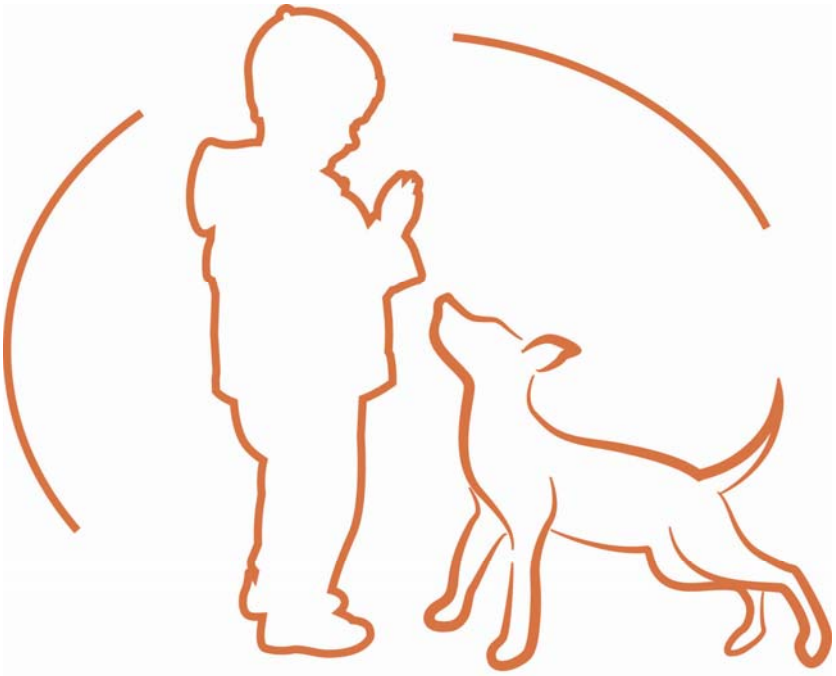

1st International Conference on Dog Population Management

York, 4-8 September 2012

Book of Abstracts

WSPA

fera
The Food and Environment Research Agency

World Health Organization

RSPCA

IFAW.org
INTERNATIONAL FUND FOR ANIMAL WELFARE

HUMANE SOCIETY INTERNATIONAL

OIE

Contents

Oral Presentations

Wednesday, 5 September 2012

Session 1 - General

Dog-borne zoonoses particularly rabies: striking a fair balance between public health and animal welfare considerations

F.X. Meslin[1]; [1]World Health Organization Geneva Switzerland. Email: meslinf@who.int

A small number of zoonoses transmitted from dogs to humans have so far been recognized as important enough in public health terms to require the launching of national prevention and control programmes with international coordination and support. This is the case of echinococcosis, leishmaniasis and rabies in the cycle of which dogs represent the main source of the disease. As a consequence in the absence of other tools the very first attempts at controlling these diseases targeted the dogs as the source of the infectious agent. For dog rabies for example, systematic destruction of dogs in rabies outbreaks started in the 18th century and led to dog rabies elimination at the beginning of the 20th century in parts of Europe. Dog elimination activities continued to represent the mainstay of national dog rabies control programme in many countries during the mid-20th century and beyond particularly in low and medium income countries although new methods for rabies prevention by immunization were progressively developed and applied. During the past 30 years new information has been collected on dogs, particularly in developing countries and more attention has been paid to ethical and animal welfare considerations. Today dog welfare considerably influenced control strategies applied to combat these three diseases.

Zoonoses control and dog population management

M. Kachani[1]; [1]College of Veterinary Medicine, Western University of Health Sciences, California. *Email: mkachani@westernu.edu*

Dog population management is a critical component to any program aiming at controlling major dog-transmitted zoonoses such as rabies, *leishmaniasis* and cystic *echinococcosis* (CE or *Echinococcus granulosus* infection). CE is highly prevalent in most developing countries especially in rural livestock keeping communities. It is caused by *Echinococcus granulosus*, a tapeworm that lives in the intestine of infected dogs and can be transmitted by domestic and feral dogs to humans and livestock. Humans and livestock hosts become contaminated by ingesting ova of the parasite in contaminated food. Dogs become infected when they ingest offal infested with hydatid cysts in slaughterhouses or during home slaughtering. In developing countries where the resources are limited, the control of dog-transmitted zoonoses requires alternatives that enable the reduction of the cost of the relevant control measures. The One Health approach, based on intersectoral collaboration has been promoted worldwide by intergovernmental organizations such as the WHO, FAO and OIE. Integrated control of zoonotic diseases, based on the horizontal approach to disease control has also been recommended to improve cost-effectiveness. Although these approaches enable resource sharing through inter-sectoral collaboration and integrated control, they are generally not applied in reality due to the difficult logistics and the lack of structural and policy frameworks that bridge the gaps between the various sectors involved. Major diseases are still controlled in a vertical manner, or remain widely uncontrolled due to the lack of intersectoral collaboration. In addition, the development of control measures by rich countries does not consider that resource limited countries cannot afford these tools. Developing countries must consider alternatives that enable them to save and share resources such as the One Health approach or the horizontal approach. This paper describes a success story that applied the One Health and the horizontal approaches in a pilot program aiming at controlling CE and rabies in an endemic area using the existing structures and resources at the local level. The project enabled collaboration between several relevant departments and significant financial contributions that allowed cost sharing. The paper discusses challenges, alternatives and opportunities that could be explored by other endemic countries and the lessons learned. It also describes ways to secure contributions from various sectors that are not always associated with disease control. We hope that our experience will be taken into consideration by other endemic countries when they plan to implement control strategies. We also hope approaches that enable to share or save resources at the country or regional or local levels will be considered.

Stray animal practices in Europe: An overview

A. Hammond-Seaman[1]; [1]Royal Society for the Prevention of Cruelty to Animals, United Kingdom. *Email: ahammond@rspca.org.uk*

Attempts to control stray dog populations present a significant problem and are often the cause of public and political debates; some of the main concerns are inhumane practices of catching, inhumane killing practices and poorly resourced services that cannot ensure minimum welfare for the animals in their care. When this is not a problem, and the provision of services, resources, skill s and knowledge are readily available, there is often still the issue of an unacceptably high numbers of dogs being abandoned, relinquished, and euthanized every year because suitable homes cannot be found for them. In 2007 WSPA and RSPCA International supported a survey into stray animal control practices in Europe. 34 animal welfare groups operating in 30 countries in Europe and Eurasia responded to a questionnaire on the control of stray dogs and cats in their country during 2006/2007. In addition to this, data were provided by the competent authorities in five countries. No country surveyed reported that it centrally monitored its national dog population, demographics or trends in ownership. Although 67% gave estimates, those figures were generally collected through commercial activities (kennel clubs, pet food manufacturers). The report included trends in stray dog numbers between 2002-2007: 43% report the numbers remaining constant, 13% report an increase, 9% a decrease, 9% no information, 26% no stray dogs . Although, 87% of surveyed countries had legislation that covered animal welfare, only 42% had legislation that specifically addressed pet ownership. In 61% legislation relating to pets outlined requirements for their care and husbandry, 50% had restrictions in the breeding and selling of dogs and cats. Abandoning was made illegal in 70%, 70% had compulsory licensing or registration system, 77% had mandatory identification yet over 50% report little effect of ID on stray dog numbers due to lack of commitment to effective enforcement. 10% did not permit euthanasia of healthy animals, requiring them to be kennelled for life, or in the case of Greece re-released. In the majority of surveyed countries local and municipal authorities are responsible for the provision of services. One could deduce from this report and from other sources that in large parts of Europe the legislative provisions are adequate and the intervention tools are in place; yet the results are quite disappointing. Too little efforts have been made to invest in preliminary assessment resulting in a lack of consistent data on the population size, source of stray dogs and ownership trends. The gaps and areas requiring improvement all point towards poorly implemented and enforced legislation, lack of political will for a long term commitment, no strategic approach or inadequately resourced and managed strategies. This is further coupled by the lack of technical skill and knowledge, lack of public and community engagement and lack of understanding of the issue which results in misconceptions, poor attitudes towards stray dogs and irresponsible behaviour.

Daring to dream – of National Guidelines for Dog Welfare

T. Helman[1,4], J. Hardaker[2,4], H. Wirth[3,4]; [1]Department of Primary Industries, Australia. [2]Animal Management in Rural and Remote Indigenous Communities (AMMRIC), Australia. [3]Royal Society for the Prevention of Cruelty to Animals (RSPCA), Australia. [4]Australian Animal Welfare Committee (AUSAWAC) Companion Animals Working Group, Australia. *Email: Tracy.Helman@dpi.vic.gov.au*

Australia is a Federation made up of six states and two territories each of which is responsible for its own animal welfare legislation. The Australian Government has no legislative responsibility for animal welfare but plays a leadership role through coordinating the development and implementation of the Australian Animal Welfare Strategy (AAWS). So how can a country that is roughly twice the area of Europe (approx 7.7m square metre compared to 3.5m square metre), that has one of the smallest population density of any continent (6.4 people per square mile compared to Europe's 134 people per square mile), that has highly urban and extremely remote environments with greatly varying western culture and traditional Indigenous cultures, communities and language groups –develop and implement National Guidelines for dogs? Nationally endorsed animal welfare standards have been identified as a key mechanism under the AAWS to improve consistency of animal welfare requirements across the country. The Companion Animals Working Group (CAWG), one of the sectoral groups of AAWS identified the development of national standards and guidelines for dogs as a priority task and formed a small project team to begin work on the issue. The guidelines are being developed to give pet owners and people who live with or amongst dogs' clear information about their responsibilities with regard to the health and well being of dogs, and people. The journey has started, it is an ambitious project and some lessons have been learnt and some wins can be celebrated. How will each State or Territory legislate the standards? How will the enforcement agencies implement the

legislation? Different cultural and language groups accept the Guidelines and will they be adaptable enough to bridge such differences? Will we get there? Find out more at the conference where we will provide the details of the journey so far, tips for new players, lessons to learn and (most importantly) the progress to date.

Session 2 - General

Partners for Rabies Prevention: Working together to reduce the global burden of rabies

S. Cleaveland[1]; [1]College of Medicine, Veterinary Medicine and Life Sciences, University of Glasgow on behalf of the Partners for Rabies Prevention United Kingdom.
Email: sarah.cleaveland@glasgow.ac.uk

The Partners for Rabies Prevention (PRP) is an informal group of stakeholders working in the field of rabies prevention that is committed to reducing the global burden of rabies by sharing time, expertise and resources. The Global Alliance for Rabies Control sits as the secretariat of the PRP. The PRP was initially formed to increase commitment and support for rabies prevention programs across the world. Members of the PRP include experts in the field of rabies and representatives from major international health organizations, (World Health Organization and the Pan American Health Organization, World Animal Health Organization, Food and Agriculture Organization, Centers for Disease Control and Prevention and the Pasteur Institute), academia, animal welfare, and major foundations. Additionally, the PRP includes representatives from private industry. Initially, the PRP developed and agreed upon a "Road Map" as a workable strategy to improve global rabies prevention and control and then the PRP produced the first freely accessible web-based Blueprint for canine rabies elimination and human rabies prevention (www.rabiesblueprint.org). The Blueprint has been translated into French, Spanish, Russian and Portuguese and continues to be regularly utilized by governments and individuals seeking to establish canine rabies control programs. As a follow-up to the Blueprint, the PRP has developed a second chapter that outlines the strategy for oral vaccination to prevent rabies in red foxes. This second chapter of the Blueprint is expected to be online later in 2012. The PRP is currently evaluating the global burden of rabies and is working with human and animal health economists to estimate the cost-benefit of controlling canine rabies across existing canine rabies control programs in Africa and Asia.

The role of dog population management in rabies control

K. Hampson[1], S. Townsend[1], T. Lembo[1], A. Jatikusumah[2], R.A. Arief[2], W. M. D. Widaystuti[2], L. Sikana[3], Z. Mtema[1,3], S. Cleaveland[1]; [1]University of Glasgow UK, [2]Centre for Indonesian Veterinary Analytical Studies, Indonesia [3]Ifakara Health Institute, Tanzania.
Email: katie.hampson@glasgow.ac.uk

Dog population management is widely used in efforts to control canine rabies, usually to complement dog vaccination programmes. Here we discuss different elements of dog population management, their rationale, operational feasibility and utility in practice, specifically estimation of dog population size and accessibility, and methods to control dog population size and turnover. In places where canine rabies remains endemic, most dogs are free-roaming and unrestrained, and preconceptions often exist about the extent of the truly unowned dog population. Knowledge of dog population size and accessibility is therefore an important initial step in terms of planning rabies control activities and is essential for monitoring levels of vaccination coverage achieved. Yet, throughout the world, estimating the size of domestic dog populations presents considerable difficulties. Most estimates are extrapolated from household surveys and mark-recapture transects (often using temporary vaccination collars as 'marks'). Comparing such studies in East Africa and South East Asia we show that there is often considerable variation in human: dog ratios and while predictors such as the dominant religion and livelihood can be used effectively in some settings, in other areas there are few if any such predictors and determinants of dog population size are unknown. We discuss the pitfalls of these methods and pragmatic options for dealing with these issues as part of rabies control programmes. Using data analysis and modelling we explore dynamic demographic, ecological, and sociological responses to culling, birth control and movement restrictions when carried out as part of rabies control measures. We find that a range of counterintuitive epidemiological and demographic

impacts and welfare implications can result. Summarizing these results we identify several key knowledge gaps and present a research agenda to help guide the development of more effective and acceptable dog population management tools for the control of dog rabies.

OIE standards on the control of stray dog populations for rabies prevention and control

M. Martinez Aviles[1], M. Varas[1]; [1]World Organisation for Animal Health (OIE) France.
Email: m.martinez@oie.int

Stray dog population management is an integral part of programmes aimed at reducing the risk of exposure to dog-based zoonoses, being rabies one of the most widespread and with the worst impact considering it is 100% preventable. Rabies is endemic in many countries of Africa and Asia, where rabid dog bites are the main transmission route for human deaths due to rabies. Dog vaccination might have not been implemented at all or insufficiently to stop the transmission cycle. Stray dog population control may be needed to reduce the exposure to bites, to help managing the implementation of a vaccine programme and also to target other dog-mediated zoonoses such as hydatidosis, improving the overall health of communities benefiting from an integrated strategy. The OIE standards recognise the importance of controlling stray dog populations without causing unnecessary animal suffering. The Veterinary Authority is responsible for implementing animal health and welfare legislation, and should work closely with other government and non-governmental organisations and institutions as well as private veterinarians to achieve a humane control of stray dog populations. The OIE Terrestrial Animal Health Code Chapter 7.7 identifies a number of measures to achieve a long term control of stray dog populations. Understanding that euthanasia alone is neither an effective nor a sustainable control measure, the OIE encourages the use of combined measures like promotion of responsible ownership, including registration and identification of dogs; the enforcement of measures to prevent dogs accessing waste and, thus, reducing both the dog populations and human exposure; reproduction control; or using local knowledge and expertise in handling and kennelling dogs for vaccination or implementation of sterilisation programmes. Stray dog population control programmes should first assess the source of stray dog populations taking into consideration social, cultural or environmental aspects in order to find the best approach for that particular situation. With this purpose, veterinarians have to work together with experts in dog ecology, dog behaviour, zoonotic diseases, wildlife, and representatives of relevant stakeholders, including public health officers, being this the reason for which rabies control has been chosen as one of the model examples to apply the One Heath approach.

Impact of dog population and rabies control strategies on people's perception of roaming dogs in Colombo city

E. Hiby[1], B. Hasler[2], C. Sankey[1]; [1]World Society for the Protection of Animals UK; [2] The Royal Veterinary College, UK. *Email: ellyhiby@wspa-international.org*

The human-dog relationship has many faces. In most of Asia, a dog's ownership status is not always clear, as privately or community-owned dogs roam alongside unowned animals. Dogs can be a great enrichment in people's lives but they can also cause severe nuisance (e.g. bites, breeding, fouling), especially in parts of the world where rabies is endemic. Inhumane dog culls, such as poisoning, shooting, gassing, electrocuting, bludgeoning and drowning are often carried out in a misguided attempt to regulate roaming dog populations and control rabies outbreaks. The aim of this study was to investigate the impact of the implementation of a humane rabies and dog population control programme, including mass vaccination and targeted sterilization of dogs and public education, on the population's acceptance of dogs in Colombo City, Sri Lanka. Changes in people's acceptance were assessed in two ways: firstly using data collected in surveys in 2007 and 2010 and secondly using data collected in focus groups in Colombo City. Results showed a higher acceptance of dogs in dog-owners than non dog-owners both in 2007 and 2010. However, the implementation of the rabies control programme led to a significant increase in dog acceptance in non dog-owners from 2007 to 2010. In addition, people perceived a decrease in the number of problems caused by dogs, as well as in the actual number of roaming dogs, which contrasts with the stable numbers recorded by teams of the Blue Paw Trust (local animal welfare organisation). In conclusion, even though the roaming dog numbers remained stable throughout the intervention, dogs were perceived to be fewer and less of a

problem, which could be explained by an improvement of their health status and better behaviour (e.g. less biting, breeding…), thus reflecting the success of the on-going control programme.

Session 3 (parallel) – DPM, rabies and other infectious diseases

Evidence-based control of canine rabies: a critical review of population density reduction

M.K. Morters[1], J.L.N. Wood[1], O. Restif[1], S. Cleaveland[2], K. Hampson[2], A.J.K. Conlan[1]; [1]Cambridge University, UK; [2]University of Glasgow, UK. *Email: mm675@cam.ac.uk*

Control measures for canine rabies include vaccination and reducing population density through culling or sterilisation. Despite evidence that culling fails to control canine rabies, efforts to reduce canine population density continue in many parts of the world. The rationale for reducing population density is that rabies transmission is density-dependent. However, recent evidence suggests that rabies transmission scales independently of density in domestic dogs. Understanding the role of density in the transmission of rabies is critically important to inform rational control policies and prevent further unnecessary killing of dog populations. In this paper we critically review the justification for reducing population density as a means to control canine rabies. We conclude that, although the mechanisms of transmission are still poorly understood, density reduction is unlikely to be an effective control measure.

Results from a street dog and rabies control (ABC) programme in Jaipur, India

J.F.Reece[1], L. Hiby[2], S.K. Chawla[3]; [1]Help in Suffering, India. [2]Conservation Research Ltd., Cambridge, UK. [3] Humane Society International, India. *Email: jack@his-india.in*

Help in Suffering (HIS) has been running a street dog population and rabies control programme (the ABC programme) in Jaipur, India (pop 3 million) since 1995. The ABC programme aims to sterilise and vaccinate against rabies street dogs, and also to collect data about the dog population and the programme's effects upon it. The programme sterilises about 3,000 – 3,500 dogs mainly bitches per year using a right flank surgical ovariohysterectomy. Surveys indicate that between 70 and 80% of bitches have been sterilised, and that over 70% of the total roaming dog population has been vaccinated against rabies. Index of abundance surveys from 1997 to date show a decline of 53.5% in the free roaming dog population of a defined but large area of the city. Data collected throughout the programme have allowed estimations of demographic data on street dogs to be made. These estimations, together with the records maintained by the programme, have enabled estimations of the total street dog population. While acknowledging the poor quality of human rabies data in India, publically available figures from the city's main hospital suggest a decline in human rabies cases from those areas covered by the ABC programme, while showing an increase in cases from other areas. The annual number of human animal bite cases has declined from over 7 per thousand of population to under 3 per thousand over the duration of the ABC programme. Some evidence suggests this is due both to a reduction in dog numbers and also a change in dog behaviour in this period. Recent comparative work on dog pathology done in part at HIS suggest that the free roaming dog population in Jaipur is healthier than in other cities in Rajasthan where ABC programmes have been operating for shorter periods of time, or not at all. Initial challenges of the ABC programme were logistical; how to catch, handle, spay etc large numbers of dogs in a welfare friendly manner. Lack of experience and knowledge about ecology and population biology caused difficulties in data collection and handling. These problems have largely been solved with greater experience and understanding. The ambivalence of local government and officials, their lack of understanding, corruption, and short term outlook continue to pose difficulties which arise from time to time.

