmospheric air pollution in large cities has reportedly led to the development of chronic diseases in humans and animals. Among the cancers most susceptible to environmental factors is non-Hodgkin lymphoma. This presentation aims to present studies carried out at the University of São Paulo, School of Veterinary Medicine and Animal Science, involving cancer, pets and air pollution in São Paulo. This city is located in the Southeast region of Brazil, is the capital of the São Paulo State, and currently has almost 12 million inhabitants, with a density of 7,500 inhabitants per Km^2. It is a city that has a fleet of 32 million vehicles, including cars, trucks and buses, which circulate daily in the city. As a result of the large number of vehicles, there are high levels of air pollution, caused by vehicle emissions.

There are numerous reported effects of air pollution on human health. According to a study, São Paulo has more than 2.5 million dogs that live with their owners [1]. Dogs adopted as pets by their owners can suffer from indoor and outdoor pollution. Because they live very close to humans, with whom they share the home environment, food, and outdoor walks, dogs can be considered sentinels of environmental contamination to which humans are also exposed. Our studies demonstrated that dogs over 5 years old living in the city of São Paulo have greater DNA breakage in epithelial cells of the respiratory and olfactory tracts [2]. In a study to investigate the risk factors for the development of non-Hodgkin's lymphomas in owner dogs, it was found, in 80 dogs, that dogs weighing more than 10 Kg, living mainly in backyards, in houses close to busy avenues (more than 50 vehicles per minute) were more likely to develop non-Hodgkin lymphoma [3]. In another study, the spatial distribution (geolocation) of lymphoma cases in dogs and humans was investigated. Around 600 cases of non-Hodgkin's lymphomas in dogs and 600 cases in humans were geolocated in the city of São Paulo using postal code. It was verified, that the geolocation of lymphomas in these two species coincided, and occurred predominantly in the central region of São Paulo where there are large, very busy avenues, with intense traffic in the morning and afternoon [4]. Finally, a study was carried out to verify the possibility of evaluating blood leukocytes in dogs as markers of environmental exposure and development of non-Hodgkin lymphomas [5]. It was found that global leukocyte DNA methylation was different in dogs with Non-Hodgkin's lymphoma when compared to dogs without lymphoma. We highlight the importance of studying dogs as sentinels of environmental contamination. To this end, animal cancer registry systems are important, and we created the first animal cancer registry in Latin America in São Paulo [6].

At a global level, the Global Initiative for Veterinary Cancer Surveillance, GIVCS [7], offers an unprecedented and original perspective for the study of cancers in domestic animals and their role as sentinels of environmental contamination. It is urgent to obtain data on cancers in animals and their risk factors to predict and control exposures, like air pollution, in humans and their consequences.

References:

[1] Guilloux et al. (2018) Stray dogs in urban fragments: relation between population's perception of their presence and socio-demographic factors. Pesquisa Veterinária Brasileira, 38: 89-93.

[2] Kimura et al. (2010) Evaluation of DNA damage by the alkaline comet assay of the olfactory and respiratory epithelia of dogs from the city of São Paulo, Brazil. Experimental and Toxicologic Pathology, 62(3): 209-219.

[3] Zanini et al. (2013) Environmental risk factors related to the development of canine non-Hodgkin's lymphoma. Ciência Rural, 43: 1302-1308.

[4] Kimura et al. (2013) Domestic animals as sentinels for environmental carcinogenic agents. BMC Proc, 7 Suppl 2(Suppl 2): K13.

[5] Epiphanio et al. (2019) Global DNA methylation of peripheral blood leukocytes from dogs bearing multicentric non-Hodgkin lymphomas and healthy dogs: A comparative study. PLOS ONE, 14(3): e0211898.

[6] Tedardi et al. (2015) Sao Paulo Animal Cancer Registry, the first in Latin America. Vet Comp Oncol, 13(2): 154-5.

[7] Pinello et al. (2020) The Global Initiative for Veterinary Cancer Surveillance (GIVCS): Report of the first meeting and future perspectives. Vet Comp Oncol, 18(2): 141-142.

INVITED PRESENTATION

THE GEOSPATIAL DISTRIBUTION OF CANINE CANCERS CAN INFORM POTENTIAL ASSOCIATION WITH ENVIRONMENTAL FACTORS: THE AUSTRALIAN EXPERIENCE

Palmieri C.

The University of Queensland, School of Veterinary Science, Gatton campus, Queensland, Australia

c.palmieri@uq.edu.au

Between 30-50% of all human cancer cases are preventable, i.e. caused by potentially modifiable risk factors such as smoking, indoor and outdoor pollution, UV radiation, unhealthy diet amongst others. And even in companion animals, environmentally-driven cancers occur more frequently than we thought. Classical examples are canine urothelial carcinoma of the urinary bladder linked to increased concentration of water disinfection by-products or canine lymphoma cases observed with high frequency in proximity to nuclear power plants or chemical suppliers. When it comes to environmental factors that raise the risk of cancers, it may seem like avoiding exposure is nearly impossible. However, we can gather evidence-based information that help consolidating strategies for prevention or increase monitoring in high-risk populations. The only tool that may help in this evidence-based approach is cancer data and mapping. Using retrospective pathology data and patients electronic records, we have conducted cross-sectional studies looking at the incidence of canine UCC and lymphoma in Queensland, Victoria and New South Wales and possible association with environmental and climate factors, as well as a online survey to examine the relationship between dog owner-reported canine cancers and household exposure to potential carcinogens. The evidence of a possible link between environmental risk factors and canine cancers opens up tremendous opportunities to further explore the causality of these relationships and provide meaningful data for environmental health decision making.