Dog management in city parks: a one health approach investigating *Echinococcus multilocularis*, *Giardia* spp. and *Cryptosporidium* spp. in urban coyotes and domestic dogs in Calgary, Alberta, Canada

A. Massolo[1,2],S. Liccioli[3], A.Smith[1], K.Lamy[4], J.Greenwood-Lee[2, 5], G. Mccormack[2, 5], P. Duignan[1], S. Kutz1, M. Rock[2, 5], N. Neumann[6] [1]Dept. of Ecosystem and Public Health, Fac. of Veterinary Medicine, Univ. of Calgary, Canada; [2]Institute for Public Health, Univ. of Calgary, Canada; [3]Dept. Biological Sciences, Univ. Calgary, Canada; [4] Fac. of Environmental Design, Univ. of Calgary, Canada; [5]Dept. Community and Health Sciences, Fac. Medicine, Univ. Calgary, Canada; [6]School of Public Health, Univ. of Alberta, Canada. *Email: amassolo@ucalgary.ca*

Due to urbanization, interactions between humans, domestic animals (dogs and cats) and wildlife have increased in parallel with the risk of disease transmission. Some wildlife species, such as the Coyote (*Canis latrans*) are widely distributed and abundant in North America and are also common in urban landscapes. In 2009, we started a research program to identify the potential for transmission of gastrointestinal (GI) parasite (i.e. *Giardia*, *Cryptosporidium*, and *Echinococcus* spp.) between coyotes, domestic dogs and people in city parks in Calgary, AB. We collected coyote carcasses (91) and faeces from coyotes (N=248) and dogs (N=494), and detected *Echinococcus multilocularis* in 15% of urban coyotes against 25% in the rural surroundings. *Giardia* spp. was found in 20% of coyotes and 24.7% of dogs (with different strains, mostly not zoonotic) and *Cryptosporidium* spp. was detected in14.7% of the dogs in urban parks We also detected an association between GI infections in dogs and the frequency with which dogs were observed off-leash, possibly related to the frequency of faecal contamination in urban parks with an average of 3.1 kg of dog faeces/ha left on the ground per week. By assessing the presence of *E. multilocularis* in intermediate hosts (rodents) and characterizing the strains of *Giardia* and *Cryptosporidium* spp. in coyotes, wild prey species, water sources and dogs, we aim to track potential routes of infection, and to assess the infection risk for people walking their dogs in city parks. These results will be used to raise awareness in dog owners and local authorities on the risks of diseases transmission between species and to improve dog management and owners' responsible behaviour.

Simplicity, complexity and chaos in Indian dog population management: what has gone wrong, what has gone right, what can be done and why should we persevere?

L. Warden[1]; [1]DOGSTOP, Jakarta, Indonesia. Email: lisa.warden@gmail.com

India is a dynamic, living laboratory in which to examine the viability of "ABC", or spay-neuter and anti-rabies vaccination, as official government policy for the management of free-roaming dogs. Twenty years since the first agencies began implementing ABC in India, and over 10 years since it became law, free-roaming dogs still abound, and rabies remains a serious issue. Are we on the right track? In theory, the plan is simple enough: catch, sterilize and vaccinate over 70% of the street dogs in India's cities and return them to their original locations. Couple the intervention with public sanitation reform in order to shrink the habitat for scavenger species, and it should be realistic both to eradicate rabies, and decrease numbers of free-roaming dogs. Notable successes include parts of Chennai, Mumbai, Jaipur, Visakhapatnam, Sikkim and Kalimpong. In practice, the equation has proven much more complex. Obstacles to the successful implementation of ABC are rife. These obstacles stem from three basic sources: individuals, NGOs and municipal administrations. Individual-level obstacles to successful ABC include people who kill or remove dogs, those who prevent the release of sterilized, vaccinated street dogs back into their communities, people who feed street dogs without sterilizing them, and those who allow their pet dogs to breed with street dogs or abandon them to the streets. NGO-level obstacles to the successful implementation of ABC include inadequate funding, capacity, skills, management and numbers of NGOs doing the work; corruption among NGOs (for example, notching ears without sterilizing the dogs, or profit-motivated, poor quality surgeries with dogs released the same day to generate a profit through higher turnover); unscrupulous, poorly managed NGOs killing dogs in the catching and/or transport process or in the course of botched surgeries. Lack of monitoring, oversight and transparency among implementing NGOs is a serious problem. Examples of municipal obstacles to ABC include lack of funds to run the programs, rogue municipalities engaging in mass, illegal killings of dogs, dumping dogs on city outskirts in response to public complaints, corrupt officials misdirecting funds intended for ABC and, in cases where governments themselves implement the ABC program, a lack of adherence to proper protocols, resulting in mass dog suffering and death, while exacerbating dog-human conflict and rabies transmission. If things are so bad, should we persevere with ABC? The answer is yes; it is still

our best option. The various success stories demonstrate that good ABC is achievable in India, and evidence to date indicates that removal of dogs or killing, even if by humane means, does not effectively address issues of over-abundance and rabies. The only solution is to persevere in tackling both canine fertility and human ignorance. An affordable, single-dose chemical sterilant would solve many, but not all problems. In the interim, sustained public education, sanitation reform, ABC capacity-building for NGOs and government administrations, and greater monitoring, accountability and transparency for all involved in the process would assist in the achievement of a humanely and scientifically managed street dog population in India.

Controlling rabies through "One Health" approach in Shimla Town, Himachal, India

O. Kumar[1], A. Phull[2]; [1]State Epidemiologist for government of Himachal Pradesh, India. [2]Bureau Chief Daily Post English Daily India. *Email: bhartiomesh@yahoo.com*

Background: Shimla, the capital town of North Indian hill state of Himachal Pradesh (HP) bordering China, has a population of 1, 65,000. The One health approach being followed to combat rabies has yielded encouraging results in the hill town. The approach, however, was not being governed under one umbrella till three years back. The health and Municipal Corporation (MC) authorities were separately looking into their own mandate in this regard until the HP High Court intervened and asked Shimla MC to control the dog menace. Methods: Our approach has been on all the three fronts. Dogs (and Monkeys) are being sterilized and vaccinated and a dog pond has also been created. The biomedical waste and other organic waste that used to be thrown in the open dustbins till a few years back is not in practice now. All open dustbins have been demolished and door to door garbage is being collected by private players on payment basis and transported in closed vehicles to the respective dumping sites for incineration or scientific waste management. A low cost intra-dermal anti-rabies vaccination clinic for animal bite patients takes care of the medical intervention effectively by making the vaccination affordable to people. We did a quick comparison with Srinagar, a capital town of neighbouring hill state of J&K. Results: Out of estimated 6500 dogs 5725 dogs have been sterilized and vaccinated since 2006. In Himachal, there were 15968 dog bite cases in 2009, 17690 in 2010 and 20609 in 2011. In Shimla town we had 1430 dog bite cases in 2009, 1095 in 2010 and 2022 cases in 2011. In the last three years, we have treated all 8801 dog and monkey bite patients through low cost intra-dermal technique through pooling strategy, saving USD 313,112 of the poor patients. The patient load has increased 2.8 times and poor patient load 3.2 times within a month of start of low cost intradermal anti-rabies clinic in DDU Hospital, Shimla. If we compare the results with Srinagar, there were average 13481 dog bites per year and the cost of routine intramuscular doses is 479,612 USD which is unaffordable and many dog-bite cases miss the vaccination. A project to control dog population through 1800 dog ponds and 30 teams of dog catchers for Srinagar city is estimated to cost 192,307,692 USD, which is again unaffordable. The dog to human ratio in Srinagar is 1:14, one of the highest in the India (1:36). Conclusion: Despite multiple efforts, dog bite cases are on the rise all over. But we do not have any rabies death in Shimla town for the last three years compared with the state of HP where "One Health" approach is missing and three rabies deaths reported this year till April 2012. The One Health approach can do wonders to control rabies, but the costs involved may be a dampener to do that. Efforts to have strategies to reduce costs involved can help "One Health" approach to be more acceptable to decision makers.

Session 4 (parallel) Human attitudes and current practices

Leveraging the power of tourism to help international tourist destination communities humanely control stray dog populations

D. Webster[1], D. Galati; [1]CANDi-Cats and Dogs International, USA.
Email: diana@candiinternational.org

CANDi-Cats and Dogs International works with the tourism industry, travellers, and animal lovers to saves the lives of stray cats and dogs in Mexico, the Caribbean, and other international destinations through spay and neuter, adoption and education programs. CANDi's presentation will discuss how tourism can contribute to the humane management of the stray dog population at international tourist destination communities via the sheer scale of the economic and political clout the industry wields,

e.g., the tourism economy represents 5 per cent of global GDP, while it contributes to about 8 per cent of total employment. International tourism ranks fourth (after fuels, chemicals and automotive products) in global exports, with an industry value of US$ 1 trillion a year, accounting for 30 per cent of the world's exports of commercial services or 6 per cent of total exports. Thus, with the economic influence that tourism corporations can bring to bear on tourist destination businesses and governments, more sustainable and humane methods of controlling stray dog populations can be established and made part of a community's culture. For example, preventing pre-world event (such as the Olympics or World Cup) mass killings and culling of stray dogs by implementing spay and neuter campaigns and rescue efforts prior to the event, funded in part by travel businesses and corporate event sponsors. Also, we will discuss the partnerships that CANDi has developed with major tourism corporations such as Air Transat to provide tourist destination communities with sustainable solutions for the humane treatment of animals such as spay/neuter campaigns, stray dog rescue transports, and education for local community members and governments. Finally, we will present the preliminary findings from our Humane Research Council grant-funded research on the financial impact of stray dogs on tourism. To gather this data, we are implementing a nationally representative survey of travellers regarding their perceptions and responses, including future travel purchases indicators, to seeing stray dogs at tourist destination communities while on vacation. Secondary data research will focus on available travel corporation, tourism agency, and ministry of tourism information from international organizations and governments.

A retrospective cohort study on investigating factors that influence 'consumer' choice when adopting a shelter dog

C. Siettou[1], I. M. Fraser[1], R. W. Fraser[1]; [1]University of Kent, School of Economics, UK.
Email: cs453@kent.ac.uk

The UK has a reputation of being an 'animal lover nation' indicated by the fact that almost half of its households report having a family pet (PFMA, 2011). The majority of these families consider their pets as members of their family, with the leading species for companion animals in the UK being a dog. The PFMA reported that 32% of the dogs acquired in 2008 were from a rescue centre, making shelters an important outlet for obtaining a dog. In this paper we examine consumer preferences for acquiring a dog from a rescue centre using a unique data set. To date, many studies have examined this special human-animal relationship. Most focus on the psychological aspects and have adopted a theoretical approach (eg., Holbrook et al 2001; Dotson and Hyatt 2007; Mosteller 2008). Studies that do engage in an empirical analysis are focused mainly on the US pet market and therefore the results may not be applicable to the UK market (eg., Lepper et al, 2002). The limited available empirical literature for the UK mostly includes studies that address the issue of successful permanent rehoming and factors of relinquishment (eg., Diesel et al 2005; Diesel et al 2010). Thus, the purpose of the present study is to further the literature by examining consumer preferences for rescue dogs and identifying the factors that influence their choice. The aim of the study is to examine which characteristics of the dogs offered from a large rehoming organization in the UK were more attractive to prospective adopters. The underlying conceptual framework is based on the Lancaster model of consumer demand. The main objective is to investigate the likelihood of a dog being adopted based on the dog's advertised set of characteristics. The revealed preference data we use to model consumer choice is from the Dogs Trust 'rehoming' webpages. The analysis of the probability of adoption was undertaken using a logistic regression model. The factors that were found to have a significant impact on the adopter's choice were age, size, coat length, behaviour (e.g. fearfulness, adjustment issues), dog friendliness, child friendliness, and training. Overall, this study offers an empirical analysis of adopters' preferences that could prove to be insightful to shelter personnel and researchers interested in the analysis of pet markets. Shelter personnel could derive useful information regarding preferences in relation to dog characteristics which could help in understanding which dogs are perceived as more adoptable. For researchers, the outcome of this study could be considered as a primary investigation of the under-researched field of pet markets and could become a point of reference for further analysing the UK companion animal market with empirical research.

Human attitudes towards dog owner responsibilities in a semi-rural community in south-central Chile

G. Pérez [1], E. Garde [1]; [1]Veterinarians Without Borders/Veterinarios Sin Fronteras, Canada, Latin America Branch, Chile. *Email: guillermo.perez@vwb-vsf.ca*

Attitudes toward dog responsibility were assessed by delivering surveys to adult residents in 145 random households of a semi-rural community in south-central Chile. Adult dog owners and non-owners were asked whether or not they thought the following categories were necessary responsibilities of a dog owner: to provide food, water, appropriate nutrition, health, safety, vaccinations, deworming, sterilizations, training, hygiene, exercise, socialization, grooming, happiness, homes for puppies generated by their dog, and choosing a proper dog breed depending on family dynamics and home characteristics (i.e., yard size). Using a chi-square test of association, to examine possible relationships between people with different education levels, and owners and non-owners, we found significant differences in responses between respondents who had completed a junior-high school versus post secondary education level, as well as responses between dog owners versus non-owners. To determine which of the listed categories were more widely recognized as duties of a dog owner, we summed the affirmative responses, and assigned scores of low (<33%), medium (33.1 to 66.0%) and high (>66.1%) support to each category. Non-dog owners showed unanimously high support for all categories of dog ownership, indicating a collective awareness of the array of responsibilities of a dog owner. To the contrary, dog owner respondents showed high support only for feeding, providing a nutritious diet, and vaccinating their dog, medium support for providing hygiene, safety and deworming, and low support for providing water, health, socialization, training, grooming, exercise, sterilization, finding homes for puppies, and providing happiness for their dog. Our results suggested that even though the level of responsibility of dog owners in this Chilean community is far from that outlined by international standard posted by the OIE, it is par with those found in other developing nations around the world. We discuss the importance of obtaining this type of baseline data, in developing culturally relevant solutions.

Working with communities on canine population management in Todos Santos, Guatemala

E. Stiles[1], A. Pulczer[1]; [1]Veterinarians without Borders/Vétérinaires sans Frontières-Canada, Canada. *Email: enid.stiles@vwb-vsf.ca*

Using community outreach programs, household surveys and mark-recapture dog population estimates, the primary purpose of the study was to develop and implement a community based canine population management program in 12 communities of Todos Santos, Guatemala. The secondary purpose was to provide data with regards to interest and acceptance of canine chemical castration by community members (dog owners) and complication rates associated with chemical castration using an intratesticular injection of zinc gluconate neutralized by arginine (EsterilSol™). Household surveys were performed six times between May 2008 and July 2011 in all 12 of the study communities. The estimated study region covered 80 hectares. Between January 2009 and July 2011, six mark-recapture dog counts were performed in order to estimate the number of un-owned free roaming dogs in these communities. Multiple community outreach meetings took place with members of the local government and community leaders, as well as promotional media prior to and during the implementation phases of the project. Chemical castration using EsterilSol™ was performed on 183 dogs and surgical ovario-hysterectomies was performed on 59 female dogs in January and November 2009 and November 2010. Within these 12 communities there were 472 inhabited households in which 2454 people lived (2008)(i). In December 2008, the mean number of dogs per household (MNDH) was 0.76 and there were 352 owned dogs. In June-July 2011, the MNDH was 0.67 and the total number of owned dogs was 309. Mark-recapture studies from January 2009 to July 2011 have shown that the estimated number un-owned dogs in the 12 communities has reduced from 90 dogs to an estimated 63 dogs using a Schumacher-Eschmeyer regression estimate with 95% CI. Based on household surveys (June-July 2011), 79.5% of owned male dogs aged > 3months and 49.6% of female dogs aged > 3 months were sterilized. Prior to the initial campaigns, 0% of all female dogs were sterilized and 10% of all male dogs > 4 months were sterilized. In 2011, 65.1% of the respondents to household surveys believed there was a reduction in the dog population. Also in 2011, 96.8% of household respondents felt there was an improvement in the general health of their dogs over the past 3 years. Complications associated with the use of EsterilSol™ were seen in 2/183 dogs (1.1%). One of these complications resulted in surgical scrotal ablation. A community based approach to canine population management using chemical castration and surgical female

sterilization has, in part, led to an overall reduction in population density of dogs in these 12 communities. Chemical castration using EsterilSol™, appears to be acceptable method of male dog sterilization. In this study, EsterilSol™ injections resulted in a 1.1% complication rate.

Session 5 (parallel) – DPM, rabies and other infectious diseases (continued)

Review of dog population management in urban China

Pei Feng Su[1]; [1]Deepashree Balaram ACTAsia for Animals, UK. *Email: pei@actasia.org*

This presentation will cover the current status of dog population management in different regions of China today, and a study of dog keeping regulations in 15 Chinese cities. China has no animal protection laws, and only relatively recently allowed the breeding and keeping of pets. Pet ownership is increasing in China and this has resulted in different companion animal problems. Regulations on pet keeping vary from province to province, with differences in restrictions on the height and numbers of pets allowed, vaccination requirements, neutering awareness, animal care, and commercial breeding and sale of these animals. Registration of owned animals is compulsory in cities where dog keeping regulations are in place, but owners often avoid registering their animals for various reasons. Pet shops and markets are flourishing. There are no regulations to ensure even minimal animal welfare standards. These animals are not vaccinated, neutered, or even treated with a basic standard of care and disease prevention. Many of these animals are believed to be sourced from suppliers who maintain breeding factories, again with inadequate standards of care. Many die before they reach a final owner, or within a short time after that. Animals that become sick after being sold are often abandoned, becoming a major source of stray animals. The current standard government response to a case of human rabies in an area is indiscriminate massive killing of owned and stray animals, even vaccinated animals. For instance in June 2009, over 20,000 dogs were killed inhumanely because of rabies in Hanzhong City, Shangxi Province. According to the media, between 2006-2010 over 43 cities (in 19 provinces) had at least one large scale dog killing incident, and over 110,000 dogs were killed. 17 of these cities ordered the killing because of human rabies, 7 because of dog bites, and 19 for a 'more civilised and hygienic city'. Sterilisation of dogs is a relatively new concept. Cultural obstacles and myths about neutering contribute to problems with population management. Encouragingly, the dog keeping regulations in major cities usually allow a significant reduction of registration fees to encourage the sterilisation of owned animals. Animal rescue groups are also actively promoting sterilisation programmes in the community. ACTAsia for Animals has held annual veterinary training workshops over the last 3 years, to get vets involved in rabies control, sterilisation of animals and promotion of animal welfare in the profession and community. In addition, the organisation works with Chinese animal protection groups to build capacity and increase their understanding of the elements needed for humane and effective companion animal population management. It has also conducted seminars for the replacement of current large scale indiscriminate, inhumane catch and kill efforts with humane and effective rabies control programmes. There is an urgent need for international efforts from other sectors besides animal protection to promote a humane and effective dog management policy in China, by in-depth interaction and knowledge sharing with central and local government, legislators, academics, epidemiologists and other stakeholders.

Prevalence of Infectious Disease in Dogs of Mainpat, India

K. C. Polak[1], J. K. Levy[1], C. M. McManus[1], L. A. Andersen[1], C. M. Leutenegger[2], E. Dubovi[3], M.R. Lappin[4], C. A. Hanlon[5], M. L. Bush[6], L. P. Mayer[6], T. Tsori Rinpoche[7]; [1]Maddie's Shelter Medicine Program, College of Veterinary Medicine, University of Florida, USA; [2]IDEXX Reference Laboratories, USA; [3]Animal Health Diagnostic Center, College of Veterinary Medicine, Cornell University, USA; [4]College of Veterinary Medicine, Colorado State University, USA; [5]Rabies Laboratory, College of Veterinary Medicine, Kansas State University, USA; [6]Senestech Inc, USA; [7]Yogi Tsoru Dechen Rinpoche Foundation, USA. *Email: polakk@ufl.edu*

Free-roaming dogs in India pose serious public health and animal welfare concerns due to a lack of routine veterinary care. Dog bites affect approximately 15 million people in India annually leading to 20,000 rabies-associated deaths. Programs combining surgical sterilization and rabies vaccination

have been shown to dramatically reduce both dog numbers and rabies transmission, but little is known about other infectious diseases of free-roaming dogs in India. The objective of this study was to determine the prevalence of infectious diseases in dogs in the rural Phendeyling Tibetan Refugee Settlement of Mainpat and surrounding Indian villages in Chattisgarh state, India. Both Tibetan and Indian residents keep dogs as pets and numerous street dogs are supported by sympathetic residents. Although residents reported observing and culling dogs suspected of being rabid each year, only 5% of dog owners reported their dogs were previously vaccinated against rabies. Blood samples collected from dogs participating in a rabies vaccination program were tested by serology and PCR for a panel of infectious diseases. Dogs were considered positive for previous or current infection if either serological or molecular tests were positive. Samples were collected from 88 pet dogs and 28 street dogs. Positive results were obtained for parvovirus (92%), distemper virus (77%), *Toxoplasma gondii* (76%), adenovirus (62%), hemotropic Mycoplasmas (37%), *Anaplasma* sp. (21%), Dirofilaria immitis (15%), *Ehrlichia* sp. (13%), *Babesia* sp. (13%), and *Leptospira interrogans* (11%). *Brucella* sp., *Bartonella* sp., *Borrelia burgdorferi*, and *Leishmania donovani* were not detected. There was no significant difference in the prevalence of infectious diseases in different dog populations with the exception of *Babesia* sp., which was more common in street dogs (30%) than in pet dogs (8%) (P=.026). The prevalence of virus neutralizing antibodies against rabies virus was similar in both stray (9%) and pet dogs (7%). Of 5 dogs reported to have been vaccinated against rabies in the past, only 2 had neutralizing antibodies. Infectious diseases of both canine and zoonotic importance were common in this dog population, regardless of ownership status. Antibodies against parvovirus and distemper virus indicate widespread infection with these highly pathogenic viruses since vaccination is very uncommon. Toxoplasmosis, although common in dogs, is not a zoonotic concern unless dogs are consumed. Multiple vector-borne diseases were identified, most of which have little zoonotic potential but can cause substantial morbidity in dogs. Although the prevalence of *leptospirosis* was low, the potential for contamination of water sources, particularly during the monsoon season, represents a zoonotic concern. Most dogs lacked evidence for protection against rabies, even if the owner believed they were previously vaccinated. Both dog welfare and public health would be protected by implementation of a sustainable program of dog population control by neutering accompanied by vaccination and parasite control.

Situation of rabies, dogs management in Viet Nam and methods prevent and control

Van Dang Ky[1]; [1]Epidemiology Division of Department of Animal Health, Ministry of Agriculture and Rural Development in Vietnam. *Email: vandangky@yahoo.com*

Vietnam has a large Domestic dog population. While ownership of exotic breeds for pets is increasing, the majority are local breeds kept as guard dogs, or bred for human consumption. Many families keep up to 4 dogs, often in conjunction with cats. Management of dogs and cats is weak. Most are kept unrestrained, able to freely scavenge, with few wearing collars or muzzles, the level of rabies vaccination is low and no animal registration is required. Rabies is endemic in Vietnam. Over the last 5 years, 96% of the approximately 90 annual human fatalities were related to contact with dogs, 3% cats and 1% other animals. 2011 saw a higher number of cases reported, with 89 fatalities from 20 provinces where patients were not provided with post-exposure vaccination. Rabies surveillance in animals is implemented by the Department of Animal Health (DAH), with support of provincial Sub DAH, District Veterinary Stations, Commune People's Committees, commune animal health workers and dog owners. While there were 72 cases reported for dogs in 2011, this is likely an underestimation, due to the common habit of allowing dogs and cats to roam free, and since most investigations are reactive, occurring only after a human case is reported. DAH is improving diagnostic capacity within the veterinary services by establishing three rabies diagnostic laboratories (in Hanoi, Da Nang city and Ho Chi Minh City). Vietnam's dog vaccination program, consisting of two rounds of vaccination annually (April – May and September – October), has resulted in vaccination of 50-60% of the total dog and cat population (>90% vaccination in urban areas, compared to <50% in rural and remote regions). The main constraints in disease control and prevention are the free-ranging nature of dog populations, ineffective vaccination and poor awareness of rabies amongst the general population. Possible solutions include better implementation of existing Rabies legislation, improved implementation of vaccination campaigns and compulsory registration, reduction in free-ranging dog populations, improved control of dogs in public areas (collars, leads, and muzzles where appropriate), better management of dog movements and improved awareness of the dangers of rabies, the importance of vaccination and the need to implement control and prevention measures. From 2011 to 2015, the Ministry of Agriculture and Rural Development (MARD) will cooperate with the Ministry of

Health (MOH) to implement a National Program on Rabies Control and Elimination. The objectives of the program are: -Improved community awareness of rabies control and prevention. -Improved rabies surveillance in both humans and animals. -80% of dog population registered -80% of the dog population vaccinated against rabies. -Human fatalities reduced by 30% by 2015 -80% of provinces free of rabies in animals. A recently established model of dog management resulted in 20 wards and communes in Ho Chi Minh City being certified rabies free by DAH Viet Nam. This model will now be applied nationally. Effective collaboration between the ministries responsible for human and animal health will result in considerable improvement in rabies control in the future.

Session 6 (parallel) – DPM in practice

Demography and health of village domestic dogs west of Serengeti National Park, Tanzania

A. Czupryna[1,2], L.J. Faust[1], M. Bigambo[1], J.Brown[2], R. Santymire[1]; [1]Lincoln Park Zoo, USA, [2]University of Illinois at Chicago, USA. *Email: aczupr3@uic.edu*

Free-roaming domestic dogs, *Canis familiaris*, live in a dynamic and complex system affected by humans, disease, and wildlife. Since 2003, domestic dogs have been annually vaccinated for rabies and canine distemper in villages surrounding Serengeti National Park in Tanzania. As a result, the incidence of rabies has declined in human, dog, and wildlife populations. However, the full impact of the vaccination program on dog population dynamics remains unclear. We initiated a four-year longitudinal study to determine the effects of the vaccination program on domestic dog population dynamics by characterizing and comparing dog demography, welfare, and ownership practices in villages within the current vaccination zone (n=2) and outside the vaccination zone (n=2). We are collecting demographic data (life expectancy, survival, reproduction) by following the life histories of individually marked free-roaming dogs. We assess the welfare of study dogs with body condition scores and fecal glucocorticoid metabolite (FGM) concentrations. Finally, we are collecting ownership practice data (feeding, parasite prevention, participation in vaccination) with questionnaires for households owning study dogs. We began in 2010 by marking 877 dogs from 420 study households. In 2011, the one-year survival of adult dogs was 73% in the vaccination villages and 67% in the non-vaccination villages (likelihood chi-square=2.77, df=1, p=0.096). We also marked an additional 275 dogs. Puppies (<6.5months) had lower survival rates than adults in all villages (likelihood chi-square=66.0, df=1, p<0.01). Adult male dogs had higher survival rates than adult females (likelihood chi-square=8.5, df=1, p=0.004). Average body condition score of all adult dogs was 3.4 (1-9 scale, 1=poor, 5=ideal, 9=obese) and similar between vaccination and non-vaccination villages (F1,857= 2.1, p=0.15). Body condition score of male dogs was higher than that of female dogs (F1,857=9.286, p=0.002). Body condition scores of dogs in 2010 strongly anticipated survival into 2011. For example, adult dogs with a body condition score of 1(poor) had a 33% probability of surviving one year compared to dogs with a body condition score of 5(ideal), which had an 85% probability. FGM concentrations did not differ amongst the four study villages (F3,268= 0.22, p=0.89) or between non-vaccination and vaccination villages (F1,270= 0.001, p=0.98). There were also no differences (F1,270= 0.84, p=0.36) in FGM between male and female dogs. These data suggest that factors other than vaccination may play a role in dog population dynamics. Body condition scores and FGM could be influenced by ownership practices such as feeding and parasite prevention. We will continue to examine these effects through household questionnaires. We will present preliminary data from the first two years of the ongoing four-year study. Additional field seasons will offer a better understanding of domestic dog population ecology in the context of the Serengeti ecosystem. This research will provide vital information to plan, implement, and continue dog rabies vaccination programs in the Serengeti and in other areas where domestic dogs are a public health and conservation concern.

American Strays Canine Census & Film Study

T. McPhee[1], [1]World Animal Awareness Society, USA. *Email: tommcphee@wa2s.org*

The mission and impact of American Strays is to develop an accurate count of dog populations in the city of Detroit while developing a set of data collection tools built in a user-friendly template and given away to animal NGO's the world over. The PBS ready feature documentary American Strays is the focal point of the outreach campaign and select short video clips will be used to illustrate the widely

varying points of understanding and the challenges of not having real data to support dog population management initiatives. The Canine census will help define the abundance & distribution of species, show trends in species population over time, and provide insight into relationships between animal populations and human activities within the region. The resulting data will be given to government and non-governmental organizations, using it to conduct more accurate & cost effective activities that address REAL problems/needs. The initial WA2S census/survey intends to reveal the dynamics surrounding the population of free-roaming canines within the geographic boundaries of the City of Detroit.

Stray dog population dynamics at University of Sao Paulo Campus, Brazil

R. A. Dias[1], A. G. A. Guilloux[1], A. J. Silva e Alves[1], L. I. Panachao[1], G. I. Polo[1], O. S. Baquero[1]; [1]Laboratory of Epidemiology and Biostatistics, Faculty of Veterinary Medicine, University of Sao Paulo, Brazil. *Email: dias@vps.fmvz.usp.br*

A longitudinal study is being carried out to describe the stray dog population dynamics in the University of Sao Paulo campus, Brazil from November 2011 to January 2013. The campus is located inside the urban area of Sao Paulo, the biggest city of Brazil, with a human population over 11 million. Its 4.2 km2 are walled, with 10 access gates, allowing stray dogs to move in and out freely. Over 100,000 people and 50,000 vehicles circulate in the campus daily. Four observations are going to be made during the study period, using a two-sample method. The same route is going to be performed in all observations, being travelled twice each day. Observed animals are going to be photographed and the sight coordinates were obtained using a GPS device attached to a photography camera. Animals are going to be captured, identified with a microchip and blood, feces and ticks are going to be taken. The population is going to be screened for Ehrlichia sp., Hepatozoon sp., Leishmania sp., Brucella canis, rota and coronavirus, endo and ectoparasites. Complete hemograms are going to be made. The results are going to be compared to the results of the population dynamics from a longitudinal study performed from November 2010 to November 2011 in the same location. In this work, no interventions were made in the population. Until September 2012, two captures are going to be made and preliminary results will be available. This population showed susceptibility to difference between inward and outward dog movements. Overlapping home ranges were observed in areas where most of the people circulate, corresponding to the docile dogs. An elusive group was observed close to a protected rain forest area, and no overlapping with other dog's home ranges was observed for this group. A spatial correlation between dog sight and food sale points was observed, rather than trash bins. A kernel density map showed that high stray dog density is associated with larger organic matter generators, such as university restaurants. One can conclude that the preferred food source is the leftover food deliberately offered by the restaurant users.

Thursday, 6 September 2012

Session 7 - General

High Volume CNVR

M. Jones[1], A. Rowan[2]; [1]Humane Society International UK, [2]Humane Society International USA. *Email: mjones@hsi.uk.org*

HSI has been implementing street dog sterilization programmes since 1999 and has been developing and refining a high-volume same-day, catch, neuter, vaccinate and return (CNVR) approach. This technology is now being deployed to sterilize approximately 75-80% of all street dogs in Bhutan (as of April, 2012, around 55% of the dogs had been sterilized, vaccinated against rabies and treated for other conditions where necessary). This presentation will review the process of developing this approach and will show data on outcomes that demonstrates that the approach is humane and effective. Adverse post-operative outcomes occur at lower frequency and with less severity than sterilization surgeries at teaching institutions in developed nations. It appears as though the secret to an effective and humane CNVR program is to have well-trained catchers and well trained and skilled

veterinary staff who can perform the surgeries very quickly through small incisions thus minimizing exposure to pathogens and to anaesthetic agents. Both catching and veterinary staff clearly benefit from the volume of catching and surgery. There are also indications that CNVR leads to changes in human-dog interactions that benefit both dogs and the human communities.

A review of the interactions between free-roaming domestic dogs and wildlife

J. Hughes[1]; [1]Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, UK. *Email: joelene.hughes@zoo.ox.ac.uk*

Negative impacts from the introduction of domestic animals in an area pose particular issues for biodiversity conservation as they are intimately tied to the economic, social and political values of local people, requiring interdisciplinary cooperation for successful outcomes. For example, previously issues raised by domestic cat colonies have divided conservation biologists, animal welfarists and the public, affecting conservation actions and management. Conservation problems that domestic dogs may pose have been poorly studied but are attracting increasing attention. Dog management is already carried out by human health and welfare groups in order to improve welfare and reduce disease spread, primarily rabies. By systematically reviewing information about interactions between dogs and wildlife, this research aims to provide a clear summary of current knowledge of conservation issues and facilitate interdisciplinary collaboration between conservation biologists and experts from other fields. Studies on interactions between free-roaming dogs and wildlife, primarily in rural areas, were gathered from searches of 7 online databases and other sources. In total, 69 peer-reviewed studies were found. The wildlife taxon mainly studied was mammals (78%) and the main interaction recorded was predation by domestic dogs, followed by disease transmission, disturbance of wildlife, hybridization and predation of dogs by wild carnivores. Conservation issues with domestic dogs were recorded from around the world, both on islands and continents. Suggestions of solutions were limited or not offered beyond extermination which, given the close relationship between local people and dogs, will not be appropriate in many situations. We propose some steps that will aid cooperation with other groups and enhance the effectiveness of conservation activities. We also used information from these studies to revise the global domestic dog population abundance to an estimated 770 million.

Population dynamics of free-roaming dogs in a remote Australian aboriginal community

G. Brown[1], R. Spencer[2]; [1]Faculty of Veterinary Science, University of Sydney, Australia; [2]School of Natural Sciences,University of Western Sydney, Australia. *Email: graeme.brown@sydney.edu.au*

Despite the significant impact they have had on both humans and the natural environment, there have only been limited studies into the population biology and ecology of free-roaming dogs in remote Aboriginal communities in Australia. Most remote Aboriginal communities have large dog populations. These free-roaming dogs, which are usually known as ‘camp’ dogs, are basically a hybrid of the dingo *Canis lupus* dingo and the domestic or European dog *Canis lupus familiaris*. They have a close association with the Aboriginal people who live in these communities and play a significant social and cultural role in their lives. However, there are now problems in remote Central Australian desert communities associated with the large numbers of dogs. Problems such as scavenging for food and spreading garbage are common and the likelihood of contracting zoonotic diseases is increased. The large numbers of dogs in many of these communities is of concern to the community councils and are considered to be a Public Health risk. Earlier observations populations of free-roaming dogs in remote Aboriginal communities in Central Australia suggest that some form of natural population regulation and limitation may be taking place. One of the current proposals being considered is to reduce dog numbers to more tolerable levels by using newly developed non-surgical sterilisation techniques. However, very little is known about the population structure, distribution and dynamics of dogs to generate the specific management plans for a population control program The aim of this study was to assess the population structure and dynamics of a free-roaming dog population in Central Australia. With few exceptions, all the dogs in a remote Aboriginal community in the Tanami Desert were caught and identified, and the sex and age group determined over four years. There were factors affecting the survivability of free-roaming dogs and recruitment levels were relatively high. Data on growth, survival and fecundity were used to produce population-projection matrices to model population dynamics and management options for reducing the number of dogs belonging to this community, by either using sterilisation techniques or euthanasia of unwanted dogs, or both.

Beyond the Five Freedoms: a rubric for the welfare of companion animals
H. Lentz[1], K. Nattrass Atema[1]; [1]The International Fund for Animal Welfare, USA.
Email: llentz@ifaw.org

Animal-based measures (ABMs), originally extrapolated from the "Five Freedoms" are increasingly used to measure animal welfare in husbandry systems, assisting stakeholders in assessing the impact of variations and modifications in care. The assessment of companion animals has traditionally lacked effective ABM-type measures, with the "Five Freedoms" being relatively vague and difficult to legislate, enforce, and effectively teach when given the wide variety of communities, cultures and practices affecting animal well-being. The International Fund for Animal Welfare has developed a rubric, extrapolated from the Five Freedoms, to more specifically describe the welfare requirements of dogs and cats in the context of their local community. The rubric specifically outlines the needs of companion animals and offers a clear goal for policymakers, enforcement officials and caretakers in any community, anywhere in the world. The concept can guide the approach to improving dog welfare through real-life application, ultimately leading to sustained, measurable improvements in the harmony between companion animals and human communities.

Rabies control in Bali: animal welfare and mass dog vaccination
E.Russell[1], C. Sankey[1], E. Hiby[1], R. Mitchell[1]; [1]World Society for the Protection of Animals, UK.
Email: esmeerussell@wspa-international.org

Rabies is a fatal zoonotic disease: 55,000 human deaths are reported each year (and probably many more unreported), predominantly in Asia and Africa – and mostly children. More than 95% of human cases are caused by a bite from a rabid dog. In response to a rabies outbreak, governments, both local and national, organise mass dog culls in an attempt to eliminate this disease. Rabies-driven culls cause the needless deaths of millions of dogs each year. They are killed in horrific ways including gassing, electrocution, shooting, poisoning and beating. Compounding the colossal tragedy of the inhumane deaths of dogs is the fact that these culls are ineffective and often even counterproductive in the fight against rabies. Mass culling has consistently failed to stop the spread of rabies. One example is Bali: in late 2008, a rabies outbreak occurred in the previously rabies-free island of Bali, Indonesia, where hundreds of thousands of dogs are roaming. Like in many other countries around the world, the emergency response included a widespread dog cull. Scientific evidence shows that vaccinating 70% of a dog population creates a barrier of healthy immune dogs that stop the disease from spreading. In response to the vast and unnecessary killing of dogs in Bali, WSPA worked together with the Bali Animal Welfare Association (BAWA) and convinced Bali's government to stop killing dogs and to implement an island-wide mass dog vaccination programme, saving over 300,000 dogs from a needless death. In March 2011, 210,000 dogs had been vaccinated, thus reaching the 70% coverage. During this 6 months mass dog vaccination campaign (October 2010-March 2011), there was a 35% decrease in human rabies deaths and a 76% decrease in dog rabies cases (compared to April-September 2010). The tragedy of rabies is that it is entirely preventable. The tools are available and all we need is the political will to free the world from the ongoing tragedy of rabies.

Session 8 – Fertility control

Non–surgical methods of dog population control – A brief overview of current and future opportunities
J. Briggs[1], [1]Alliance for Contraception in Cats & Dogs, USA. *Email: Joyce@acc-d.org*

Sterilization is established as an effective and humane means for controlling free-roaming populations of cats and dogs as it improves the lives of the sterilized animals and prevents unwanted litters. Yet due to the time, cost, and technical requirements of surgical sterilization, animal birth control programs are often unable to sterilize the numbers of animals needed to control the population. Alternative methods of sterilization which are safe, effective, affordable, and easy-to-administer could offer immense benefits, allowing animal welfare organizations, governments, and public health programs to reach further with limited resources. The Alliance for Contraception in Cats & Dogs (ACC&D) is a nonprofit organization working to make dog and cat sterilization faster, easier and less expensive by advancing development of non-surgical methods of sterilization. This talk will give an

overview of the current status of contraceptives and non-surgical sterilants, including who's involved, what's available now, and new momentum created by the $75 million Michelson Prize & Grants in Reproductive Biology launched in 2008, as well as a range of other initiatives. While work is underway on future technologies for sterilizing cats and dogs, several exist for use now. One is an injectable sterilant for male dogs, based on zing gluconate, that causes permanent sterility in a single treatment. It is has received regulatory approval in the United States, Mexico, Bolivia, Columbia and Panama and it is likely to be introduced in other countries. However, even where this product is not yet registered, it is sometimes possible for an individual organization to get permission to import it for field research. The talk will share lessons learned from ACC&D's international grant programs supporting field studies on this product in several new markets, as well as ongoing current behavior study being conducted in Chile. There is another zinc gluconate-based product marketed in Brazil, and research is underway on other alternatives. Another contraceptive, based on the gonadotropin releasing hormone agonist deslorelin, is commercially available as an implant for male dogs in 6 and 12 month doses and marketed in Australia, New Zealand and the EU. Approved for contraception of male dogs, it is also effective in female (and in cats). The talk will illustrate preliminary data from use of deslorelin in female dogs. A third contraceptive still at the research stage, is a GnRH-based immunocontraceptive, approved in 2010 in the U.S. for use in deer and also used in field studies in female and male dogs will also be discussed. The talk will illustrate several other novel research approaches to the development of contraceptives or sterilants for dog; approaches that include vaccines, cytotoxins, and gene silencing, with targets ranging from the brain and pituitary to the gonads.

Non-surgical sterilisation: the tip of the iceberg for dog population management

G. Massei[1], L. A. Miller[2]; [1]Food and Environment Research Agency, UK; [2] USDA/APHIS/Wildlife Services/National Wildlife Research Center, USA. *Email: giovanna.massei@fera.gsi.gov.uk*

In recent years, the potential market for contraceptives and a growing public interest in alternatives to surgical sterilization for companion animals, wildlife and livestock have fostered investments and research into the development of novel fertility control agents. As a result, new contraceptives and sterilants for companion animals have emerged and are being evaluated at present in dogs. Non-surgical sterilisation is increasingly advocated as a humane approach to manage overabundant dog populations. A fertility control agent suitable for dog population management should have the following characteristics:1. no unacceptable side effects ; 2. be effective in one-two doses; 3. render all or the majority of animals infertile for one or more years; 4. prevent reproduction in females but ideally in both genders; 5. be safe when administered to pregnant animals; 6. be relatively inexpensive ; 7. be species-specific if orally delivered and 8. be stable under field conditions. Very few of the currently available drugs meet most of the above requirements. The first part of this presentation will compare contraceptives currently available for dogs and will discuss those that have potential for large-scale dog population management and factors to consider when choosing these drugs. These factors include differences in life history traits between confined and unowned dogs, societal attitudes and expectations towards fertility control, animal welfare concerns and cost of drugs. Identifying the appropriate contraceptives for the right contexts will improve the effectiveness, efficiency and public acceptance of fertility control to manage dog populations. However, for practical applications, identifying suitable fertility inhibitors is only the first step (the "tip of the iceberg") of the many aimed at developing a strategy based on fertility control to manage dog populations or to eliminate zoonoses. Further steps include validating the results obtained in single studies and evaluating feasibility, costs, welfare and sustainability of fertility control for dog population management. For instance, the effectiveness of contraceptives, expressed as both the proportion of dogs rendered infertile and the duration of infertility, may vary between studies conducted in kennels and studies carried out on free-roaming animals or between populations of dogs in different countries. Understanding the variability of response to fertility inhibitors and the factors affecting this variability will allow managers to customise fertility control programmes to specific contexts. Fera and the NWRC have developed protocols for studies aimed at testing the effectiveness of immunocontraception in Greece, Nepal and Italy. From an ecological perspective, dogs can be regarded as other synantropic wildlife species whose subsistence and relatively high densities depend on human presence. Before fertility inhibitors can be employed to control free-roaming dog populations, numerous issues routinely addressed by ecologists and wildlife managers must be considered. The second part of the presentation will focus on the wider context of dog population management through fertility control and explore challenges, opportunities and lessons learned from wildlife management.