INVITED PRESENTATION

VET-ONCONET: DEVELOPING A NETWORK OF VETERINARY ONCOLOGY AND REPORTING A PIONEERING PORTUGUESE EXPERIENCE

Pinello K.[1], Niza-Ribeiro J. [1]

[1]Vet-OncoNet, Population Studies Department, ICBAS, Instituto de Ciências Biomédicas Abel Salazar, University of Porto, Porto, Portugal

kcpinello@icbas.up.pt

Vet-OncoNet stands as a replicable and innovative tripartite animal cancer database designed with a clear scientific and academic mission: to systematically collect data and generate evidence-based insights that advance our understanding of cancer in the animal kingdom. Embracing the One Health paradigm, Vet-OncoNet leverages cutting-edge business intelligence tools to streamline the acquisition, analysis, and reporting of animal cancer data at a national level through three distinct interfaces: ACR (Animal Cancer Registry), COR (Clinical Oncology Registry), and RFR (Risk Factor Registry). With contributions from seven laboratory veterinarians, Vet-OncoNet ensures a comprehensive and diverse dataset. Each collaborating partner gains access to personalized dashboards, meticulously organized to facilitate seamless data navigation and interpretation.

Crucially, Vet-OncoNet stands in partnership with the Portuguese Companion Animal Information System (SIAC), the official national platform for mandatory pet registration, thereby supporting the broader pet census. This collaboration holds significant importance, as it facilitates the computation of risk-based tumor incidence rates for companion animals, revealing noteworthy figures such as 27.2 cases per 10,000 dogs and 29.8 cases per 10,000 cats. Moreover, this collaboration allows for unprecedented comparisons between human and animal cancer occurrences.

The fruits of our collective effort have manifested in the publication of the Portuguese Animal Cancer Registry for the years 2020 and 2021, offering valuable insights into the prevalence of cancer in both canine and feline populations. Notably, Vet-OncoNet has amassed an impressive forty-one thousand registries within a mere four-year span, underlining its national representativeness and significance.

In delving into the malignancy patterns across species, our investigations reveal a higher incidence of malignant cancers in cats, with age, sex, and geographical region emerging as contributing factors. Comparative analyses, particularly in non-Hodgkin lymphomas and breast cancer, have unveiled striking similarities and robust correlations, reinforcing the existence of common environmental risk factors.Vet-OncoNet stands as a robust database that not only advances our understanding of animal cancer but also positions animals as crucial sentinels for environmental hazards that may contribute to cancer across both animal and human populations. Through this comprehensive approach, Vet-OncoNet serves as a beacon in elucidating the intricate connections between the health of animals and the broader environment, fostering a deeper comprehension of shared risks and advancing our collective efforts in cancer research and prevention.

INVITED PRESENTATION

CANINE AND FELINE SPONTANEOUS MAMMARY TUMORS AS MODELS OF HUMAN BREAST CANCER

Vilhena H.[1,2,3,4]

[1]Centro de Investigação Vasco da Gama (CIVG), Departamento de Ciências Veterinárias, Escola Universitária Vasco da Gama (EUVG), Coimbra, Portugal; [2]Centro de Investigação Animal e Veterinária (CECAV), Universidade de Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal (Project FCT UIDB/00772/2020); [3]Laboratório Associado de Zootecnia e Veterinária – AL4AnimalS, Lisboa, Portugal; [4]Onevetgroup Hospital Veterinário Universitário de Coimbra (HVUC), Coimbra, Portugal

hcrvilhena@hotmail.com

The frequency of cancer presents an increasing trend in humans and companion animals, and despite recent advances in diagnosis and treatment, remains a major cause of morbidity and mortality in human and veterinary medicine.

Different studies have shown epidemiological and clinicopathological similarities between several spontaneous tumors of companion animals and their human counterparts, and consequently canine and feline malignancies have been considered suitable natural models for human cancer research. In fact, comparative oncology, defined as the study of spontaneous cancers in animals as models for human disease, has gained increasing importance over the last decades. These spontaneous cancer models have several advantages over the classic *in vitro* tumor cell lines and the *in vivo* xenografts models, namely the evaluation of the animal´s immune response to the tumor, the ability to reproduce interactions between the neoplastic cells and the microenvironment, and the capacity to reproduce the metastatic behavior of the neoplasm. Moreover, the shorter lifespan and faster progression of cancer in dogs and cats allows an earlier data collection than in human malignancies. Furthermore, companion animals share the same environment as humans, and the health effects associated with exposure to hazardous materials, such as cancer, might also be detected in animals; consequently, in an epidemiological context, animals can also act as sentinels of human malignancies. Changes in the canine cancer incidence ratios, and probably also in feline tumors, were described to precede by two years similar changes in human incidence rates, which might be useful for predicting changes in cancer patterns in humans.