Advancements in a GnRH Immunocontraceptive vaccine to provide effective, low cost contraception for managing feral/free ranging dogs in conjunction with rabies vaccination programs

K. A. Fagerstone[1], L. A. Miller[1]; [1]USDA/APHIS/Wildlife Services/National Wildlife Research Center, USA. *Email: kathleen.a.fagerstone@aphis.usda.gov*

Scientists at the U. S. Department of Agriculture's (USDA) Wildlife Service's (WS) National Wildlife Research Center (NWRC) in Fort Collins, Colorado have developed an Immunocontraceptive vaccine (GonaConTM) that can induce multi-year infertility with a single injection. GonaCon™ vaccine stimulates the production of antibodies that bind to the gonadotropin-releasing hormone (GnRH), a hormone the signals the production of sex hormones. By binding to the GnRH, the antibodies reduce GnRH's ability to stimulate the release of sex hormones, inhibiting sexual activity. The NWRC has had numerous requests from US Tribal Nations, Asia (India, Indonesia), South and Central America (Mexico, Brazil), Europe, and Africa for use of GonaCon to vaccinate feral or "loosely owned" dogs concurrently with rabies vaccination as part of a rabies management strategy. Fertility control by immunocontraception could provide a humane, cost-effective alternative to surgical sterilization that could be used together with injection of the rabies vaccine to reduce the spread of rabies in stray dogs. GonaCon™ is currently registered by the U.S. Environmental Protection Agency for use in white-tailed deer, a native species that has become overly abundant in many parts of the eastern U.S. The GnRH vaccine has undergone numerous changes since it was first conceived that have allowed scale-up and a decrease in cost. These have included purchase of wholesale reagents, use of injectable quality water for all reagents, optimization of reagents, improvement in quality of reagents, and improvement of manufacturing procedures to allow for scale up. All of these changes have been implemented to provide a high production, low cost vaccine for large scale use in dog contraceptive/rabies vaccination campaigns. In addition, changes to the vaccine composition have been made to reduce the severity of injection site reactions that were visible in dogs vaccinated with the EPA-registered formulation. The NWRC has partnered with the Navajo Nation and with Mexico to conduct pen trials of GonaCon and the newer GnRH formulation with dogs. The NWRC is now seeking partners to develop, register and manufacture a GnRH vaccine for use in feral or "community owned" dogs throughout the world.

Effectiveness and safety of the use of Deslorelin acetate in bitches for contraception

I. Reichler[1], J. Palm[1], M. P. Kowalewski[2]; [1]Small Animal Reproduction, Vetsuisse Faculty, University of Zurich, Switzerland. [2]Insitute of Veterinary Anatomy, Vetsuisse Faculty, University of Zurich, Switzerland. *Email: ireichler@vetclinics.uzh.ch*

The agonists of the Gonadotropin Releasing Hormone (GnRH) can be used for pro- or anti-fertility purposes in males and females of almost all species. The GnRH-agonist Deslorelin acetate (DA) is being successfully used to achieve a transient infertility in male dogs and is currently more frequently used off-label for bitches in private practice. A preliminary study performed in intact bitches with Deslorelinacetate showed postponement of oestrus for periods of up to 27 months. We performed a retrospective study, based on an owner and private practitioner questionnaire, on 102 female dogs treated with DA for oestrus suppression. Data on the success of treatment and side effects were collected and analysed. The desired effect of the treatment, the suppression of oestrus without the occurrence of metropathy (M), was achieved in 48% of cases. In contrast to the results of the preliminary study , we noticed signs of oestrus in 26 out of 55 bitches treated during metoestrus with a confirmed progesterone level above 5ng/mL. Furthermore in our study of 102 patients 10 dogs with and 6 without clinical signs of oestrus developed a metropathy. Six of these dogs also showed a reduced general condition. Treatments included ovariohysterectomy in 14 bitches, implant removal and conservative treatment in the remaining two patients. Bitches that developed a metropathy were significantly older, with a mean age of 62 months [31; 150], compared to the unaffected dogs (20 months [8; 46], $P<0.0001$). Persistent oestrus occurred in 11 bitches, 7 of which had to be treated by ovariohysterectomy (n=5) or implant removal (n=2).

Session 9 (parallel) – Conservation, ecology and behaviour

On the concept of dominance in domestic dogs: do free-ranging dogs live in structured social groups? Implication for management of dog populations in Italy

E. Natoli[1], R. Bonanni[2], S. Cafazzo[2], E. Barillari[3], A. Abis[4] and P. Valsecchi[2]; [1]Azienda USL Roma D, Veterinary Hospital, Italy; [2]Department of Evolutionary and Functional Biology, University of Parma, Italy; [3]Agenzia Regionale Protezione Ambiente Calabria (A.R.P.A.Cal)- Dipartimento di Catanzaro-Servizio Bionaturalistico, Italy. [4]Associazione Il Tuo Parco, Presidio ecologico Torino, Italy. *Email: enatoli@tiscali.it*

The concept of social dominance has contributed greatly to our understanding of social structure in animals. Since the first description of the peck-order in hens, there has been a considerable debate about the meaning and the applicability of this concept. However, recently, it has appeared a real prejudice on the existence itself of a dominance hierarchy in domestic dogs. Actually, there is currently no much information on intraspecific relationships in domestic dogs since there are not many canine social groups suitable for behavioural studies: in westernized countries the presence of stray dogs is forbidden by law and few citizens have more than 2 dogs. Therefore, intraspecific social relationships are poorly understood. Moreover, the possibility that free-ranging dogs form stable social group was highly debated. Available literature on the eco-ethology of stray/feral dogs concerns limited-size (1–8 dogs) groups in which dominance hierarchies and their influences on social dynamics have never been studied systematically. The aim of this study was to review the analyses of the social structure of 5 groups of sub-urban free-ranging dogs (range 3-27 dogs) that could breed and move freely, but were dependent on human beings for food, plus one group living in a fenced area in a shelter. Spacing pattern, territorial, agonistic and affiliative behavior, cooperation and leadership behaviour were analysed. Data were collected (from 2003 to 2008) via focal animal sampling and ad lib sampling methods. We tested the transitivity of dominance relationships and we carried out non-parametric statistical tests, two-way and one-way ANOVA and generalized linear models. All statistical tests were two-tailed. We found that dogs were organized in highly structured packs characterized by a linear dominance hierarchy; packs travelled as a coordinated unit and were highly cooperative in intra- and inter-group conflicts. The rank order did not change in different contexts (food, receptive females or absence of sources of competition). Frequency of agonistic behaviors was higher in the presence of receptive females and even higher in the presence of food. Urine marking and ground-scratching behaviors were associated with territorial defense and were influenced by social status. Dominance hierarchies appeared to influence population dynamics: dominance rank was a strong predictor of copulatory success in males, and of “number of puppies surviving to sexual maturity” in females. Moreover, some males helped females in pup defense and puppies’ survival at sexual maturity was 50%. In spite of the process of domestication and the effects of artificial selection, domestic dogs’ sociality seems to be more complex than recently asserted. This assessment will be discussed in the contest of the debate on the dominance concept and as a tool for the management of free-ranging dog populations in Italy.

Behaviour assessment of male dogs pre- and post surgical and non-surgical sterilization in Puerto Natales, Chile

E. Garde[1], J. Serpell[2], G. Pérez[1], R. Vanderstichel[3], N. Zenteno[4], P. Dalla Villa[5]; [1]Veterinarians Without Borders/Veterinarios Sin Fronteras- Canada, Chile. [2]School of Veterinary Medicine, University of Pennsylvania, USA. [3]Atlantic Veterinary College, University of Prince Edward Island, Canada. [4]Servicio Agrícola y Ganadero (SAG), División de Protección Pecuaria, Chile. [5]Istituto G.Caporale Teramo, Italy. *Email: elena.garde@vwb-vsf.c*

Large populations of free-roaming dogs (FRDs) present a serious and overwhelming human-animal conflict affecting animal welfare, public health, wildlife conservation and local communities relying on livestock. Although sterilization is one of the most commonly utilized methods of population management world-wide, in developing regions such as Latin America, sterilization campaigns are biased towards females because people either find that the sterilization of male dogs is culturally unacceptable or they are completely unaware that male sterilization is an option. Traditionally, surgical castration involving the removal of both testes has been the international standard for male sterilization due to its proven efficiency and positive results. However, surgical castration has its limitations when attempting to control large populations of FRDs, such as equipment transportation to

remote areas, and limited availability of expertise, resources, finances and time. As a result, the possibility of providing non-surgical sterilization options is attractive in some cases. Although safety data are abundant for both techniques, there are no published studies describing the changes in reproductive and roaming behaviours in FRDs following sterilization. To explore this question we are presently investigating the potential behavioural changes observed in 157 male FRD's in Patagonia, Chile following chemical(Esterilsol™) and surgical sterilization. Here we present our methodology and preliminary data. Our project design involves the collection of relevant information pre- and post-sterilization using owner questionnaires, video-recordings to document day-time behaviours, and GPS technology to determine 24-hour ranging patterns. One of the expected outcomes of this project is to contribute new information about the effects of sterilization on male behaviours to the growing body of knowledge about FRDs. Competent authorities, population control managers, veterinarians and owners must be able to make more informed decisions about the use of male sterilization as an integral part of management. Our results will provide needed information so that we can offer more culturally, socially, economically and biologically appropriate options for the diverse situations in which we work.

Potential effects of sterilization and culling on owned dog population dynamics in urban areas of Itabirito, Brazil – Preliminary results

O. Santos[1], A. L. F. Bastos[2], M. X. Silva[2], R. V. G. Alcon[2], P. R. de Oliveira[2], R. A. Dias[1], F. Ferreira[1]; [1] Departamento de Medicina Veterinária Preventiva e Saúde Animal da Faculdade de Medicina Veterinária e Zootecnia da Universidade de São Paulo, Brazil; [2] Departamento de Medicina Veterinária Preventiva da Escola de Veterinária da Universidade Federal de Minas Gerais, Brazil. Email: *oswaldo@vps.fmvz.usp.br*

A deterministic mathematical model based on differential equations was implemented to asses the potential effect of sterilization and culling rates. The assumptions of the model were: constant yearly sterilization and culling rates, the sterilization is irreversible, the population growth is subjected to density dependence, all young born fertile and carrying capacity is determined by the dog:human ratio. The total number of owned dogs was obtained from yearly census made in the urban area of the municipality. The programs of urban fauna control and reproductive control of Itabirito supplied the number of culled and sterilized dogs concerning to 2007 – 2010. Birth and mortality rates were calculated from data collected on a cross-sectional study between 2010 and 2011. The mean of the total number of dogs for the four years was 7241.5. The carrying capacity was 32.6 dogs/km2. The birth, mortality, sterilization and culling rates were 0.523, 0.18, 0.027 and 0.021 respectively. The simulation showed that the effects of sterilization and culling rates implemented in the Municipality were similar at long term but neither of two would have the potential to reduce population density more than 5 % in ten years. To reduce population density in 20 % in five or ten years, it would be needed to spay 22 % or 20 % of females respectively. Current sterilization rates has the potential to prevent population density increase, however, it must be increased if the aim is the reduction of this density.

Disease control through fertility control: Secondary benefits of animal birth control in Indian street dogs

A. J Yoak[1], I. M. Hamilton[1], S. D. Gehrt[1], J. F Reece[2]; [1]The Ohio State University, Department of Evolution, Ecology, and Organismal Biology, USA; [2]Help In Suffering ABC Program USA. *Email: yoak.4@osu.edu*

Animal birth control (ABC) is a crucial element to any humane, effective, and science-based dog population management program as it lowers the canine population while simultaneously providing rabies vaccinations. In the developing world, dogs are the main sources of not only rabies but also numerous other pathogens important to dog, human, and wildlife health. In Rajasthan, an arid state in northwestern India, ABC programs were established at differing times in different cities, providing a natural opportunity to compare their effects on dog health. Previous work has shown that street dogs who have been treated by an ABC program to be significantly less likely to suffer from disorders when compared to sexually intact dogs. This caused us to predict ABC having a positive effect on untreated dog's health when they are living in cities with high percentages of treated dogs. The Help In Suffering program in Jaipur has been sterilizing and vaccinating street dogs since 1995 and The Marwar Animal Protection Trust has been doing the same in Jodhpur since 2005. We carried out an expansive survey of street dogs in both Jaipur and Jodhpur as well as a third city, Sawai Madhopur, which has never

received any dog veterinary care, to compare multiple disease's local prevalences. Dogs in Sawai Madhopur were vaccinated against rabies during the survey and a free rabies vaccination and education camp was established with the help of local government veterinarians. Our results show that both the presence and the length of time an ABC program is running has generally positive impact on the canine disease prevalence, often with important zoonotic and wildlife benefits. Dogs in ABC cities are significantly more likely to have higher body condition scores, lower rates of open wounds, exposure to infectious canine hepatitis, *Ehrlichia canis*, *leptospira serovars*, and flea infestations. In addition, we provide reports on the prevalence of canine distemper virus, canine parvovirus, *Brucella canis*, hookworm, *Toxocara* spp., *Toxascaris leonia*, *Taenid* spp., and various tick species. This is the largest survey that covers such a wide variety of canine disorders (15) in so many individual dogs (343) and one of the first to be carried out in multiple locations (3) simultaneously. This work provides a clear link between lowered zoonotic disease risk from street dogs in cities with effective dog population management strategies, providing substantial benefits to all potential susceptible species in the area.

Session 10 (parallel) – Fertility control (continued)

Effects of Simultaneous Intramuscular Injections of GonaCon™ and Rabies Vaccine in Captive Female Dogs (*Canis familiaris*) in Mexico

L. Lecuona[8], F. Vargas-Pino[1], V. Gutiérrez-Cedillo[1], F. Jorge[6], I. Fuentes[2], A. M. Tavares-Jiménez[2], E. J. Canales-Vargas[2], L. R. Gress-Ortega[2], J. M. Méndez-García[2], L. A. Miller[3], K. A. Fagerstone[3], C. E. Rupprecht [4], D. Slate[5], S. Bender[6], P. García-Reyna[7], Juan Ocampo-López,[7]; [1]Mexican Ministry of Health, Mexico. [2]State Health Services in Hidalgo, Mexico. [3]National Wildlife Research Center USDA/APHIS/WS, USA. [4]Rabies Section. CDC, USA. [5]USDA/APHIS/WS, Concord, NH 03301, USA. [6]Navajo Nation Veterinarian Program, Navajo Nation Department of Agriculture, USA. [7]Hidalgo State Autonomous University, Mexico. [8]USDA/APHIS/IS-WS/Mexico City Mexico.
Email: Luis.Lecuona@aphis.usda.gov

Mexico serves as a global model for achieving important advances in rabies control in dogs (*Canis familiaris*). The Mexican Ministry of Health applies approximately 16 million doses of parenteral canine rabies vaccine each year for dog rabies control. The reduction in dog rabies cases reported during the past 20 years demonstrates the effectiveness of these campaigns in protecting against rabies. A collateral effect of rabies protection is dog overpopulation. Therefore it is necessary to enhance public awareness to reinforce the role dog owners play in the reduction of the risks associated with dog overpopulation to human and animal health. Spaying and neutering remain important components to prevent reproduction, but are intrusive, time consuming and not practical for achieving broad dog population management goals. Therefore the Mexican Ministry of Health and USDA/APHIS/WS, with the technical support of the Rabies Section of the CDC, collaborated on a study of the immunocontraceptive vaccine GonaCon™ in captive dogs in Mexico. GonaCon™, which is registered for use in Cervids in the US, was initially tested in captive free roaming dogs on the Navajo Nation, Chinle, Arizona. The Mexican trial tested an improved formulation of GonaCon™ in Hidalgo State with the participation of the State Health Services as well as the local institutions and organizations during 2011. Three groups of 6 female dogs were used in this study. The first group received rabies vaccine, the second GonaCon™ and the last group received GonaCon™ and rabies vaccine. Vaccines were delivered by IM injection. All animals were placed under observation and evaluated clinically during a 61-day period. Results of the medical and clinical evolution of the animals, as well as the blood serum results for CBC, BCP, VNA, THR and GNRH measurements and comparisons on D0, D31 and D61 will be presented. The preliminary conclusions show that adverse effects of GonaCon™ were less frequent and in lower intensity than reported in the previous dog study. The immune responses to the rabies and GonaCon™ vaccines were not limited by the simultaneous administration of these products. Also, observations of the macro and microscopic lesions will be presented that are consistent with findings of the previous GonaCon™ study.

The use and training of zinc gluconate neutralized with l-arginine for male dog sterilization in global and shelter situations

G. R. Weedon, DVM, MPH[1]; A. E. Fischer, PhD[2]; [1]College of Veterinary Medicine, University of Illinois, USA;[2]Department of Animal Sciences, University of Illinois, USA.
Email: weedonr@illinois.edu

Zinc gluconate neutralized with l-arginine (zinc neutering) is a permanent, one-time injectable sterilant for use in male dogs. It is currently being used globally and will soon be available for shelters in the United States. Zinc neutering does not require general anesthesia, so it is safe, less expensive, and faster than surgical castration. The authors will discuss their experiences with the use of zinc gluconate neutralized with l-arginine in both global, and shelter situations. Additionally they will discuss how teaching US veterinary students about zinc neutering and its use has led to its increased awareness, and will lead to additional animals being sterilized both globally and in shelter locations. In the United States, the majority of the dogs are owned, and considered pets. However in most developing nations, only a small percent of dogs have owners in the Western sense. Globally, in the past, local governments have typically resorted to inhumane extermination methods to control their free-roaming dog populations. For a number of reasons, U.S.-style animal care and control—where homeless dogs and cats are housed in shelters for potential adoption—isn't a realistic solution. It is equally clear that mass killings aren't effective in reducing populations over time or protecting people from disease. In many communities, financial, geographic, and cultural barriers make population control via surgery an unlikely possibility. Imagine how a nonsurgical sterilant like zinc gluconate neutralized with l-arginine could be used in such an environment. While in the United States, the number of animals euthanized in shelters has been reduced significantly, down from 115 animals per 1,000 population in 1970, to 12.7 animals per 1,000 population in 2010, there are still animals reproducing that put a burden on animal shelters in many communities. While great strides have been made in developing high-quality high-volume spay/neuter programs, there are a number of obstacles to sterilizing enough animals that would result in no adoptable animal being euthanized. Many barriers—cultural, social, and economic—exist to sterilization; this is particularly true with the castration of male dogs. Zinc neutering does not require the same facilities or equipment as surgery and its use offers a way around these barriers to increase the likelihood that a greater number of male dogs will be sterilized.