Breast cancer represents the most prevalent cancer and the leading cause of cancer-related mortality in women worldwide. Mammary gland tumors are also among the most frequent tumors in female dogs and cats. Canine and feline mammary tumors present many similarities with human breast cancer, including incidence, relative age of onset, risk factors, biological behavior, metastatic pattern, histological, molecular and genetic features, and response to therapy. For these reasons, are recognized as suitable natural models for human breast cancer studies, particularly for the most aggressive types.

The "One Health" approach to oncologic diseases, including mammary tumors and other neoplasias, provide advances in the knowledge of malignancies, and potentially an improvement in clinical outcomes for diseased humans and animals.

Skuggan, the Cat

KEYNOTE PRESENTATION

ONE HEALTH: CHEMICAL EXPOSURE AND ENDOCRINE CHALLENGES IN CATS AND CHILDREN

Weiss J.M.

Dept. Environmental Science, Stockholm University, Sweden

jana.weiss@aces.su.se

Within the One Health approach, studying pet animals to address human health issues have been demonstrated in several studies. Exposure to anthropogenic organic chemicals (OCs) has been suggested to contribute to the increasing incidence of endocrine diseases in humans and animals observed the last decades. Cats are advantageous models for human exposure to indoor chemicals, as demonstrated in the previous project MiSSE (www.aces.su.se/misse). Cats' grooming and toddlers' hand-to-mouth activities leads to an elevated household dust intake and dust acts as a sink for OCs that are released from our household products, furniture and building materials. Two exposure pathways were established in the MiSSE project by the analysis of paired serum sample; brominated flame retardants (BFRs) and per- and polyfluoroalkyl substances (PFASs) from dust, and; phenolic compounds in canned cat food, mainly coming from the marine environment. The fully brominated biphenyl (BB209) was also correlated to dry food, a compound found in all cat serum samples.

In MiSSE we reported serum levels of PFASs in cats to be higher than all other OCs determined. A range of in vitro, and in vivo studies have reported PFASs to be interfering with the endocrine system, e.g., altering thyroid hormone and glucocorticoid levels. Epidemiological studies have reported associations to e.g., diabetes, lowered birthweight and increased cholesterol serum levels. Consequently, in the following project abbreviated FELIX (www.aces.su.se/felix), we will further investigate the exposure by analysis of >200 PFASs in cats and their environment. We will collect cat serum and fur from healthy cats and cats diagnosed with feline hyperthyroidism and diabetes mellitus. Obesity will be measured using the body condition score system. We will ensure to collect a sufficient number of samples (n=50 per group) to reach statistical significance in the material. Cat hair will be investigated as a non-invasive sampling matrix for analysis of PFAS and cortisol, linking the exposure to chronic stress and effects on the glucocorticoids, which will simplify feline diagnostics. By analysis paired cat hair and serum levels the matrix will be confirmed/rejected to reflect the internal exposure to these compounds.

In this presentation, the research conducted within the MiSSE project is summarized and presented in a broader perspective. Further, the objectives and aim of the FELIX project will be presented.

INVITED PRESENTATION

USING NON-INVASIVE SAMPLERS AS A TOOL TO EVALUATE SHARED EXPOSURE TO ENVIRONMENTAL MIXTURES AND APPLICATION IN CANINE CANCER STUDY

Wise C.F.[1,2], Wiley C.A.[3], Herkert N.J.[1], Vaden S.L.[4], Hoffman K.[1,2], Breen M.[5,6], Stapleton H.M.[1,2]

[1]Nicholas School of the Environment, Duke University, North Carolina, United States; [2]Duke Cancer Institute, North Carolina, United States; [3]Department of Molecular Biomedical Sciences, College of Veterinary Medicine, North Carolina State University, North Carolina, United States; [4]Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, North Carolina, United States; [5]Comparative Medicine Institute, North Carolina State University, North Carolina, United States; [6]Center for Human Health and the Environment, North Carolina State University, North Carolina, United States

catherine.wise@duke.edu

Pet dogs are considered a good comparative model for many human diseases, especially cancer. Due to their shorter lifespan, dogs have a reduced latency period between environmental exposures and cancer development and can serve as a sentinel species for identification of possible environmental risk factors linked to cancer. We established that people and their pet dogs have very similar environmental exposures by using silicone samplers as passive personal exposure monitors. Silicone samplers were analyzed for a suite of chemicals across many compound classes, including flame retardants, plasticizers, and pesticides. Significant and positive correlations were observed between humans and dogs (n=30 pairs, rs=0.38-0.96, p<0.05) for 35 of 45 chemicals measured in ≥50% of all samplers. Urinary biomarkers of organophosphate esters and pesticides were correlated with silicone sampler concentrations; stronger correlations were observed in dogs compared to humans. These data demonstrate that pet dogs can act as surrogates for human exposures in the home environment. In a follow-up study, we used silicone samplers to measure exposure to mixtures in a canine bladder cancer case-control study. Cases were defined as dogs with detectable urinary BRAF mutation levels (range 0.29-21%) (n=25). Controls were sex, breed, and age matched with no detectable BRAF mutation (n=76). The silicone samplers were analyzed using targeted and untargeted GC-MS approaches. Targeted analyses focused on 115 chemicals, of which 39 were detected in ≥50% of all samples. Higher levels (2-3X) of 4 chemicals were measured in silicone samplers worn by cases compared to controls (p<0.05). While 2 more chemicals were higher (1.5X) in samplers worn by cases, this was not statistically significant (p≤0.09). Nontargeted analyses revealed a higher burden of environmental chemical exposures experienced by cases, both in the number of chemicals detected and the magnitude of exposures. Of the 1,407 features detected in >50% of samples, 668 were detected more in cases and 505 were detected more in controls. This study is the largest to investigate such a wide breadth of exposures associated with canine bladder cancer, the first to objectively measure exposures and the first to assess a population with subclinical disease. These data combined with whole exome sequencing data from our cases will allow for advances in gene-environment interactions and translational medicine that may improve clinical outcomes or disease prevention for humans and pets. These studies demonstrate the tremendous value and opportunities that exist to use companion

animals, particularly pet dogs, as sentinels to investigate relationships between environmental exposures and health outcomes.

ORAL PRESENTATION

RADIOPHARMACEUTICAL RESEARCH AND DEVELOPMENT USING SPONTANEOUSLY OCCURRING CANINE PATIENTS

Thuroczy J., Balogh L.

Gamma-VET Ltd, Animal Health Center Budafok, Budapest, Hungary

Thuroczy.Julianna@gmail.com

Background: Radiopharmaceutical (diagnostics, therapeutics, theranostics) and conventional pharmaceutical research and development share many similarities. Safety and efficacy must be proven for authorities to grant registration approvals. In the case of radiolabeled ligands containing isotope components, there are specific considerations.

Methods: Radiopharmaceutical candidates were administered intravenously to spontaneously diseased (oncological, endocrinological, neurological, etc.) patients. Subsequently, serial whole-body 3D imaging (SPECT/CT or PET/CT) was the most commonly employed method, conducted on anaesthetised patients. Visual analysis and quantitative uptake values (SUV) of target and critical organs were assessed to determine the viability of candidate analogues before human clinical trials. Post-application, serial blood and urine samples were frequently obtained.

Results: Basic kinetics, optimal imaging times, target-to-background ratios, excretory pathways, internal dosimetry, and staff dosimetry data were estimated, calculated, and evaluated. Registration files of radiopharmaceutical entities often contained clear target uptake images along with additional kinetic, safety, and dosimetric data.

Conclusions: Various spontaneously occurring diseased animals proved to be the most effective in vivo models for radiopharmaceutical researchers. This phenomenon of using replacements is advantageous not only for the animals and their owners but also for referring veterinarians, the field of radiopharmaceuticals, and science as a whole.

References:

[1] Balogh et al. (2002) Sentinel lymph node detection in canine oncological patients. Nuclear Medicine Review, 5(2): 139-144

[2] Galli et al. (2014) 99mTc-labeled-rhTSH analogue (TR1401) for imaging poorly differentiated metastatic thyroid cancer. Thyroid 24, 1297–1308.

[3] Galli et al. (2021) In Vivo Imaging of Thyroid Cancer with 99mTc-TR1401 and 99mTc-TR1402: A Comparison Study in Dogs. J. Clin Med. 10(9): 1878

Isa, the sleddog and Elsebeth, the cat, with their humans
Troels and Ellanor

KEYNOTE PRESENTATION

SLED DOGS AS SENTINEL SPECIES FOR MONITORING ARCTIC ECOSYSTEM HEALTH

Andersen-Ranberg E.[1] & Sonne C.[2]

[1]Department of Clinical Veterinary Medicine, University of Copenhagen, Denmark; [2]Aarhus University, Faculty of Science and Technology, Department of Bioscience, Arctic Research Centre, Aarhus, Denmark

emilie.ranberg@sund.ku.dk

Drastic anthropogenic changes and challenges for the Arctic ecosystem is calling for relevant sentinel species to be used for the purpose of monitoring the effects of these changes. These sentinels need to be suitable both practically – such as readily available for sampling – , as well as in terms of biological comparability to other fauna and humans. Wildlife species such as polar bears, whales and seals have been used to monitor effects of anthropogenic and bioaccumulating pollution, climate change and to a lesser extent changing disease patterns. These wildlife species are however elusive and some of the protected in terms of capture, hunting and distribution. It is also challenging to extrapolate results from these animals to human health directly. Sleddogs, on the other hand, represent a species which exists in an intersection between the wild environment and human civilization. They are not only in daily contact with humans, but they are also exposed to many of the same environmental effects has humans, i.e., pollution and zoonoses, while a diet of largely wildlife overlaps with Inuit diet preferences. Moreover, sleddogs are relatively abundant, they have a nearly circumpolar occurrence and they are more readily accessible compared to Arctic wildlife.

Studying humans directly is of course of high value when the main focus is on human health but, generally speaking, human samples are less accessible because of strict regulations for use, and human samples will not let us infer on the environment and wildlife to the same degree as sleddogs, while sleddogs share a greater overlap with the wild in terms of behavior, diet and environmental exposure.

Our studies of the effects of persistent organic pollutants in sleddogs have already shown significant pathological effects on kidney, liver, bone, hormones and immune-competence. A novel project, QimmeqHealth, has increased focus on zoonotic diseases in Greenland sleddogs in particular while, at the same time, aiming to increase the availability of veterinary care for Greenland sleddogs which, as a breed, is disappearing and experiencing significant health challenges for various largely man-made reasons. QimmeqHealth has found that Greenland sleddogs are hosts for several significant zoonotic parasites, and sometimes at surprisingly high frequency. Moreover, novel non-targeted modalities such as Next Generation Sequencing are showing great promise diagnostically, among other by making it possible to find pathogens which were not expected or already targeted. This is particularly relevant when trying to assess if new viral pathogens are emerging from thawing permafrost due to increasing mean temperatures.