Use of deslorelin implants in the suppression of dogs' fertility

C. Navarro[1]; [1]Virbac Animal Health, Medical Department, France. *Email: christelle.navarro@virbac.fr*

Gonadotrophin Releasing Hormone (GnRH) is the master hormone controlling mammalian reproductive physiology. When given over a sustained period of time, GnRH analogues induce desensitisation of the GnRH-receptors (GnRH-R) and consequently prevent the release of gonadotrophins leading to infertility. Deslorelin is a superagonist of GnRH with a higher binding affinity for the GnRH-R and therefore better potency than GnRH. An implant containing deslorelin is available for dogs in Europe, Australia and New Zealand (Suprelorin ND, Virbac, France). Its lipidic matrix provides a sustained release of deslorelin over time. Two dosages (4.7mg and 9.4mg) are available with 2 different formulations: the matrix of Suprelorin 9.4mg is less permeable to water and consequently release of deslorelin is slower in comparison with Suprelorin 4.7mg. The licensed indication for these implants is the temporary suppression of fertility in mature male dogs during at least 6 months (Suprelorin 4.7mg) or at least 12 months (Suprelorin 9.4mg). Trigg et al. showed that the duration of action might be longer in small dogs (up to 400 days in dogs under 10 kg bodyweight with Suprelorin 4.7mg) and that repeated implantations of dogs induced prolonged infertility. Recently, studies have been performed to assess the use of this product in bitches. In a study conducted by Romagnoli et al., the implants were effective for suppression of fertility in adult bitches during a prolonged period of time (at least 5 months with Suprelorin 4.7mg and 11 months with Suprelorin 9.4mg) and no sign of heat was noted for periods of up to 4 years. Implants can also be used to postpone puberty in prepubertal bitches. Deslorelin implants have also demonstrated an efficacy in the treatment of disorders related to spaying such as urinary incontinence or puppy hair coat syndrome [4]. In a recent review of its various uses, Fontaine and Fontbonne reported that the implants could be used safely. The only unwanted effects were a slight and transitory inflammation at the site of implantation and a decrease of the testis' size. Deslorelin implants are an efficient and safe method to suppress fertility in male and female dogs. They are also successfully used to decrease

some unwanted effects of surgical neutering. An area of active research is the use in prepubertal animals which allows a prolonged infertility with minimal side effects.

Effects of prepubertal GnRH agonist administration in domestic cats: Preliminary results

C. Gobello[1], A. Carranza[1], P. E. de la Sota[1], J.D. Diaz[1], P. Blanco[1], Y. Corrada[1]; [1]Faculty of Veterinary Medicine-National University of La Plata & National Research Council, Argentina.
Email: cgobello@fcv.unlp.edu.ar

Domestic carnivores overpopulation is a severe social and sanitary problem in many countries. Safe, efficient and practical pharmaceutical compounds are still needed to control reproduction in these species. Due to their developmental similarities, the domestic cat (*Felis catus*) is a good model to study certain aspects of canine reproduction. Continuous administration of gonadotropin-releasing hormone (GnRH) agonists act through desensitization and down-regulation of pituitary GnRH receptors, which in turn causes gonadotrophin depletion. It was hypothesized, that in cats, as in other mammals, GnRH agonists, administered at a "critical postnatal period" may impact adversely on reproductive development and function. To assess the efficacy (i.e. adverse reproductive effect) and clinical safety of the postnatal administration of a long term release GnRH agonist on domestic cats, 20 half or full siblings postnatal (within the first 24 hours of birth) kittens were randomly assigned to deslorelin acetate 1.6 mg sc (n = 7) or placebo (n = 13) during a period of 36 weeks. The kittens were clinically and endocrinologically followed until puberty (defined as complete balano-preputial separation+penile spines or > 80 superficial cells in vaginal cytology for male and female cats, respectively) or up to the time of writing. The frequency of cats that achieved puberty and presented side effects were compared between groups by Fisher Exact Test. Estradiol (females) and testosterone (males) concentrations in feces, body measures and scrotal volume were analyzed by ANOVA for repeated measures. Results were reported as (x±SEM) and the level of significance was set at $p < 0.05$. Two control and one deslorelin-treated animals dropped out of the study due to reasons unrelated to the treatments. At the time of writing, none (0/6) of the deslorelin treated cats (ages: 15 to 36 weeks) and 7/11 of the placebo- treated females (16.5±0.7 weeks) and males (21.3±1.5 weeks) achieved puberty ($p<0.1$). The remaining placebo animals (n=4/11) are < 15 weeks of age. No differences were found for body weight (females $p>0.1$; males $p>0.1$), withers height (females $p>0.1$; males $p>0.1$) and body length (females $p>0.1$; males $p>0.1$) between groups. In control animals, scrotal volume became higher throughout time ($p=0.01$). Conversely, fecal estradiol 17- ($p=0.01$) and testosterone ($p>0.1$) were lower in deslorelin- treated cats. No clinical or behavioral side effects were observed in any (0/20; >0.1) animal. In this trial, the long term release GnRH agonist, deslorelin seems to safely prevent puberty in domestic cats. Further follow up of this study is underway. Acknowledgement: Found Animals Foundation D0910-F14

Session 11 (parallel) – Fertility control (continued)

No adverse effects of simultaneous vaccination with the chemical sterilant Zinc gluconate neutralized by arginine and a commercial rabies vaccine on rabies virus neutralizing antibody production in dogs

S. C. Bender DVM[1], D. L. Bergman[2], M. Wang [3], B. Corbett [3]; [1]Navajo Nation Veterinary Program, USA. [2]USDA APHIS Wildlife Services, USA. [3]Ark Sciences, USA.
Email: scottbender@navajo-nsn.gov

Parenteral vaccination campaigns and dog population control are integral to the elimination of canine rabies. To ensure herd immunity in dogs, a chemical sterilant Zinc gluconate neutralized by arginine (zinc gluconate) provided at the time of rabies vaccination should eliminate fecundity and dog abundance. Zinc gluconate neutralized by arginine has been used successfully as a chemical

sterilization method in male dogs. As an initial step in evaluating a chemical sterilization campaign in combination with a veterinary vaccination program, we assessed the effects of Zinc gluconate neutralized by arginine on a parenteral vaccination of a rabies vaccine. Eighteen feral/free ranging dogs were included in this initial study: six were given Zinc gluconate neutralized by arginine only, six were given rabies vaccination only, and six were given Zinc gluconate neutralized by arginine and a rabies vaccination. Antibody levels were documented over 28 days. The use of the chemical sterilant Zinc gluconate neutralized by arginine did not adversely affect the ability of dogs to seroconvert in response to a rabies vaccine. Thus, Zinc gluconate neutralized by arginine provides a potential chemical sterilant in combination with a rabies vaccine will provide a potential new combination for dog's rabies and population control.

Calcium chloride nonsurgical sterilization: a comparative review of studies, with regulatory status and implications for field use

E. Lissner[1]; [1]Parsemus Foundation, USA. *Email: Lissner@ParsemusFoundation.org*

Calcium chloride nonsurgical testicular injection has been known to be effective as a male dog sterilant since the 1970's, yet only in recent years has research systematically addressed the most common questions: Does it hurt? Is it humane? How long does swelling last? How does it compare to zinc gluconate injection in testosterone reduction, and how much behavior change results? With an FDA-approved zinc gluconate male sterilization injection unavailable outside the U.S. and Central America and dog population management at crisis stage for many groups in Europe, Africa, Asia, and Oceania, these questions take on greater urgency. This presentation reviews the current state of calcium chloride research and field use, comparing strengths and limitations of studies from the U.S., saline and alcohol bases; India, lidocaine base; Turkey, saline base; Italy, alcohol, lidocaine, and saline bases comparison; and our own pilot studies in four juvenile goats, alcohol and lidocaine bases. We present conclusions regarding which solution bases (saline, alcohol, or lidocaine) are most effective and result in the fewest adverse reactions, along with photo and video documentation of use and animal reaction. Because calcium chloride sterilant's ingredients are readily available (calcium chloride dihydrate USP from a laboratory chemical supplier, plus food-grade 95% alcohol) and it can be mixed and sterile-filled by a qualified compounding pharmacy for less than 1 dollar / Euro per dose (or, if absolutely necessary, mixed on site and sterilized through a syringe filter), it is beginning to see use in the United States as an alternative to inhumane home castration procedures on rural farms in remote regions without access to affordable veterinary care. However, dog population management stakeholders and their veterinarians are held to a higher standard of evidence than farm users. Fortunately, laboratory data from Italy soon to be published, along with recent publications from India and our pilot study, is providing a clearer picture of benefits, risks, and best practices than was available in the past, allowing dog population management stakeholders in countries where there is no commercially available zinc gluconate injectable sterilant on the market to make an informed decision whether this alternative is appropriate in their context. After summarizing the conclusions of this research, we compare legal status of non-regulatory-approved compounded treatments such as calcium chloride in the European Union, United States (where compounded calcium chloride will no longer be usable or needed in dogs when an FDA-approved zinc gluconate injection comes to market), and countries most represented among conference attendees-- including restrictions upon (or record-keeping requirements for) veterinary use, rescue/TNR group use, and individual use by owners/guardians of family and farm dogs.

Non-surgical contraception of male dogs with a calcium chloride based drug Chemisterisol™: clinical evaluation and its mechanism of action

K. Jana[1], P. K. Samanta[2]; [1]Division of Molecular Medicine, Bose Institute, India. [2]Department of Veterinary Surgery & Radiology, West Bengal University of Animal & Fishery Sciences, India.
Email: kuladip@bic.boseinst.ernet.in

Sterilization has long been recognized as the most effective means of controlling pet populations. However, with the enormous number of owned and un-owned dogs in India, the sterilization programs currently available are not enough. Mostly the population control for male dogs has been accomplished through surgical sterilization, i.e. orchidectomy. However, it carries the risks that inherent in any surgical procedures. Furthermore, many people are unwilling to subject their pets to what they perceive to be a painful and invasive procedure. In addition, when considering dog populations where permanent sterilization is desired, surgical methods can be expensive to be performed on a large scale. Presently a viable alternative to surgical sterilization is being intensively

investigated. Although, a variety of compounds have been tested, some of which were either safe but not effective or vice versa. In this study we have used a new sterilizing preparation where calcium chloride (dehydrate) dissolved in normal saline with lignocaine hydrochloride; local anesthetic, a preservative, and several minor ingredients (Chemisterisol®), to sterilize dogs. Twelve dogs were injected with Chemisterisol® in each testicle and the dose was selected according to the testicular width. At 8 weeks, dog testes and epididymis were collected and the histology showed complete necrosis without presence of any germ/sperm cells along with the appearance of fibrous/hyaline tissue (Electron Microscopic analysis). Serum testosterone was reduced dramatically about 70% along with significant ($p<0.01$, One way ANOVA followed by Newman-Keuls test) elevation of serum LH and FSH concentrations. Androgenic enzyme activities and their expressions were also reduced in all the treated dogs, and intra-testicular testosterone concentration was also very low ($p<0.01$). The negligible expression of testicular steroidogenic acute regulatory protein (StAR), which is responsible for transport of cholesterol in mitochondria for testosterone biosynthesis, was also revealed by western blot analysis. Increased testicular ROS, lipid peroxidation, protein oxidation with reduced antioxidants, mitochondrial membrane potential ($\Delta\psi m$), and intracellular ATP levels were also evident following Chemisterisol® injection. However, there were no apparent changes ($p>0.05$) in body weight, general appetite, rectal temperature, scrotal and inguinal integument, heart and respiratory rate, serum or saliva cortisol, serum prolactin and insulin, serum IgG, fasting blood sugar, blood urea nitrogen, PCV, ESR, serum AST and ALT, serum sodium, potassium and calcium or total serum protein concentrations following Chemisterisol® injection, suggesting that this method of sterilization is not associated with any untoward systemic side effects. Due to its permanent reduction of testosterone, Chemisterisol® is in a different category than the injectable sterilants that are currently on the market. It should be used in cases where elimination or reduction of sex-based behaviour is desired, such as for family pets and in street dog/feral cat programs; the injectable male sterilant, should be used when return of testosterone is desired for health reasons such as in large pure breed dogs susceptible to orthopaedic disorders or when the owner wishes to preserve behaviour such as guarding. In conclusion, Chemisterisol® demonstrates potential for androgenesis-eliminating nonsurgical contraception of male dogs in addition to its proven efficacy in cats and other domestic mammals.

Calcium chloride dihydrate nonsurgical sterilization in 81 dogs: dose, formulation, and best practice implications for maximal effectiveness and minimal complications, from the first large study outside of India

R. Leoci[1], [1]Department of Animal Production, Faculty of Veterinary Medicine, University of Bari, Italy.
Email: leocivet@yahoo.it

Calcium chloride dihydrate nonsurgical male dog neuter/sterilization has been known in the published literature since the 1970's and has been the subject of a series of studies in multiple species in India; but until now, no large, controlled study has been conducted by an independent team outside India to validate the results. In order to be used with confidence in the field, calcium chloride injectable sterilization must be backed by detailed safety and effectiveness documentation from more than one team, showing both its potential effectiveness and any risks. Without contact with the original researchers, we attempted to validate the results, determine a standardized concentration using their suggested dosing regimen (volume per testicular width), understand why different researchers have had varying results, and select the most effective standardized formulation for going forward. For dose determination, 40 dogs of mixed breed were divided in four equal groups, respectively injected with 10%, 20%, 30%, and 60% calcium chloride dihydrate ($CaCl_2$) in saline solution. Semen evaluation was performed by CASA (Computer Assisted Sperm Analysis) system at months 2, 6, and 12. This study revealed a dose-dependent relationship when $CaCl_2$ in saline was used. 10% and 20% concentrations maintained sterility past 6 months in some but not all dogs. The maximum response in contraception was noted at 30% and 60% concentrations, but the higher concentrations had higher risk of abscess-fistulization, as presented in photos. We concluded that although calcium chloride in saline has considerable effectiveness, it is not reliably effective at doses that are free from risk of adverse events. Blood testosterone is under evaluation. Calcium chloride in alcohol: Based on the dose-determination study, we chose 20% concentration of $CaCl_2$ as the best chance at effectiveness without adverse events, and sought to improve our results. Early publications reported greater

effectiveness, less tenderness, and fewer complications with alcohol as a base rather than saline; pure food-grade ethanol alcohol is also economical and readily available. We hoped to obtain similar outcomes. Twenty-one dogs of mixed breed, 4.7±1.23 years old, 20±5.84 kg of body weight, were lightly sedated and injected into both testes with a solution of 20% calcium chloride dihydrate in 95% ethanol alcohol. Results are presented. Calcium chloride in lidocaine. In the pivotal studies of calcium chloride from India, a lidocaine solution was generally used, not saline or alcohol. We sought to compare the three solutions head-to-head. In this ongoing experiment, 21 dogs of mixed breed were injected with 20% $CaCl_2$ in lidocaine 1% solution. Two months later, dogs showed azoospermia and no libido. In our experience to date (10+ months), although we found calcium chloride in both alcohol and lidocaine bases to cause reliable neutering free from chronic pain or stress, we found one to be superior in speed of onset. Long-term results and testosterone measures to 1 year remain under evaluation, and the latest figures will be presented.

Friday, 7 September 2012

Session 12 - General

Dog Population Management: Some Thoughts

A. I. Wandeler[1];[1]Canadian Food Inspection Agency Ottawa Laboratory, Canada. *Email: alexwandeler@rogers.com*

There are numerous areas that are worthy of investigations in view of dog population control: the cultural diversity of dog human relations, the heterogeneity of dog supervision and accessibility, the different outcomes of different approaches to dog population control in different cultural/ecological settings, the use and misuse of theoretical population biology and simulation models, the possibilities of operational research and more. Dogs are present (kept or tolerated) in almost all societies. They have impacts on the environment, and on human behaviour and health. These impacts are viewed (recognised) quite differently in different cultures. While dogs are “things” for some people, they are considered equivalent to humans for others. They fulfill specific functions for some people, they are a nuisance to others, or they are just there as a part of a multispecies community. The access to dogs for population and disease management purposes is therefore variable. The primary goal of dog population control is a reduction in dog population size and/or a decrease of negative impacts of dogs on the environment and human health. Other important objectives are the promotion of responsible dog ownership, the improvement of dog population health, the reduction of animal suffering, the slowing of population turnover. The approaches to dog population control vary widely from cruel and inhumane to gentle, and sometimes ineffective. The outcome of different interventions still need to be studied by appropriate modelling and well monitored field studies. Operational research escorting dog population control programs are done far too infrequently. The development of methods chemical and immunological sterilization is advancing, though there are still gaps to be filled.

Assessment of the impact of rabies and its control on animal welfare for inclusion in a cost-effectiveness analysis

B. Häsler[1], N. Gregory[1], H. Bennani[1], J. Rushton[1]; [1]Royal Veterinary College, UK
Email: bhaesler@rvc.ac.uk

Economics is a critical discipline to advise policy makers on resource allocation in animal disease control. The World Health Organisation estimate the global annual cost of rabies to be US $ 583 million mainly due to the high number of human post-exposure prophylaxis treatments. Although the transmission of rabies from dogs to people can be prevented by controlling the disease in dog populations by vaccination, organising effective campaigns has proved difficult in many developing countries. As a result, many veterinary services have resorted to dog culling using methods such as gas, shooting, or poison, based on the assumption that this will be easier than vaccination to reduce the infection pressure in the dog population. In order to inform decisions on resource allocation for

rabies control, the World Society for the Protection of Animals requested a comprehensive economic assessment tool that would measure monetary and non-monetary benefits of rabies control including welfare. Cost-benefit and cost-effectiveness models were developed to assess the positive and negative consequences of rabies control strategies. To measure the effectiveness of such strategies with regards to animal welfare, a qualitative scoring system was developed. The framework was applied to dog rabies control campaigns in Colombo City, Sri Lanka, and Bali, Indonesia where before implementation of systematic intervention campaigns, there was a history of culling dogs using gas and strychnine poisoning, respectively. The economic analysis compared the new strategy – the intervention - with the existing one based on culling – known as the baseline. Relative scores were attributed to situations that could negatively affect dog welfare. For each situation, a set of conditions potentially affecting animal welfare was identified, e.g. pain, injuries, and dyspnoea. An impact scale (0 no impact to 4 extreme impact) was used based on the proportion of animals affected, the severity, and the duration. The scores were attributed based on data collected in the field, videos of the situation and information from the scientific literature. It was assumed that dogs suffered pain and discomfort in the same way as humans. For the cost-effectiveness analysis, an outcome was developed based on one overall qualitative animal suffering score each for the intervention and the baseline taking into account the number of animals affected by rabies and its control over several years. The comparison provided an estimate of the change in animal welfare with the intervention. With the intervention animal suffering changed from intermediate-high to low-intermediate and high-very high to low-intermediate in Colombo City and Bali, respectively. This indicated a gain in animal welfare for both locations. Even though the scores were relative and qualitative, they allowed an assessment of animal welfare change and provided an outcome measure for the cost-effectiveness analysis of rabies control. In the absence of systematic measurements of physiological and behavioural parameters, this system provides a practical alternative to include animal welfare outcomes in economic analyses which help policy makers understand the dynamics of resource use and choose among available alternatives.

Beyond dog population control - Developing a sustainable approach to improving dog health and welfare in remote regions of northern Canada

S. Kutz[1], A. Veitch[2], G. Krebs[1], T. Sooley[1], T. Stevens[1]; [1]Faculty of Veterinary Medicine, University of Calgary, Canada. [2]Dept. of Industry, Tourism & Investment, Government of the Northwest Territories (NT), Canada. *Email: sabbaticalsue@gmail.com*

Dog health, welfare, and overpopulation are increasingly recognized as important issues influencing the social and physical health of people in remote and marginalized communities of developed nations. Across northern Canada, the role of dogs is in a state of transition from a history of working animals to 'companion animals', yet in many cases the local experience and knowledge on care and welfare of dogs in this new role is limited. This, together with minimal or no access to veterinary services and animal husbandry education, has lead to significant issues regarding dog welfare, dog population control methods, and dog-related health (zoonoses) and safety (dog attacks) of people in remote regions. In response to community concerns, in 2008, we began a program to deliver veterinary services to isolated communities of the Sahtu Settlement Area, of the central Northwest Territories. The program is a collaborative effort among five communities, five local schools, the territorial government, and the Faculty of Veterinary Medicine, University of Calgary. It includes annual service delivery during the short 'winter road' season, as well as a substantial youth education and participation component and training of future veterinarians. Initial uptake of services was low due to a variety of social and cultural barriers, but has increased substantially. From 2008-2012 the number of dogs brought to clinics doubled and the number of clients tripled. We have observed substantial improvements in a variety of health indicators for dogs over this time period. For animals brought into clinics, rabies vaccination coverage has increased from 37% to 100% and deworming from 29% to 100%. Sterilization rates have increased from about 20% of dogs examined in 2008 to 75-100% for females and 50-85% of males examined in 2012. Importantly, there has been a noticeable shift in attitudes, a stronger human-animal bond observed, and grass-roots community support of the clinics has grown substantially. Our goal is to establish a mechanism for ensuring long term, regular, preventative veterinary care and animal and public health education in a sustainable manner. The implementation of the program, along with the political, social, economic, and cultural facilitators and barriers, will be discussed.

Challenges and options to reduce stray dog numbers and irresponsible dog ownership in England

P.Claughton[1]; [1]Royal Society for the Prevention of Cruelty to Animals, UK
Email: pclaughton@rspca.org.uk

Across England, stray dog kennels are at breaking point with an increase in both stray dog numbers and those remaining unclaimed beyond the seven-day statutory period. The increase in stray dogs is representative of a wider problem animal welfare organisations, local authorities and police are facing with irresponsible dog ownership. But how do we deal with it? What is the root cause of the problem and is it within the capabilities of the animal welfare world to address it? The presentation aims to outline the challenges that are faced, some of the work that is being done and suggest some potential solutions to reduce stray dog numbers and the wider irresponsible dog ownership issue.