We therefore recommend that ecosystem health assessments in the Arctic include analyses of sled dogs combined with modern modeling and genetic sequencing tools.

ORAL PRESENTATION

ONE MEDICINE IN PRACTICE, THE HUMANIMAL TRUST PLEDGE

Bailey J.[1], Hauptmannova I.[1], Simões M [2]

[1]Humanimal Trust, Godalming GU7 2QQ, Surrey, United Kingdom; [2]Dept. Veterinary Medicine and CHRC, University of Évora, 7000-083 Évora, Portugal

mpsimoes@uevora.pt

The Humanimal Trust advocates for One Medicine, a concept that promotes collaboration between human and veterinary medicine to ensure equal and sustainable medical progress for both humans and animals. The Trust's work is underpinned by the belief that a collaborative, One Medicine approach can benefit all patients, regardless of their species, and has the potential to save time, money, and ultimately, lives.

One Medicine also involves the use of "sentinel species" in monitoring and detecting potential health risks. Sentinel species are used to distinguish early warning signs of potential health hazards in the environment that could affect humans and animals, contributing to a proactive detection and prevention of inbalances/health issues.

Throughout its main research areas, the Humanimal Trust has established a powerful evidence base and is working to build understanding of the principle and potential of One Medicine, with the goal of closing the divide between human and animal medicine whilst funding research that aims to improve knowledge by studying naturally occurring disease. This approach is supported by the idea that humans and animals share a lot of their biology.

The Trust's efforts are also aimed at ensuring that medical progress is made equally and sustainably for both humans and animals, and it believes that the world would be fairer and more respectful if One Medicine is to be more widely understood and delivered.

The organization funds multi-disciplinary research to advance the One Medicine concept, with a focus on small, collaborative projects that benefit all species and ensure a more sustainable, balanced and healthier future. At the same time, Humanimal Trust is actively engaged in community education and outreach to promote the One Medicine approach.

ORAL PRESENTATION

FOXES AS SENTINELS OF ANIMAL AND HUMAN HEALTH

Cortes H.[1,4], Simões M. P.[2], Monteiro N.[1], Vila-Viçosa M. J.[1], Cardoso L.[3], Basso W[4]

[1]Victor Caeiro Laboratory of Parasitology, Department of Veterinary Medicine, MED, University of Évora, Évora, Portugal; [2]Department of Veterinary Medicine, CHRC, University of Évora, Évora, Portugal; [3]Department of Veterinary Sciences, and CECAV – Animal and Veterinary Research Centre, University of Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal; [4]Institute of Parasitology, Vetsuisse, University of Bern, Switzerland

hcec@uevora.pt

Over 60% of human infectious diseases are zoonoses, and the daily contact that humans are having with animals, including pets, is increasing, with most cats and dogs living indoors and sleeping in their owners' bed. In developed countries, city policies include an urban development strategy that promotes the inclusion of large green areas and the substitution of impermeabilized spaces by gardens, aiming to be 'new' habitats for wildlife. This fauna is also bringing its parasitic and infectious agents, therefore increasing the risk of zoonotic disease exposure. Likewise, human activities in nature and agricultural areas are becoming more popular, with humans doing trekking, fishing, walking in their free time. In these cases, with cities encroaching wild areas and the humans and their pets spending more time in contact with nature, the exchange of pathogenic agents is promoted. Therefore, the identification of parasites and other agents in wildlife becomes a very important issue for the prediction of hazards and their risks for both pets and humans. In the present work, we collected hunted foxes that were sampled for the presence of parasites. Throughout a parasitic necropsy, different organs and tissues were collected, and parasites were directly detected and morphologically identified, and DNA extracted with the purpose of molecular detection and identification. Among the infectious agents that were found, some can also have dogs or cats as hosts (*Eucoleus aerophilus* and *Hepatozoon canis*), and others do have zoonotic potential (*Toxocara canis*, *Uncinaria stenocephala*, *Dirofilaria immitis*, *Trichinella britovi*, *Leishmania infantum*, *Anaplasma platys*, *Ehrlichia canis*). Besides the increasing risk of zoonotic diseases in this world facing climatic changes and a different behavior of humans in their intention to have a healthier life (through exercise in the fields and environmental changes in their houses and cities), we strongly suggest the use of dead animals from hunting and road killed animals, as an important source of information that may help predict the spillover risk of diseases for humans and their pets, as well as from these ones, to wildlife, as a key aspect in One Medicine practices benefiting both human and animals health.

Luna, the Dog

KEYNOTE PRESENTATION

METABOLIC DISORDERS IN PETS AND THEIR TUTORS

Tvarijonaviciute A.[1], Lamy E.[2]

[1]University of Murcia, Murcia, Spain; [2]Mediterranean Institute for Agriculture, Environment and Development (MED), University of Évora, Évora, Portugal

asta@um.es; ecsl@uevora.pt

Obesity is a common, complicated, and costly chronic disease that affect humans, both adults and children, as well as pets. Obesity together with different metabolic related diseases are constituting a burden for both animals and humans. Besides number of investigations and societal actions, obesity rates in humans and pets are increasing possibly due to the shared environment and behaviors among other possible factors. However, although dog and human obesity share a number of physiological aspects and consequences, there are also differences that result from the different physiology of these species.