Session 13 – General

Dog bite rates as an index of community dog management

A. N. Rowan[1]; [1]Humane Society International, USA. *Email: arowan@humanesociety.org*

City and county animal control operations began as a way to manage and prevent the transmission of rabies from dogs to humans and the worrying of livestock by dogs. However, in most of the OECD countries, human rabies is now a very rare disease and extensive canine vaccination programs have greatly reduced the threat of rabies in many other parts of the world (e.g. Latin America). However, dogs create several other public health problems of which the most common is probably dog bites and subsequent human morbidity and even mortality. This presentation will review dog bite prevalence numbers and argue that the rate of dog bites (in the USA, there are approximately 100 dog-bites per 100,000 humans that are treated annually in hospital emergency rooms) is an index of the effectiveness of dog (both owned and street) management programmes. The prevalence of different categories of dog bites will be outlined and an argument made that we should track dog bites treated by hospital emergency rooms as an indicator of dog management. The statistic has a very wide range (from over 1,000 per 100,000 humans to under 1 per annum) and the data is relatively(!) easy to obtain. There is no excuse in the 21st century for humans to suffer from either rabies or from a high incidence of dog bite injury.

A new system for the monitoring and evaluation of community animal welfare projects: A work in progress

K. Nattrass Atema[1], J. Friar[2]; [1]The International Fund for Animal Welfare, [2]Wise Monkey Foundation USA. *Email: katema@ifaw.org*

Dog and cat population management and welfare projects have historically struggled with the capture of appropriate, scientific data on which to base strategic guidance and decision-making. A survey of these programmes in several countries indicates that even where data is reported, projects rely heavily on activity-based measures and anecdotal indicators of success. Among the major challenges to appropriate data capture are time, cost and expertise. The traditional forms of scientific data recommended for these projects include surveys, focus groups, and population censuses, all of which require a level of expertise in design and analysis which is often unavailable to project staff. The International Fund for Animal welfare in conjunction with Wise Monkey, has developed and is currently pilot testing a prototype system for monitoring community and animal welfare in the course of daily project implementation, whereby all programme activities can be measured against any number of available community indicators. The aim is to finalize a locally-customizable system which, with minimal training, project staff can employ to capture reliable data to guide local decision-making. We share this work in progress with the intent to stimulate discussion, improvement and collaboration.

Using clinical data to evaluate an ABC intervention

L. Hiby[1], J. Reece[2], E. Hiby[3]; [1]Conservation Research Ltd, UK; [2]Help in Suffering, India; [3]WSPA, UK.
Email: lexhiby@gmail.com

Using clinical data to evaluate an ABC intervention estimating the number of roaming dogs in a city prior to any intervention is extremely difficult given the variation in the urban environment and in the behaviour of the dogs themselves. Given the lack of data on initial population size a preliminary survey may be worthwhile but an accurate estimate or a reliable confidence interval beyond the available resources. However, an accurate initial estimate of total abundance is not required to evaluate the need for an intervention nor, provided it is scaleable, for its planning. By focusing attention on the information available as a by-product of the intervention itself and allowing the intervention to respond to that information its effectiveness can be evaluated and optimized. The basic clinical data on where and when each treated dog was released can be combined with survey data to monitor the number of roaming dogs in each region provided the "where" includes the region name or an element such as a postal code allowing release locations to be assigned to regions later. A survival estimate for the releases is required but is also available as part of the intervention by monitoring the rate of increase in the percentage treated from its inception or, more accurately, from individually marking the treated animals. Including clinical data on pregnancy and percentage lactating in the survey records allows fecundity to be monitored and comparative surveys in cities that do and do not sterilize males allows any effect of that on fecundity to be assessed. Surveys designed to estimate percentage male, female, lactating, treated etc. are very quick to conduct if the people normally employed to collect the dogs are asked to detect and classify the dogs because no measure of effort is required, just a reasonable coverage of the selected region. Thus each intervention has the potential to provide valuable information provided a database for the clinical data is established in such a way that data from different clinics operating within the same city can be combined. Some of these ideas are illustrated using downloadable software and clinical data plus survey results from Jaipur and Jodhpur in Rajasthan, India.

The role of ecologists and evidence-based information in dog population management

G. Smith[1], G. Massei[1], [1]Food and Environment Research Agency, UK.
Email: graham.smith@fera.gsi.gov.uk

Worldwide, human-dog conflicts have been traditionally managed by local authorities, veterinary services and non-government organisations. The pressing need to "do something" has also led to action without quantification and measurement, and thus an inability to predict the outcome of intervention. This is also hampered by the lack of scientific involvement, and thus there is very little information published or available on the actions taken, and the outcomes observed. We strongly argue for the involvement of a more scientific approach to population management, one that occurred in the field of wildlife management for a number of years. There are many parallels between wildlife management and dog population management. Although there are also some very important differences, these can be incorporated into the approaches currently used by ecologists. Free-roaming populations of dogs can be regarded as another synanthropic species that cause human-wildlife conflicts. We will argue that much resource is wasted without measuring both the effort and the outcome of any intervention, and that a simple model of the local population would help to direct resources in the most efficient way. Population parameters such as natality, mortality, immigration (including the abandonment of unwanted litters) and emigration (including the adoption of strays) can be measured. Where relevant a model based on these data can be used to predict the course of infections such as rabies. Using this approach is now routine in wildlife management, with these models being used to aid decision making. The most important difference between wildlife and dog population management concerns the special status of dogs in society. In many countries, the strong association between people and dogs limits the spectrum of population management options and affects population density and population parameters and may influence contact rates between dogs. We discuss the role of ecologists in this field and how integrating evidence-based results with practical needs from stakeholders can lead to sustainable and predictable dog population management.

Session 14 (parallel) – New Tools

Pet population management and public health: a new tool for the improvement of dog traceability

P. Dalla Villa[1], S. Messori[1], L. Possenti[1], M. Cianella[1], C. Di Francesco[1]; [1]Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G.Caporale", Italy. *Email: p.dallavilla@izs.it*

The risks associated with zoonotic infections transmitted by companion animals are a serious public health concern. An effective approach to prevent pet borne zoonoses is to reduce their incidence in domestic animals, both owned and stray. Integrated dog population management (DPM) programs, based on the availability of information systems providing reliable data on the structure and composition of the existing dog population in a given area, are fundamental to make realistic plans for any disease surveillance system. Compulsory dog identification and registration is therefore one of the most effective measure to ensure the sustainability of DPM programs. In addition, this DPM tool can help to give a deeper insight on dog population composition, promoting responsible dog ownership and giving valuable help in reducing the number of stray dogs. Even if this approach could guarantee many advantages, several areas of improvement emerged from the countries where it has been applied. One of the main issues is the multiplicity of the databases where information are recorded, that makes it difficult to find a dog without knowing exactly in which database it has been registered. In Italy, for example, every region hosts its own dog registry, and these registers are not communicating amongst them. To compensate for this problem, the Istituto Caporale of Teramo developed a web-based-application for an Identification and Registration (I&R) system to manage the dog regional register. This information system has an innovative infrastructure implemented with open standards that allows multichannel access by different devices and data exchange via the web with other existing applications. The main potential of this system relies in the possibility of connecting databases together through web services, making an integrated and complete system, without changing the pre-existing platforms. A pilot dog register was developed for the Molise region and, more recently, it has been also adopted by the Sicily region. Today the system manages a database of more than 330,000 dogs. If this approach will be embraced at a higher level (national or international) it could be the solution to gather large amount of data at a reasonable cost, allowing traceability on a large scale and therefore improving effective zoonoses control.

Free-roaming dogs welfare issues in Belgrade, Serbia

M. Vucinic[1], M. Pelemiš[2], Z. Todorovi[3], M. Prostran[3]; [1]Department for Animal Hygiene, Faculty of Veterinary Medicine, University of Belgrade, Serbia. [2]Institute for Infectious and Tropical Diseases, Clinical Center of Serbia, Faculty of Medicine, University of Belgrade, Serbia. [3]Department of Pharmacology, Clinical Pharmacology and Toxicology, Faculty of Medicine, University of Belgrade, Serbia. *Email: mery@vet.bg.ac.rs*

There are several important welfare issues related to the population of free-roaming dogs in Belgrade, Serbia. It is well known that as in many other developing societies so in Belgrade there are two main populations of dogs: the population of owned dogs and the population of free-roaming dogs. Firstly, there are a great number of irresponsible, unregistered and unlicensed dog breeders and owners who are the main cause for the survival of the free-roaming dog population in Belgrade. Secondly, there are a great number of dog bites to people such as those from free-roaming dogs, so those from owned dogs. However, victims of revolted citizens were mainly free-roaming dogs who were poisoned or physically abused. Thirdly, there are a lot of cases of dog hoardings in Belgrade. Numerous free-roaming dogs are picked up from public places and housed under inadequate conditions by hoarders. Uneducated citizens are not able to recognize cases of dog hoarding until unsanitary conditions from hoarders in their neighbourhoods begin to interfere with their life quality. Fourthly, there are some "animal protectionists" who feed a great number of free-roaming dogs in public places and help them to form packs and exert protective forms of aggression. Consequences of all mentioned above are numerous of dog bites. So, from January 2005 to December 2011 there were 13506 cases of dog bites to citizens in Belgrade. Stray dogs were involved in 9055 cases and dogs of known owners in

4451 cases. Monthly dog bite incidences per 100000 citizens varied from 137.19 in 2006 to 192.27 in 2011. Moreover, the number of dog bites continuously rises, as well as the population of free-roaming dogs. The increasing trend in the number of stray dog bites indicates that the city of Belgrade lacks a strategy to prevent injuries from stray dog bites. Also, a number of injuries from bites of owned dogs indicates that there are irresponsible, unqualified and unskilled owners who are unable to properly handle their dogs regardless of whether bitten victims were dog owners themselves, their family members, visitors to their homes or people in public places. This indicates the need for education of dog owners and the strict implementation of the institution of responsible dog ownership.

Innovative solutions to improve and ease stray dog population counts in urban territories: an Italian experience

A. Giovannini[1], S. Barnard[1], C. Ippoliti[1], D. Di Flaviano[1], A. de Ruvo[1], C. Di Francesco[1], A. Di Pasquale[1], P. Dalla Villa[1]; [1]Istituto 'G. Caporale' di Teramo, Italy. *Email: a.giovannini@izs.it*

Free-roaming dog populations pose serious public health concerns. To tackle this issue targeted strategies are needed. Specific and effective types of intervention have to be based on a comprehensive knowledge of the dog population size, composition and distribution on the territory. The Istituto 'G. Caporale' of Teramo carried out a study for the development of a statistical model to quantify and describe dog populations of two towns in southern Italy. This model was based on empirical data collected through dog counting, telephone interviews to citizens, and the retrieval of regional dog databases information on owned pets. A great effort was made to finalize the whole data collection; analyses are still in progress. However, dog count procedure was greatly facilitated by innovative and technological solutions set up to allow a faster and efficient data collection. This work will describe these innovations as an aid for future researchers in this field. Dog count techniques are widely applied to estimate the density of free-roaming dogs in public areas. Counts are usually carried out in a random sample of city subareas, and then extrapolated to the whole city. To carry out the whole procedure new approaches were followed: 1. Subdivision of the city map in blocks: blocks were drafted not on the basis of their areas but on the number of households. The demarcation of blocks was the same used for the National population census. The use of the census data allowed a validation of the data collected through the phone interviews as well as a proper weighing and extrapolation of the data collected in the sampled areas. 2. Random selection of a sample of these blocks: it was based on a two-steps sampling aimed at avoiding a repeated counting of the same animals. Adjacent and a-point-sharing blocks were differently coloured using a topological algorithm implemented in ESRI ArcGIS software, and five colours were evened out in each city. Firstly a colour was randomly selected and secondly a number of blocks were sub sampled within the chosen colour. 3. On-field data collection and report of all collected data for statistical analysis: an application for Android devices was developed to enable a more effective on-field data collection and subsequent data management. The advantages of this method were that a single portable device (e.g. smartphone) allowed: to visualize the street view or satellite map with all selected blocks boundaries highlighted; to detect the researcher's position through an integrated GPS system and navigate along the streets within each block; to open, when encountering a dog, an assisted compilation form to record all useful dog data (e.g. sex, age, behaviour). Moreover, pictures or videos of the dog could be taken and matched to the dog form. The application also allowed the download onto the computer of all collected data as XML files. The adoption of these technological solutions applied to a widely used technique of dog population estimation allowed a faster and more precise data collection, saving precious time and resources in terms of human labour.

Rabies, the most neglected tropical disease in Bangladesh and One Health approach for its prevention and control

S. P. Marma[1], B. Ahammad[1], M. S. Uzzaman[2], S.M. E. Ali[3], S. Hossain [4], R. Ahmed [5], B. Ahmed[1]; [1]Communicable Disease Control Division, Directorate General of Health Services, Bangladesh; [2]Dhaka Medical College Hospital, Bangladesh; [3]Infectious Disease Hospital, Bangladesh; [4]Tongi Municipality, Bangladesh; [5]Obhoyaronno, Bangladesh. *Email: draungsprue@yahoo.com*

Rabies had been one of the longstanding most neglected tropical diseases in the country. Although, it is a highly dreadful disease, very little attention had been given for its prevention and control. In Bangladesh, there are about two-three hundred thousand animal bites and estimated over two thousand human rabies and deaths annually mainly due to dog bites. Most of the three to four million dogs in the country are stray and unvaccinated. Superstition, ignorance and lack of proper post

exposure management are main reasons for development of human rabies. Until July 2010, the existing activities related to rabies control were namely infrequent inhuman stray dog culling by local government, animal bite management by nerve tissue vaccine (NTV) and very limited use of tissue culture vaccine (TCV) at private sector. Since then Government has taken initiatives to provide standard post exposure management. Initially, rabies prevention and control center was set up at capital Dhaka and then gradually expanded the program to seven divisions and remaining districts. Meanwhile, out of 64, rabies prevention and control center have been functioning in 63 districts, where all animal bites are being managed by trained health personnel. Cost effective updated Thai Red Cross regimen of intra-dermal tissue culture vaccines along with anti-rabies serum (ARS) have been introduced through orientation of concerned physicians and nurses. It is believe that these initiatives were able to cut some of the rabies deaths. Updating of the strategy for prevention and control of rabies is underway. The other activities recently carried out are namely pilot project for dog population management through ABC, dog survey in the capital, school based rabies related health education program, rabies control pilot project at three sites, district level rabies workshop, national rabies survey etc. Government of Bangladesh stopped the production of NTV in October 2011. Ministry of local government has already declared capital Dhaka as no cull city and disseminated the message to all municipalities in the country. Bangladesh is moving with a plan to make rabies free status of the country by the year 2020 with integrated approach of health, livestock and local government by adopting the following strategies: Awareness building, Dog ownership promotion, mass dog vaccination, dog population management and post-exposure management of animal bites.

Session 15 (parallel) – Case studies

Dog Population Management in Nepal

K. Sharma[1], B. Webb[2], J. Pearson[2], J. Stavisky[3], M. Downes[3] and G. Massei[4]; [1]Himalayan Animal Rescue Trust (HART), Nepal. [2] Tytherington Lane, UK. [3]University of Nottingham, School of Veterinary Medicine and Science, UK. [4]Food and Environment Research Agency, UK.
Email: k.sharma@hartnepal.org

In Nepal, where rabies is endemic, free-roaming dog populations are controlled through strychnine poisoning, routinely used in response to rabies outbreaks or complaints from citizens. HART was established three years ago with the overall mission to both humanely reduce the free-roaming dog population and to assist with rabies elimination in Nepal through fertility control and community education. To achieve this, HART designed a long-term strategy based on multi-year field interventions, such as dog vaccination and sterilisation, as well as community awareness. HART also signed Memoranda of Understanding with the Municipal authorities of two cities, with 'no-poisoning' clauses included, and liaised with the Veterinary School in Bharatpur and with researchers in the UK for technical assistance on household surveys and data collection and analysis. The aims of the talk are 1. To illustrate current and future challenges of dog population management in Nepal and to share lessons learned; 2. To present preliminary results of dog population surveys, dog population dynamics and census and 3. To provide an overview of planned interventions for dog population management. HART conducted dog censuses, Catch-Neuter-Vaccination-Release programmes, mass rabies vaccination and education programmes in two large Nepalese cities, Pokhara and Bharatpur. In under three years HART spayed and vaccinated ~2220 female dogs, administered ~4950 rabies vaccinations, undertook ~680 rescue and treatment cases and actively engaged with local communities and stakeholders. HART also conducted 1669 community surveys to obtain data on attitudes to dogs and their ownership. Nepal has no animal welfare laws, no registration of animals and no government vaccination programme. Some citizens keep dogs as guard or companion animals although many view street dogs as noisy, dirty, disease carriers. The education programme provided by HART resulted in increased awareness of rabies and dog welfare at community level. HART's 2011 census in Pokhara showed post-intervention results of 69% dogs spayed, 1% castrated and 85% vaccinated. In Bharatpur, where clinical work started in 2011, an estimated 20% of dogs have since been spayed, 2% castrated and 54% vaccinated. In Bharatpur, 34.6% (251/725) of households interviewed owned at least one dog and 62% of these dogs were allowed to roam free. Preliminary results indicate that there is a peak in dog reproduction between September and January, which coincides with previous findings in the region. The estimate of the proportion of dogs sterilised

in a year in a town will be used to quantify the effort required to achieve such proportion with surgical sterilisation. The data will also be used to estimate the impact of fertility control and rabies vaccination on dog population dynamics and on rabies control.

Road map for creating measureable outcomes from a high volume spay/neuter program on a Lakota Reservation, US

R. Steinberger[1]; [1]Spay FIRST! USA. *Email: ruth@spayfirst.org*

In 2002 the author was contacted by the Director of Health Administration of the Rosebud Sioux Tribe of South Dakota, USA to initiate a high volume spay neuter program in order to reduce dog overpopulation through humane methodologies. Until that time the tribe held periodic round-ups and shootings. Through high volume spay/neuter clinics and by timing the clinics to maximize the effectiveness, the number of unwanted dogs has declined, collection and killing was no longer deemed necessary and the outcomes are measureable. The Rosebud Sioux Indian Reservation includes five counties; the most populated is Todd County, SD, which is 88.1% Sicangu Lakota. Todd is the fourth to the poorest county in the US. The reservation is home to nearly 25,000 Sicangu Lakota tribal members. In 2002 no animal control or protection program existed on the reservation. Homeless dogs affected by mange and parasites, froze and starved to death each year; packs of dogs sometimes survived by cannibalism and the number of dog bites was over 20 times the national average. Using an accident prevention strategy, the Rosebud Sioux Tribe Community Health Representative (CHR) office sponsored high volume spay/neuter services, created educational outreach and transferred unwanted animals to adoption facilities and euthanized under certain circumstances. A transport program enabled animals from outlying communities to be sterilized and returned to their homes. The core of the data was Indian Health Service bite records, anecdotal information about problems, regular sightings of unwanted animals, packs and estimated damage from packs (including incidents of dog on dog cannibalism). Following 'blitz' style clinics in 2003 and 2004, it was determined that reducing the number of litters required changing the timing to include multiple clinics with one in early spring. In 2005 the program was changed to include targeted timing that provided three clinics per year, with a first clinic in April to prevent the first litters of spring and 1. Sufficient veterinary capacity so that every animal brought to clinic is altered 2. Transportation to the clinic from outlying reservation communities to make sure that every animal can get to the clinic for sterilization. 3. Publicity and outreach throughout the reservation. 4. Transfers to out-of-state shelters for adoption 2,421 surgeries, or one for every ten people on the reservation, were provided in the first three years. As of 2010, the number of sterilizations equalled roughly one spay or neuter for every 4.8 people on the reservation and roughly one transfer per every12 people on the reservation in the same time period. Outcomes included 1. reduced sighting of strays (both anecdotal and by those who care for the strays), 2. Increased sales of pet food and pet care supplies (according to the two retailers) as the number of dogs declined, 3. Increase in cats as pets We have a documented road map on how the Rosebud Sioux Tribe eliminated collection and killings of unwanted dogs through high volume spay/neuter services.