One non-invasive way of assessing obesity and know more about mechanisms involved is through saliva analysis. Saliva, although being mainly produced by salivary glands, contains blood-born molecules, being useful to access pathologic and/or physiologic states. There are salivary proteins that are changed in individuals with metabolic dysfunctions and in obesity. This has been observed in humans and also in dogs. Although salivary changes induced by obesity and metabolism may present differences between the two species, their existence points to the interest of this fluid for getting deeper understanding of the disease. Taking into account that saliva can be also a source of other molecules, like environmental contaminants, microorganisms, among others, and knowing that these can be present in the shared environment, there is the need for studies that assess the potential of saliva from dogs (and other pets) as markers of owners' exposure and consequent risk of disease development.

ORAL PRESENTATION

EQUINE ASSISTED THERAPY: HORSE IN RELATION

Matias A.R.[1], Almeida N.[2], Santos G.[1]

[1]University of Évora, Comprehensive Health Research Center, Évora, Portugal; [2]T-Terapias, Portugal

armatias@uevora.pt

Equine-assisted services (EAS) is a form of therapeutic mediation that facilitates and requires the practitioner's participation, contributing to the promotion of physical, social, and cognitive well-being Although the horse is mainly seen as an important therapeutic element in physical rehabilitation, it also should be seen as a symbolic element in a therapeutic process.

The image of the horse has power but also a freedom that allows the reactivation of internal paternal images. It can also allow a return to maternal containment through warmth, support, rocking, and odors. In this way, the horse can be seen as an object of care, feeding, preparation, and manipulation by the other; it can be seen as a possible support for the projection of the subject's lived experiences, their own body, and the relationship with the other (Silva, 2018; (Yorke et al., 2008).

It is known that children established emotional bonds with horses in different ways, and in many cases, participants could empathize with the animals. Empathy is suggested to be imperative for healthy emotional and social functioning, being an emotion intrinsically linked to parental care (attachment) and often in deficit in this population. Considering the above-mentioned, we have developed a study to understand the effects of EAS intervention on socio-emotional competencies in three institutionalized children (aged 5, 6, and 9 years), selected by convenience. 17 sessions of EAS were developed individually, once a week for 45 min. Beyond the observation, two questionnaires were performed: Strengths and Difficulties Questionnaire (SDQ) and Assessment of Children's Emotion Scales (ACES). The first one allowed us to understand the abilities and difficulties of children, while ACES enabled us to assess children's ability to recognize emotions and the accuracy of their attribution.

This research allowed us to observe an improvement in the socio-emotional skills of the participants, specifically in favoring the affective relationship, adhering to rules, solving problems with identification and/or developing appropriate solutions, and developing a relationship with the horse. Consequently, there was a positive impact on intrapersonal skills with marked improvement in self-regulation and self-control, in addition to an improvement in the intentionality of movement and adequacy of gesture to the context. In short, children developed new adaptation mechanisms and some horsemanship skills. It is suggested that studies be conducted on a greater number of children in the future, including individual and group intervention with a higher frequency of sessions per week. This type of intervention underlies a renewed educational and therapeutic approach, contributing to mental health promotion in this population.

ORAL PRESENTATION

PATÉM CALMA - A CATALYST FOR MENTAL WELL-BEING IN PORTUGUESE ACADEMIC AND CORPORATE SETTINGS

Bastos S.R.L.

[1]University of Évora, Évora, Portugal

sarareginabastos@gmail.com

This research investigates the transformative impact of introducing therapy dog programs in Portugal, focusing on their role in enhancing mental well-being within academic and corporate environments. The study underscores the pioneering nature of such initiatives in the Portuguese context, marking a significant stride toward innovative mental health support. By analyzing the unique benefits of therapy dogs, including stress reduction, improved mood, and the creation of a positive and inclusive atmosphere, the research highlights their holistic impact on mental health.

The findings reveal quantifiable impacts on participants' mental health, supported by evidence from surveys, assessments, and anecdotal reports. These tangible benefits experienced through therapy dog interventions underscore the potential to revolutionize workplace and academic cultures, fostering emotionally positive environments that promote collaboration, communication, and a sense of community.

The research also emphasizes the empowerment of individuals in actively managing their mental health through engaging avenues provided by therapy dog programs. This empowerment contributes to the broader conversation about mental health awareness within academic and corporate sectors.

As a call to action, the study advocates for continued research into therapy dog programs, encouraging exploration of diverse settings and contributing to the growing body of evidence supporting the efficacy and sustainability of such interventions. Seeking increased institutional support and recognition for therapy dog programs is highlighted, positioning them not only as direct interventions but also as catalysts for broader conversations about well-being.

Furthermore, the study underscores the imperative to establish best practices for implementing and sustaining therapy dog programs, including considerations for training, ethical guidelines, and program evaluation. The need for national and international collaboration is emphasized, with Portugal positioned as a potential contributor to the global dialogue on innovative approaches to mental health support. In conclusion, the research demonstrates a commitment to ongoing studies in the field of human-animal bond research. This commitment recognizes the potential for a deeper understanding of the dynamics between humans and therapy dogs to drive advancements in mental health interventions and support. Overall, therapy dog programs emerge as a promising avenue for promoting mental well-being in both academic and corporate settings, with far-reaching implications for individuals, institutions, and society as a whole.