Estimating the stray dog population and assessing the general welfare of owned dogs in Lilongwe: Developing strategies for dog population management in Malawi

R. K. Ssuna[1]; [1]Lilongwe Society for the Protection and Care of Animals, Malawi.
Email: richardssuna@gmail.com

The first comprehensive dog population survey in Lilongwe, Malawi was carried out in 2011. All roaming dogs were counted within randomly selected blocks across the city and a household survey was conducted using a questionnaire to gather data on the household (i.e. size, animal ownership, attitudes to dogs and record of dog bites) and dog data (i.e. number, sex, age, vaccination and worming status). Determining the size and characteristics of the stray and owned dog population in Lilongwe is a prerequisite to designing a humane stray dog management strategy and an effective rabies vaccination programme. This survey revealed that Lilongwe has a sizable population of roaming dogs, 4450 ± 882. Eight hundred and fifty-two households were surveyed and of these 244 (29%) owned a dog(s). The owned adult dog population is skewed towards males, 293 males compared to 146 females. This reflects the respondents' attitudes, 327 respondents stated a preference for male dogs compared to 111 preferring a female dog. Household data indicates a low provision of care towards the majority of owned dogs and the low vaccination coverage is of concern for both the dog and human populations. Sixty-one per cent (61%) of dogs are provided with food, 43% had never been vaccinated against any disease including rabies, 60% were never dewormed

and 44% dogs are regularly dipped to control ecto-parasites. The rate of spaying is very low (7%) and the majority of owned dogs (94%) are allowed to roam the streets at least part of the day, so the potential for the stray population to continue rising is of concern. Lilongwe City Assembly in 2012 ceased its previous annual practice of killing stray and roaming dogs during the 'tie and shoot' period, i.e. mass culling. This practice, coupled with the annual rabies vaccination campaign, has failed to control the stray animal population and has not curbed the prevalence of rabies cases in the city. The data on the dog population will provide useful guidance to the local and central government for planning rabies vaccination campaigns and stray dog management strategies. The information learnt from the household surveys will be invaluable in developing public awareness campaigns on a range of important animal welfare and public health issues such as rabies and responsible dog ownership.

Dog management issues and the meat industry

H. Bacon[1], H. Walters[1], D.Neale[2], I. Feng[2]; [1]Jeanne Marchig International Centre for Animal Welfare Education, University of Edinburgh, UK. [2]Animals Asia Foundation, UK.
Email: Heather.Bacon@ed.ac.uk

For thousands of years dog has been consumed as a traditional food in many parts of the world, including Switzerland and Asia. Whilst there are many emotive arguments made in relation to the dog trade and the unique nature of dogs as human companions, scientific evidence regarding the specific welfare of dogs traded for meat in lacking. The dog trade for meat is an important consideration when planning disease and population management strategies, and when identifying potential barriers to change in terms of how dogs may be perceived, bred, used and managed. This paper will review current data originating from China in relation to the cultural rationale for the consumption of dog meat, the trade in dogs for meat and the epidemiology of infectious disease, and human attitudes to the concept of dog sentience compared to other species. The supply and demand of dogs in the meat trade links closely with general issues surrounding dog population management and disease control, and a holistic approach to all issues of dog management is useful in addressing population issues.

Session 16 – Case studies (continued)

Population management within the Bill and Melinda Gates Foundation project KwaZulu-Natal, South Africa

K. Le Roux[1], D. Stewart[2]; [1]Veterinary Services, KwaZulu-Natal, South Africa. [2]World Health Organization, South Africa. *Email: K.LEROUX@kzndae.gov.za*

Within the context of the KwaZulu-Natal (KZN) rabies control program, dog population management became increasingly important, as an apparent increase in unmanageable stray dogs threatened to compromise control efforts. Headed by a few dedicated field officers, a small pilot dog ecology study, linked to a primary health care clinic for companion animals, stimulated a dramatic explosion of interest in population research and practical population control programs. This gave rise to the holistic view of disease control in KZN and laid the foundations for international funding which would in turn inspire local government support for wider primary animal health care initiatives. From a population management point of view initial work proved discouraging, as it was quickly recognized that surgical sterilisation is simply too costly and slow to affect the dynamics of the approximately one million dogs in KZN. In villages where interventions involved up to 60% of the population through sterilisation and welfare-related removals, dog problems were again being frequently reported within a year. Despite these limitations, the exercise has proven extremely valuable as the project expanded its base of research to include dog ecology, dog behaviour, contraceptives and molecular transmission studies that as a whole will provide practical answers to disease management questions. Of even greater value has been the taking of basic services into communities, as we found there is no substitute for "presence" in the field to answer communities needs and create awareness. Dramatic changes in community attitude toward veterinary services has allowed rabies campaigns in some cases to double the number of vaccinations. As a result, rabies disappeared from most areas where the project has been applied. Dramatic decreases in dog bite cases have been recorded, not primarily due to interventions but as a result of community awareness. Results from the ecological studies now suggest that KZN's stray dog population is negligible. However there remain serious needs for responsible pet ownership and primary health care, as high population turnover hampers disease

control efforts. In addition, human socio-economic problems may interrupt normal interventions and the dog population become steadily more difficult to access for immunisation. Population management programs aimed at both managing dogs and providing basic veterinary care are important to implement long term sustainable disease control programs. KZN managed to bring all major stakeholders together and highlighted the fundamental role of "Champions" in initiating and sustaining programs. Practical applicable research has been initiated according to observed needs, emanating from hands on field work, emphasising the need for a holistic approach to rabies control.

Population management of feral cats and dogs and wild monkeys in Hong Kong, with notes on Shanghai

D. Burrows, Central District, Hong Kong. *Email: burrowsvet1@yahoo.com*

Human/animal conflict is common in Hong Kong, sometimes real, sometimes perceived. High rise residential buildings exist next to substantial areas of forest or bush wilderness-type land where feral dogs are able to thrive with access to human food waste bins and kind human feeders, while feral cats proliferate in alleyways. After 50 to 60 years of catch and kill, the animals are still there hardly dented. Nuisance, fear and rabies prevention are relevant. Hong Kong is free from rabies but the disease is endemic in the region outside Hong Kong. A decade ago, we started a programme of spay/neuter + health + vaccination + microchip for feral cats, bringing the individual cat feeders into the process as designated cat colony carers each in charge of a colony zone, with compassionate discipline of the carers. In ten years some 50,000 cats have been treated in the programme with good success. Recent attempts to introduce small trials for cats in Shanghai were unsuccessful as animal groups there were unable to come to agreement on this, although such cat colony programmes are running in some other cities in China. Political niceties delayed the introduction of a related programme for dogs, which is starting this year on a 3 year trial. Such programmes for dogs are already in progress in some towns in China The availability of injectable and/or oral long term contraceptives for dogs, especially bitches, would be beneficial if it could replace surgery. Development of residences extending into the countryside brought Hong Kong wild monkeys into conflict with humans. Also a decade ago, we commenced a successful programme of contraception for the wild monkeys, using one-dose injectable SpayVac(R) immunocontraceptive adjuvanted vaccine for the females with the procedures completed in the forest and return of the animals to their groups within a few hours.

Massive dog and cat successful sterilization campaigns: 3 years experience in Yucatan, Mexico

A. Ortega-Pacheco[1], A. Ríos-Pérez[2], N. Mis-Ávila[2], L. Martín-Ortiz[2], J. Young[3]; [1]Universidad Autonoma de Yucatan, Facultad de Medicina Veterinaria y Zootecnia, Mexico. [2]Planned Pethood Mexico, Mexico. [3]Planned Pethood Plus Inc, USA. *Email: opacheco@uady.mx*

There have been 3 successful campaigns of mass sterilization of dogs and cats in the city of Merida Yucatan during the years 2010, 2011 and 2012. The number of surgeries per year increased from 1243 in 2010 to 1723 and 1975 in 2011 and 2012 respectively. The success of these campaigns has been due to good planning and the involvement of government health agencies, state and national animal welfare organizations, private companies and enthusiastic participation of volunteers (general public and students of Veterinary Medicine). A key piece of the public response is that the surgeries were completely free and free veterinary services were provided to the complete recovery of patients. The planning begins 6 months before the scheduled date (always at the beginning of the year) during which a fixed a number of surgeries are programmed. The material requirements for surgery and healing, as well as antibiotics and analgesics are listed and a partial budget performed. Several meetings are held with state and federal ministries of health seeking for the support of the materials; support is not always 100% but a good proportion of materials are achieved. Several companies are invited to participate collaborating with diverse materials including surgery and healing materials, money, food, tents, chairs etc. It begins an aggressive advertising campaign and telephone appointments are made to assist in times divided into three groups: 08:00, 11:00 and 14:00 hrs. Approximately 350-400 dogs are attended each day. Students and other volunteers are trained and located in different activities. The surgeons (around 12) are local volunteers, from other states from Mexico and foreign that travel to Mérida with its own resources and / or support of international organizations (i.e. Planned Pethood Plus). The day of the campaign each surgeon is assigned to a surgical table with his own surgical equipment and materials for chemical disinfection. On arrival the owners and pets pass to the reception where their general information is taken and identification of

the patient is made, hence pets go to a physical examination to determine their health condition and authorized the surgery. Patients then pass into the preparation room where they are anesthetized and the surgical area disinfected. Volunteers take the patients to the surgeons table. If they need assistance and more anaesthesia, a circulating veterinary technician is responsible for providing the service. Male cats go to the table of veterinary students who are responsible of castrations under the supervision of a veterinarian. After the surgery, patients go to the recovery room where they are supervised by veterinary students and volunteers until full recovery from anaesthesia. In these room patients are medicated with intramuscular antibiotics and analgesics. After recovery owners and pets go to the table of drugs where they are delivered oral antibiotics and analgesics for 5 days and a list of veterinary clinics to go in case of emergency. Finally, free rabies vaccine is offered.

Humane dog population & rabies management project, Colombo, Sri Lanka

G. de Silva[1], N. Obeyesekere[1] ;[1]Blue Paw Trust, Sri Lanka.
Email: gangadesilva@hotmail.com

Sri Lanka is a rabies endemic island in Asia. Dog elimination practiced for more than 100 years neither reduced stray dog populations nor eliminated rabies. Previous programs in Colombo, involved vaccination of owned dogs and inhumane culling of roaming dogs resulting in dog rabies numbers averaging 35 cases per year (1992 – 2007). Though containing the disease, this did not impact roaming dog numbers and did not create herd immunity, thus contributing to endemicity. A presidential no kill directive (2006) threatened to worsen the situation as culling was halted and vaccination inadequate. This placed pressure on the Colombo Municipal Council (CMC) to explore alternate solutions to the Rabies issue. In response Blue Paw Trust (BPT), World Society for the Protection of Animals (WSPA) and CMC initiated a 5 year project in June 2007 - a pioneering field trial of the “Humane Dog Population Management Guidelines” compiled by the International Companion Animal Management (ICAM) Coalition; components included female dog sterilization, vaccination, education, and capacity building effected within an action research framework. Roaming dogs in Sri Lanka are primarily community dogs without individual ownership but rather a lax collective responsibility; a component are owned yet allowed to roam, with a small percentage of real strays (feral). As CMC only vaccinates owned dogs, BPT initiated vaccination of roaming dogs. CMC staff was trained in humane dog handling, catching and veterinary techniques. Targeted education programs reach various social strata (puppet show for primary schools, street drama for underprivileged communities, etc.). Initially community resistance was encountered; however attitudinal change was created through education and demonstration of results. The project is now well received by CMC and local communities. A distinctive feature is a well designed dog count, carried out in Colombo for the first time, generating a human to dog ratio of 30:1 as opposed to the previously assumed 8:1 ratio. Unique to BPT is the development of Dog managed zones (DMZs) in response to requests from public locations to remove dogs as they posed a bite and rabies threat. In a DMZ, the existing dogs remain in a controlled environment, sterilized and annually vaccinated. Due to territorial behaviour, their presence helps prevent unknown, unvaccinated roaming animals from entering the premises. Staff are coached concerning their obligations in establishing a clean, safe and nuisance free surroundings. DMZs are recommended by Rabies Alliance as a useful strategy for Rabies control programs. Another special feature is post operative care organized by the BPT’s Community Liaison Officer through community caretakers; ensuring animal welfare while furthering collaboration and engagement. A minimum 10 % of surgeries are monitored post surgically (WSPA guidelines). BPT interventions have reduced - • Dog population growth; • Dog rabies cases (8 in 2011; one to end April 2012). • Lactating females from 14% to almost zero; pups from 12% to 2%. • Improved animal welfare (increased body/skin condition scores). Detailed procedural guidelines were developed; therefore the project can be duplicated by interested organizations/countries. Due to its success, WSPA is investing in project replication to other South East Asian locations.

International Companion Animal Management (ICAM) workshop

The aim of this workshop is to guide participants through the first two stages of the International Companion Animal Management (ICAM) humane dog population management methodology – initial data collection and assessment, and look at the influential factors in dog population management. It will demonstrate that many interventions already in place are likely to have been implemented based on assumptions and it will explore the effect and impact of these assumptions on current intervention

activities. The workshop format itself will also be deconstructed so that the participatory methods and the purpose of this approach are fully explained. H. Eckman (International Fund for Animal Welfare) will be leading the workshop.

Poster Presentations

1. Chemical sterilization with calcium chloride: a dose-dependent study in the dog

R. Leoci[1], G. Aiudi[1], F. Silvestre[1], G. M. Lacalandra[1]; [1]University of Bari, Department of Animal Production, Italy. *Email: leocivet@yahoo.it*

Chemical castration is one of non-surgical techniques to male contraception. Chemical agents injected into the testis cause infertility by inducing azoospermia in male animals. The technique is not technically challenging, is inexpensive and suitable for large-scale sterilization programs in dogs. In this trial a single intratesticular injection of calcium chloride water solution was evaluated and a dose-dependent study was realized. Forty dogs of mixed breed, 4.6±1.19 years old, 17±2.67 kg of body weight, with good clinical conditions and normal reproductive parameters, were divided in four equal groups (n=10): A, B, C, D. Groups were respectively injected with 10%, 20%, 30%, 60% calcium chloride dihydrated in saline solution (CaCl2). Dogs were lightly sedated and injected into the dorso-cranial portion of both testes with 1 ml solution. The procedure for intratesticular injection involves inserting the needle from the caudal pole of the testis and gently pushing it towards the other pole, depositing the injection homogenously as far as possible through the tissue. The animals were kept under routine clinical observations. Semen evaluation was performed by CASA (Computer Assisted Sperm Analysis) system at month 2-6-12. Every animal tolerated the intratesticular injections of CaCl2. Dogs of group A and B did not suffer from any agitation fever or marked inflammatory swelling of the testis. At month 2 only a small testicular remnant was palpated. Semen analysis at months 2 revealed azoospermia. Dogs remained azoospermic for six months in both groups A and B. At 12 months: 6 dogs (60%) remains azoospermic and 4 become oligospermic (40%) in group A; 8 (80%) remains azoospermic and 2 become severely oligospermic (20%) in group B; four dogs of group C (40%) and four of group D (40%) developed an abscess that fistulized in two weeks and underwent surgical castration; 6 dogs of groups C and D (60%) remain azoospermic. This study revealed a dose-dependent relationship when CaCl2 was used to induce sterilization in the male dog. The maximum response in contraception was noted at 30% and 60% concentration but the higher concentration the higher risk of abscess-fistulization. 10% and 20% concentrations were effective for only 6 month and then restart semen production in some dogs.

2. The no-kill policy on free-ranging dogs in Italy revisited on the basis of 21 years of implementation (Italian National Law No. 281 come out in 1991): reflexions on dog management and welfare

E. Natoli[1], S. Cafazzo[2], R. Bonanni[2] and P. Valsecchi[2]; [1]Azienda USL Roma D, Veterinary Hospital, Rome, Italy; [2]Department of Evolutionary and Functional Biology, University of Parma, Italy.
Email: enatoli@tiscali.it

Among European countries, only in Italy, Austria and some Regions of Spain, the law forbids the euthanasia of free-ranging dogs, unless they have an incurable illness or proved to be dangerous. The Italian National Law 281 of 1991 makes compulsory the registration of owned dogs and supports spay/neuter programs, essential for prevention but not thoroughly enforced. Therefore, in spite of an average of 1000 adoptions over 1500 new intakes per year (considering only the public dog shelter), the no-kill policy has brought about a stable overpopulation in shelters and, as a result, higher costs of management and welfare problems since some dogs remain in the shelter for life. For example, in 2005 only in the Lazio Region there were over 11,000 dogs censused in private and public shelters, and many of them remain there for the entire life. Given that, in Italy, we have decided for dogs that it is better a life-imprisonment than a painless euthanasia, it is our ethical duty to guarantee them with an adequate level of welfare. It is evident from the scientific literature that this is not the case. In our opinion, the no-kill policy deserves a wider debate about costs of management and level of welfare of sheltered dogs, based on data coming from countries where it has been enforced by law.

3. Adoptions: follow-up interviews in a Brazilian zoonosis control center

A. G. A. Guilloux[1], L. I. Panachão[1], A. J. S. Alves[1], G. Takeda[1], R. A. Dias[1]; [1]University of São Paulo - Department of Preventive Veterinary Medicine and Animal Health, Brazil.
Email: aline_gil@hotmail.com

In 2008, the State of São Paulo, Brazil, forbade the euthanasia of non aggressive pets by government institutions, such as zoonosis control centers, as a method of population control, except in case of severe illness of incurable contagious illness. Adoption has become the only possible destination of most of captured dogs, becoming a major concern to the centers. The risk of an adopted dog damaging its owner physical integrity must be considered, avoiding unsuccessful ownership experiences, when the dog is returned to the center or relinquished elsewhere – it represents unnecessary stress to the dog and unprofitable expenses to the public authority. Behavioral tests are an alternative that is gaining strength to determine whether a dog can or cannot be adopted and to increase the number of successful adoptions. Those tests have demonstrated to be better predictors of future behavioral problems than the opinion of the team working in the shelter. The present work has tested 166 shelter dogs available for adoption using a behavioral test proposed by the Valsecchi (2011), between September and December of 2011. The people who adopted one of those dogs are being interviewed after a period of between 58 and 67 days after adoption. This interview consists of questions on familiar environment, interaction with the animal, manifestations of aggressiveness and a validated test to analyze human-animal bond. Of the tested dogs, 3 died in the shelter, 47 were adopted 116 are still at the shelter. Out of the adopted dogs, 3 are no longer in their adoptive homes – one for behavioral problems, one was rescued for welfare issues and one ran away. Four owners couldn't be reached and 30 completed the interview. Considering the observed adoption rate constant, it would take 14 months to get all 166 dogs out of the shelter. The follow up interviews will still be done with every dog that is adopted and the relation of the behavioral test and human-animal bond is still to be analyzed. Considering that the city of São Paulo has a limited structure to receive and put dogs to adoption and that those adoptions may take a long time to happen, it makes clear that every adoption is a gold opportunity that cannot be lost or wasted and the adoption system must be improved to value these opportunities.

4. Two-stage cluster sampling to estimate population parameters of owned dogs and cats in urban area of Votorantim, Brazil

O. Santos[1], E. Nestori Chiozzotto[2], R. de Cassia Maria Garcia[2], R. A. Dias[1], F. Ferreira[1]; [1] Departamento de Medicina Veterinária Preventiva e Saúde Animal, Universidade de São Paulo. [2] Instituto Técnico de Educação e Controle Animal – ITEC, Brazil. *Email: oswaldo@vps.fmvz.usp.br*

A two-stage sampling design was adopted to estimate parameters of interest to the management of dog and cat populations. In a pilot study, the between and within cluster variance as well as the intra-class correlation coefficient, for the variable "total number of dogs per household" were calculated. With those values, the minimal number of households (secondary sampling units) to be selected in each census sector (primary sampling unit) was obtained. The minimal number of census sectors to be sampled was calculated from the number of households previously determined and through a function that relates the cost of inclusion of both units the primary and the secondary. The selection probability of each census sectors was proportional to its size (number of households that contain) and with replacement. The selection of households in each census sector was systematic and random. To collect data, a questionnaire created and refined in a pilot study was used. A total of 10 population parameters were estimated, concerning to interviewees and households; 31 related with demographic characteristics of animals; 36 concerning to reasons for not sterilizing the animals; 50 related with the destination of animals and 76 related with the tolerance of nuisance behaviour. For the particular case of the variable "total number of dogs", the point estimate was 26734.1 (dog:human ratio = 1:4.07); CI 95 % = 20061.98 – 33406.14; and the design effect was = 4.856. For the other variables, the median, mean, minimum and maximum of design effects were 1.197, 2.252, 0.143 and 43.25 respectively. The sampling design based on the variable total number of dogs per household produced appropriate design effects for almost all the variables, however, further studies are still required to create sampling designs that may produce more precise estimates and bigger effective sample sizes.