©GiuliaPoma

Moes des Poes, the Cat

Poster 1

COMPARATIVE EPIDEMIOLOGICAL STUDY OF BREAST CANCER IN HUMANS AND CANINE MAMMARY TUMORS IN PORTUGAL: DOGS AS SENTINELS OF CANCER IN A COMMON ENVIRONMENT

Carvalho, P.T.[1], Niza-Ribeiro, J.[1,2,3], Amorim, I.[4], Ribeiro, A.I.[5], Queiroga, F.[6,7], Severo, M.[2,3], Pinello, K. [1,2,3]

[1]Vet-OncoNet, Departamento de Estudo de Populações, ICBAS, Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Porto, Portugal; [2]EPIUnit—Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal; [3]Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional (ITR); [4]Departamento de Patologia e Imunologia Molecular, ICBAS, Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Porto, Portugal; [5]Departamento de Ciências da Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina, Universidade do Porto, Porto, Portugal; [6]Departamento de Ciências Veterinárias, Universidade Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal; [7]CECAV—Centro de Ciência Animal e Veterinária, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

paulotiagocarvalho@gmail.com

Introduction

Dogs spontaneously develop mammary gland tumors (MGT) and exhibit striking similarities in clinical and epidemiological characteristics to human breast cancer (HBC).

Objective

Descriptive and comparative analysis of HBC and canine MGT with a focus on evaluating similarities and geographical distribution.

Methods

HBC cases were obtained from North Regional Oncological Registry (RORENO) (2010-2015) and canine MGT cases from Vet-OncoNet (2019-2022). Analyses were performed based on published and well accepted classification systems (ICD-O-3.2 for humans and Vet-ICD-O-canine-1). Age-standardized incidence risks (ASIR) of Porto district municipalities were calculated using 2021 Portuguese census (INE) and data from the Portuguese animal registration system (SIAC).

Results

Among 7,674 HBC cases and 1,140 MGT cases, a similar age and sex distribution pattern was observed. Approximately 69.2% of HBC cases were between 40 and 69 years old, while 66.9% of MGT cases were diagnosed between 7 and 12 years old (mean age of 9.6 years, SD = 2.6). In women, Invasive breast carcinoma (8,500/3) was the most common histological type (n = 5,679, 74%) while in dogs it was the Complex Carcinoma (8,983.1/3) (n = 205, 39%). Cocker and Yorkshire Terriers exhibited the highest relative risks (3.2 and 1.6, p < 0.05, respectively) when compared to cross breed dogs. The municipalities' ASIR of the two species exhibited a high correlation (R = 0.85, p < 0.01) and the spatial cluster analysis revealed similar geographic hotspots. Also, higher ASIR values both in women and dogs were more frequently found in urbanized areas compared to rural areas.

Conclusion

This research sheds light on the shared features and geographical correlation between HBC and canine MGT, highlighting the potential of cross-species environmental oncology studies. As both species increasingly share common environments and similar exposomes, these findings support the hypothesis that dogs could serve as valuable sentinels for human oncological epidemiology.

Poster 2

SPONTANEOUSLY OCCURRING CANINE ONCOLOGICAL PATIENTS AS MODELS OF SURGICAL DEVELOPMENTS

Balogh L., Thuroczy J.

Gamma-VET Ltd, Budapest, Hungary

balogh.gammavet@gmail.com

Background: The complete removal of malignant tumors remains a worldwide challenge for surgeons. Novel intraoperative techniques often aim to detect sentinel lymph nodes and simultaneously determine tumor-free margins. These studies typically require large animal pathological models.

Methods: In recent years, the authors participated in three separate studies where spontaneously occurring canine malignancies were the subjects. These studies involves.

1) Sentinel node detection by scintigraphy and isoptope-guieded surgery (Sentinel Detection Project)

2) Mass spectrometry –guided detection of tumor-free margins (Jedi ONCO Project, REIMS)

3) Cherenkov-light assisted oncosurgical method (CLIO)

Results: In 1.) Sentinel Detection Project proved that large sized (≥200 nm) radiolabelled colloids needed to decline the overflow and efficacy data showed that the most effective method to find the sentinel lymph nodes is planar and SPECT imaging combined with intraoperative detection by 99mTc HSA-colloid. Both 2.) mass spectrometry and 3.) Cherenkov-light assisted oncosurgical method is very effective tool in surgeon's hands to effectively determine the safe borders of malignancies in operation theatres. In all the 3 projects protocols were capable perfectly mimicking the human clinical aspects of surgical methods.

Conclusions: Canine oncological patients used as spontaneously occurring animal models have a great potential to Replace laboratory animals in onco-surgical projects too.

References:

[1] Balogh et al. (2002) Sentinel lymph node detection in canine oncological patients. Nuclear Medicine Review, 5(2): 139-144

[2] Balogh et al. (2010) Identification of Biological Tissues by Rapid Evaporative Ionization Mass Spectrometry. Anal. Chem., 82 (17): 7343-50

Poster 3

VALIDATION OF A SPECTROPHOTOMETRIC AUTOMATED ASSAY FOR THE MEASUREMENT OF ADENOSINE DEAMINASE IN FELINE SALIVA

Cañadas-Vidal E.[1,2], Pardo-Marin L.[1], Muñoz-Prieto A.[1], García-Martínez J.[3], Tvarijonaviciute A.[1]

[1]Interdisciplinary Laboratory of Clinical Analysis Interlab-UMU, Regional Campus of International Excellence 'Campus Mare Nostrum', University of Murcia, Murcia, Spain; [2]Veterinary Clinical Hospital, University of Murcia, Spain; [3]Department of Animal Medicine and Surgery, Faculty of Veterinary Medicine, University of Murcia, Spain

esme736@gmail.com

Adenosine deaminase (ADA) is considered a biomarker of lymphocyte function in humans and can be measured in saliva. Cats are sentinels for human health and in some cases, they have been used in comparative studies with humans to understand the immune response, for example in coronavirus infection. However, to the best of authors' knowledge, there are no studies on the determination of ADA in feline saliva. Therefore, the aim of this study was to perform an analytical and clinical validation of an assay for the determination of ADA in feline saliva.

For analytical validation, precision, accuracy, and lower limit of quantification (LLOQ) were determined with feline saliva samples. In addition, ADA concentrations were determined in saliva samples from five healthy cats and five cats with inflammatory diseases. Total salivary ADA activity was determined by a commercially available assay (Adenosine Deaminase Assay Kit, Diazyme Laboratories).

Intra and inter-assay CVs were below 15% in all cases. The linearity under dilution study yielded a coefficient of correlation close to 1. The LLOQ was 1.65 IU/L. Salivary ADA values varied from 21.3 to 8211.2 IU/L in cats, being a median of 2.3-fold higher in diseased animals ($P<0.05$).

The results of the present study indicate that ADA can be measured in feline saliva. This study could serve as a basis for future investigations aimed at assessing the immune response in cats in a non-invasive manner.

Poster 4

AMMONIA IN THE SALIVA OF HORSES WITH EQUINE GASTRIC ULCER SYNDROME (EGUS): A POSSIBLE ROLE IN THEIR DEVELOPMENT AS OCCURS IN HUMAN GASTRIC ULCERS

Muñoz-Prieto A.[1], Llamas-Amor E.[1], Contreras-Aguilar M.D.[1], Cerón J.[1], Hansen S.[2]

[1]Interdisciplinary Laboratory of Clinical Analysis (Interlab-UMU), Regional Campus of International Excellence 'Campus Mare Nostrum, University of Murcia, Espinardo, Murcia, Spain; [2]Department of Veterinary Clinical Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Denmark.

alberto.munoz@um.es

Background: Ammonia (NH_3) is considered a possible cause of gastric ulcers in humans, and it is documented that gastric-juice ammonia correlates with the severity of gastritis in people [1]. Equine gastric ulcer syndrome (EGUS) is one of the most frequent diseases in the equine population [2]. The aim of this study was to evaluate if the saliva concentration of ammonia could be related to EGUS. For this purpose, a spectrophotometric assay for measuring ammonia in horse saliva was validated. Previous studies have found that this non-invasive sample can provide information about the EGUS pathogenesis [3].

Material and Methods: Ammonia was determined using a commercially available immunoturbidimetric assay (Spinreact, Girona, Spain) adapted to an automated Olympus AU400 system. The method was analytically validated by determining precision and accuracy (by the linearity under dilution) for horse saliva samples. In addition, ammonia levels of 14 saliva samples of horses diagnosed with EGUS were compared with 12 healthy horses. The unpaired T-test assessed differences between groups. Results were expressed as mean and standard deviation (SD). A $P<0.05$ was considered significant.

Results and Discussion: Analytical validation of the automated ammonia assay showed a maximum imprecision of 5.68 % in the repetition series of saliva samples at different concentrations, and a good linearity under dilution ($R2=0.99$). Ammonia levels were significantly higher in horses with EGUS (5.11±2.45 g/mL ($p<0.001$) compared to healthy horses 0.67±0.47 g/mL. This study indicated that ammonia can be measured precisely and accurately in the saliva of horses. Also, this analyte increases in the saliva of horses with EGUS, suggesting the possible implication of the alteration of gastric mucosa, as previously indicated in human gastritis[1]. In contrast to gastric ulcers in humans, Helicobacter Pylori or any other bacteria has not been accepted to be implicated as part of the pathogenesis of EGUS[2]. Further investigations are warranted to evaluate ammonia as a biomarker for EGUS status in horses.

Conclusion: This study indicated that ammonia can be measured precisely and accurately in the saliva of horses, indicating a possible role in the pathogenesis of EGUS. Further investigations are warranted to evaluate ammonia as a biomarker for EGUS status in horses.

References:

[1] Kearney et al. (2000) Gastric-Juice Ammonia Assay for Diagnosis of *Helicobacter pylori* Infection and The Relationship of Ammonia Concentration to Gastritis Severity. American Journal of Gastroenterology 95: 3399–3403.

[2] van den Boom (2022) Equine gastric ulcer syndrome in adult horses. The Veterinary Journal 283–284: 105830.

[3] Muñoz-Prieto et al. (2022) Evaluation of a Comprehensive Profile of Salivary Analytes for the Diagnosis of the Equine Gastric Ulcer Syndrome. Animals 12: 3261.

Lyra, the Dog

Mimi, the Cat

Maia, the Dog

Bife and Canico, the Dogs