5. Dog chemical castration by intratesticular injection of a calcium chloride in an alcohol solution

R. Leoci[1], G. Aiudi[1], F. Silvestre[1], G. M. Lacalandra[1]; [1]University of Bari, Department of Animal Production, Italy. *Email: leocivet@yahoo.it*

Overpopulation of stray and feral dogs pose serious human health, animal health and welfare problems and have a socio-economic, political and religious impact in many countries. The

uncontrolled populations of stray dogs are fast increasing; although sterilization of male and female dogs is ideal for prevention of overpopulation, sterilization of male may be more beneficial, because males have the potential to produce a greater number of offspring than females. Surgical sterilization has been the cornerstone of efforts to curb pet overpopulation. While undoubtedly effective in preventing reproduction in individual animals, surgical techniques are far from ideal tools: can be too time consuming, expensive to be performed on a large-scale and presents many adverse side effects. Chemical castration is an alternative non-surgical approach to male dog contraception. The technique is not technically challenging, inexpensive and suitable for large-scale sterilization programs. Advantages of nonsurgical chemical sterilization are apparent reduction of pain and stress, and elimination of haemorrhage, infection and other surgical sequelae. Actually, scientists with an interest in animal welfare have been attempting to define the criteria that can identify husbandry systems that are less stressful on the physiological and ethological well being of animals. An ideal chemical sterilizing agent for domestic animals would be one that effectively arrests spermatogenesis and androgenesis as well as libido and absence of toxic and untoward side effects. Intratesticular injections have been investigated as a method of inducing aspermatogenic orchitis and male contraception for more than five decades. Unfortunately the ideal chemical agent has not been found, yet. The aim of this trial was to evaluate the efficacy of 20% calcium chloride in pure alcohol solution, injected into the testicular parenchyma, as a method for chemical castration. Twenty-one dogs of mixed breed, 4.7±1.23 years old, 20±5.84 kg of body weight, with good clinical conditions and normal reproductive parameters, were lightly sedated and injected into the dorsocranial portion of both testes with a solution of 20% calcium chloride dehydrate in ethanol (95%). The dose injected corresponds with the testicular width (19-22 mm receive 0.8 ml; 23 and above 1 ml). Semen evaluation was performed by CASA (Computer Assisted Sperm Analysis) system at day 30-60-90. Forty-eight hours after the injection, dogs showed very light discomfort at palpation and testicular tumefaction, which regressed within 3 days. At day 30, testicular ultrasonography revealed bilateral more dense nodular lesions; prostatic volume and parenchyma were normal. Semen evaluation showed azoospermia at day 30-60 and 90. At day 90 testicles were shrunk at palpation. An intratesticular injection of 20% calcium chloride in pure alcohol solution, as a method for chemical castration, was effective and economical for the sterilization of male dogs. It is free from pain and chronic stress and will contribute to a simple alternative method to surgical castration. The dogs of this study are under evaluation to study this solution injection long term effect (one year).

6. Distribution and abundance of stray dogs in the province of Rieti (Lazio, Italy): basic data for management planning

S. Adriani[1,2], M. Bonanni[2], A. Cardone[2], G. Casciani[2], M. Mangiacotti[2], A. Mazzilli[2], E. Morelli[2], V. Rosati[2], S. Rughetti[2], V. Ruscitti[2], A. Amici[1]; [1]Dept. of Science and Technologies for Agriculture, Forestry, Nature and Energy (DAFNE) University of Tuscia, Italy. [2]Environment Committee Pro Loco Fiamignano, Italy. *Email: adrianisettimio@libero.it*

This study was conducted in the province of Rieti (Lazio, Italy), in an area of 2,760km2 split into 73 municipalities. Stray dogs (*Canis familiaris*) represent a serious problem that can have negative consequences on human and domestic animal health (e.g. *Echinococcus granulosus*), increase livestock predation, and generate possible genetic pollution of wolves (*Canis lupus* is present in 12 Sites of Natura 2000 network). In addition, concern is growing as stray dogs may also attack humans (Livorno, February 28, 2012; Milano, March 2, 2012). Due to these worries it is absolutely mandatory to acquire data to plan an appropriate management of stray dogs. An operational intervention can be effective only if the exact distribution and abundance of the phenomenon are known. The survey was carried out by patrolling the area. For this purpose the territory was divided into 10 zones, assigned to as many supervisors. The patrols were carried out between May 2011 and January 2012. The agricultural and natural areas have been examined following pathways previously identified and georeferenced (3,420km; 1.23km/km2). The larger inhabited areas were split into districts and assigned to trusted supervisors. The surveys took place simultaneously in various districts of the same town centre. Only the dogs without owners were counted at the time of interception. The presence or absence of the collar has been of relevant importance in order to distinguish wandering dogs (with owner, but unguarded) from stray dogs (without owner). The observed subjects were divided according to the areas of interception (villages or natural location), to aggregation (individual or packs) and to breed. To avoid underestimation and multiple counts, each path (country or village) was executed without interruption. The patrol was carried out in 582 small towns (average=276 inhabitants/village). During 601 inspections 841 stray dogs were localized, of these 413 belong to 173 mono/multiracial packs consisting of 2 to 5 subjects (average=2.39 heads/pack, S.D.=±0.62); 428

lonely animals. The average density on a provincial basis is 0.31 stray/km2. 158 localizations took place in a natural environment (92 lonely subjects, 160 belonging to 66 mono/multiracial packs formed by 2 to 5 subjects, average=2.42, S.D.=±0.63, average distance from the nearest village approximately 552m, S.D.=±454.24). 312 subjects had a collar, whilst 529 were without (therefore considered strays). The latter almost certainly had no owner and were not regularly registered. Within the villages were localised 337 subjects with no collar (185 individuals, 152 belonging to 64 mono/multiracial packs, average=2.38 heads/pack, S.D.=±0.66). In terms of breed: 114 were shepherd dogs, (of these 67 belong to 35 mono/multiracial packs consisting of 2 to 5 subjects); 193 hounds (of these 83 belong to 44 mono/multiracial packs consisting of 2 to 5 subjects); 346 half-cast hounds (of these 183 belonging to 81 mono/multiracial packs consisting of 2 to 4 subjects). The extent and diffusion of this phenomenon, together with the dispositions of the national legislation 281/91 on pets, and the law 17/95 of the Lazio Region (for the preservation of fauna), require an immediate action planning for the management of stray dogs.

7. The traditional management of sheepdogs increases the number of stray dogs. A case study in the province of Rieti (Lazio, Italy)

S. Adriani [1,2], M. Bonanni[2], A. Cardone[2], G. Casciani[2], M. Mangiacotti[2], A. Mazzilli[2], E. Morelli[2], V. Rosati[2], S. Rughetti[2], V. Ruscitti[2], A. Amici[1]; [1]Dept. of Science and Technologies for Agriculture, Forestry, Nature and Energy (DAFNE) University of Tuscia, Italy. [2]Environment Committee Pro Loco Fiamignano, Italy. *Email: adrianisettimio@libero.it*

Sheep-farming is widespread in the province of Rieti (practiced in 70 of 73 municipalities). The sheep population counts 84,954 heads distributed in 2,057 farms, with an average of 41.30 heads per unit/company. In 24 municipalities sheep population exceeds 1,000 animals. In these territories there are many companies where sheep-farming is the main source of income. Usually flocks of sheep are assisted by pure-bred Abruzzo Dogs (AD), which are currently promoted since they are considered to be able to prevent and fight the assault of wolves to flocks of sheep. The number of AD for each farm is variable. A specific survey has revealed that the relationship AD/sheep lies between 1/43 and 1/250. In order to facilitate the activities of prevention and protection normally dogs are set free outside the sheepfolds. This attitude allows subjects poorly trained to wander within the territory with the risk that they might damage both livestock and fauna. This wrong management continues despite law impositions: “Dogs of all breeds including those guarding homes, property and livestock, must not be left unattended in the countryside for distances of more than 200m from homes or cattles (L. R. Lazio 17/95 Art. 29); “Anyone who abandons dogs is susceptible to punishment with administrative sanction” (L. 281/91; Pets). The data presented in this study are extrapolated from a large survey on stray dogs carried out between May 2011 and January 2012. Due to regulatory prescriptions only stray AD (unaccompanied) have been counted, intercepted at distances of at least 200m from households and livestock. In 82 contacts 114 AD were intercepted (67 parts of 35 packs, including 13 multiracial and 22 exclusively AD; for an average of 2.36; S.D.=±0.66). The 30 interceptions occurred in the countryside took place at an average distance of about 583m from the nearest residential areas; (S.D.=±552.16). Between all the AD intercepted only 27 had the collar and, therefore, were probably officially registered. In 52 cases, within the inhabited centers, 67 AD were intercepted, 29 of which are part of 14 mono/multiracial packs formed by 2 to 4 subjects. 42 of these dogs (33 interceptions) were without a collar and belong to 7 mono/multiracial packs formed by 2 to 5 subjects. This data clearly indicate that sheep-farming is the real cause of stray dogs. This problem, besides causing damage to livestock, has also an impact on farmers themselves. The increase of wolves in the Apennines and the encouragement for protection with selected dogs will enhance the use of AD. In order to counteract the impact on livestock and faunal communities it is advisable to define specific company protocols for managing working dogs. Furthermore it is necessary to intensify controls on companies which use these auxiliaries, in order to check: health status, official registration, regular maintenance, ways of farm management. Finally, on the basis of legal prescriptions, the regular presence of unidentifiable stray dogs in inhabited centers raises the question of the real capacity of local authorities to manage properly the problem of stray dogs.

8. Stray dogs and damage to sheep farms in the Oristano province (Sardinia, Italy)

S. Adriani[1], M. Bonanni[2], P. Briguglio[3], S. Pinto[4]; [1]Dept. of Science and Technologies for Agriculture, Forestry, Nature and Energy (DAFNE) University of Tuscia, Italy. [2]Naturalist, Wildlife Manager, Italy. [3]Merops Veterinaria e Ambiente s.r.l., Italy. [4]Dept. Animal Production and Food Control, University Federico II, Italy. *Email: adrianisettimio@libero.it*

Livestock Predation in Italy has been mainly studied in the areas with the presence of Wolf (*Canis lupus*) and Brown bear (*Ursus arctos*), large predators particularly protected. In a preservation prospective in these areas there are regulations in force to compensate damage to livestock. The historical data available in Italy indicate that most of the events in these regions has been attributed almost entirely to Wolf and rarely to stray or feral dogs (*Canis familiaris*). Nevertheless, the presence of stray and feral dogs has been verified as well as their ability to prey on livestock. While faced with an extensive bibliography related to Wolf/Bear damage, references on dog predations are instead rare. The objective of this survey is to estimate the extent of damage caused to sheep by these predators. The investigated area is the Oristano province, where, due to the absence of Bear and Wolf, the predation on livestock is certainly due to stray or feral dogs. We exclude the Red fox (*Vulpes vulpes*), also present in the studied area, since it can prey only on lambs. In the Oristano province there are 2,505 farms collecting 501,980 sheep. In Sardinia 263,000 dogs are regularly registered and about 22,000 strays are estimated, often in packs (source SIMeVeP 2008). In the studied area wild boar hunting is widespread (October to January) with the copious use of packs of hounds. These animals are often out of control by the conductors and roam unchecked for several days, causing damage, before being recovered. In Sardinia there isn't a centralized registration of predation events; farmers requiring the payment of damage must take out appropriate insurance policies. In case of damage farmers must complain directly with law enforcement agencies that start investigating to identify the owners of the responsible dogs. The data analyzed in this study were provided by the Merops Veterinaria e Ambiente s.r.l. (MVA), assisting 60 farms operating in the considered area and carrying out surveys in case of predation. In the period 2010/2011 21 companies have suffered 36 attacks by dogs with a total loss of 371 heads (10.31 heads/event; SD=±12.21). In relation to the available data, a first estimate of the damage produced annually by dogs predation to sheep farms in the Oristano province is possible by assuming that the analyzed sample is representative of the overall phenomenon taking place in this area. For the estimation we analyzed the 25 events occurred in 2011 against 17 companies (28.33% of MVA-assisted). The total sheep population of these companies was 4,525 animals, including 245 lost because of predation. Comparing these data to the provincial sheep number, we got the annual losses in the investigated area to be 23,000 animals. Considering that the price of sheep in the stock exchange of Cagliari in February 2012 was 140.00 €/head (ISMEA), we estimated a total annual loss of about € 3,220,000.00. The heaviness of the phenomenon and the lack of regulations that protect farmers suggest to plan actions aimed at a speedy and proper management of stray dogs.

9. Knowledge, attitudes and practices of rabies prevention and dog bite injuries in urban and peri-urban provinces in Cambodia, 2009

E.Stiles[1], M. Lunney[1], S.J.S. Fèvre[1], S. Lyb[2], S. San[2], S. Vong[2]; [1]Veterinarians without Borders/Vétérinaires sans Frontières–Canada, Canada; [2]Institut Pasteur–Cambodia, Phnom Penh, Cambodia. *Email: enid.stiles@vwb-vsf.ca*

Rabies remains a major public health issue despite the existence of well established prevention and treatment protocols. Knowledge and methods of practice were evaluated in an urban and peri-urban province of Cambodia (Phnom Penh and Kandal, respectively). The majority of respondents (93.2%; 233/250) had heard of the disease rabies, of whom only 77.3% (180/233) knew it was fatal to humans. In addition, only 51.9% (121/233) were aware of the vaccine for dogs. The proportion of the population that reported a dog bite (2004–2009) was similar for Phnom Penh and Kandal. Nearly one-half of all victims (37/75) sought treatment at the Institut Pasteur–Cambodia (IPC) clinic, followed by a private clinic (19/75), a hospital (6/75) and traditional medicine (4/75); 7 victims sought no treatment and 2 reported other. Overall, children aged <15 years reported a significantly greater proportion of dog bite victims than adults aged >15 years [10.0% (28/280) vs. 4.4% (47/1059), respectively]. Nearly all dog owners agreed to pay for their dogs' vaccination (96.5%; 136/141) and to use a collar (94.3%; 133/141). Only 41.8% (59/141) and 51.8% (73/141) would pay to have their dogs spayed and neutered, respectively. Further community education on the prevention of rabies transmission is needed. Focusing on responsible dog ownership and the importance of both the prevention and immediate treatment following a dog bite is essential to reduce rabies infection in Cambodia.

10. Spatial accessibility of the no cost spay/neuter program of dogs and cats in Bogota, Colombia - Preliminary Results

G. Polo[1], C. A. Mera[2], R.A. Dias[1]; [1]University of São Paulo, Epidemiology and Biostatistics Laboratory, Brazil. [2]University of São Paulo, Institute of Physics, Brazil.
Email: gina@vps.fmvz.usp.br

The stray animals surplus is a global threat, observed in different countries. This surplus is also dependent on factors such as urbanisation level, public health, garbage management and cultural traditions. Neutering programs towards domestic animals, when accomplished permanently with adequate geographic distribution, has decreasing costs throughout the time and are effective in diminishing stray populations. The 2-step floating catchment area approach integrated with a Gaussian function was used to explore the spatial accessibility created by the no-cost neutering program to dogs and cats in the city of Bogotá, Colombia, and identify areas with poor access. In particular the equitable distribution of accessibility patterns is explored in relation to neighbourhood socio-economic strata.

11. Characteristics of a canine distemper virus outbreak in Dichato, Chile following the February 2010 earthquake

E. Garde[1], B. M., deC. Bronsvoort [2], G. Pérez [1], G. Acosta-Jamett[3]; [1]Veterinarians Without Borders/Veterinarios Sin Fronteras- Canada, Latin America Branch, Chile. [2]The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, UK, [3]Instituto de Medicina Preventiva Veterinaria y Programa de Investigación Aplicada en Fauna Silvestre, Facultad de Ciencias Veterinarias, Universidad Austral de Chile, Chile. *Email: elena.garde@vwb-vsf.ca*

Human public health and welfare risks following natural disasters are well-described, but similar information for animals is scarce. Previous accounts of companion animals in disaster situations are primarily with reference to the effects on people. For example, the psychological sequelae on owners following pet loss, factors affecting pet owner compliance with evacuation measures, the geographic expansion of diseases following pet relocation, and the zoonotic risks for pet owners all report on disasters and pets, but none address the immediate disease risks for dogs and the associated animal welfare effects. Natural disasters have disproportionate effects on developing countries and in the absence of effective free-roaming dog control programs under normal circumstances, canine diseases and animal welfare have the potential to become important issues. We report here on a canine distemper virus outbreak in Chile following the 2010 earthquake and tsunami. Canine distemper virus (CDV) is one of the most important infectious diseases of canines, causing high mortality rates. One month following the Chilean disaster of February 2010, accounts of an unknown cause of mortality in domestic dogs began to circulate in a small town located close to the earthquake epicenter. We examined a total of 208 dogs, vaccinated 128, and obtained CDV results for 104. Fifty-four dogs (51.9%) were positive for CDV at the cut off titre of >1:50, most of these positives being in dogs less than 2 years of age. We observed many dogs in poor health and evidence of an increase in chronic disease over the two visits. These findings suggest that the lack of pre-disaster dog management can have widespread negative effects in the post-disaster environment, and support the creation of a preparedness plan that takes animal welfare and the prevention of disease outbreaks into consideration.

12. Animal reproductive scientific research with discovery to focus on the successful implementation of effective dog population management

M. Wang[1]; [1]MD Ark Sciences, Inc. Center of Reproductive Science and Technology, USA.
Email: mwang@arksciences.com

Animal welfare organizations and governments have utilized various strategic initiatives in an attempt to effectively manage dog populations throughout the world. Reproductive science research and development should focus on several variables so that any new discovery should have value to its strategic implementation and would be universally acceptable and affordable regardless of social and economic factors for global utilization, especially in those regions that are at greatest risk of zoonotic diseases such as rabies, in addition to lessening the negative environmental impact that could be directly attributed to the overpopulation of dogs in a given region. Research and development must determine several factors when determining the path to discovery that would have the greatest impact to effectively management the dog population in a humane and effective method, including but not limited to: (1) Contraception vs. Sterilization; (2) Female targeted vs. Male target; (3) Entirety Animal System vs. Local System Effect Only; (4) Surgical vs. Non-surgical; (5) Reversible vs. Permanent; (6) Single Application with Multiple Functionality vs. Multiple Applications with Multiple Functionality. Numerous social and economic factors widely impact the effectiveness and sustainability of the success of these strategies. In most developed countries, the dog is widely considered as a family member and plays an integral part in the guardian's lifestyle, increasing the value associated with

"owning" a dog. In other countries the role of "community" dogs has a much different role in the value-added proposition, but nonetheless there is a demand and thus a value placed on the dog's interaction with the humans. Regardless of the social, economic, cultural, or geographic environment, a segment of the dog population are not treated with the appropriate level of welfare and proper care that is universally desirable to achieve. The varying degree of responsible ownership, be it in "owned" or "community" dogs has created a gap in humanely providing the suitable veterinary care such as spay/neuter or vaccination to reduce the amount of unwanted litters increasing the economic burden on governments and non-government organizations to meet the short fall in the standard of living for the communities involved. For the past 30 years the attempts to find a comprehensive strategy to reduce the number of unwanted litters through education, advancements in spay/neuter techniques, and even the abhorrent mass culling of entire geographic populations have yet to solve the problem of effective management of the dog population. The education and advance in spay and neuter techniques has led to greater acceptance on the importance of responsibility that humans have for the domesticated animals and continued efforts should be a primary focal point, but understanding the reproductive sciences for humans as well as animal will help lead to new discoveries that will bolster the strategic initiates to ever higher levels of efficiency for sustainable and humane dog population management.

13. Hunting dogs and Aujeszky´s disease in Czech Republic

P. Literakova[1]; [1]Mendel University, Faculty of Forestry and Wood technology, Czech Republic. *Email: petra.literakova@centrum.cz*

Aujeszky's disease (ACH) or pseudorabies is a worldwide extended viral disease, which is caused by a virus of a Herpesviridae family. This virus attacks pigs, but other mammal too, with exception of primate and human. Infection by this virus is sporadic by horses. Aujeszky´s disease goes about in Europe, Southeast Asia, Central and South America including Mexico. This disease was first described in Hungary in the 1902 by professor Aujeszky. He isolated generator of disease from bull, dog and cat. This viral infection affect central nervous system, respiratory system, and causes tenacious pruritus. Pigs are the natural host of Aujeszky's disease, including wild boar. Most of animals, except pigs, die after infection, two days after contamination. Czech Republic has an Aujeszky's disease-free status, thanks to therapeutic program at domestic pig farms, which ended in our Republic in 1987. ACH still represent threat for our farms. In 2004 Aujeszky's disease appeared at female pig in a small farm. This female pig came to contact with a place where wild boar were slaughterer. Today wild boar represent a risk of infection of this disease to other animals. After random serological investigation of 42 wild boar, it was found that 20 of them were positive (47, 6%) Therefore Aujeszky's disease monitoring is covered by the tate veterinary board in the Czech Republic. At present, by the resolution of European commission in the 2009, these states are free from this disease: Czech Republic, Denmark, Cyprus, Luxemburg, Austria, Slovakia, Finland, Sweden and a part of France. Pigs are the reservoir of ACH and they are sensible to every way of contact with the virus. Propagation of the virus in pigs does not have to cause clinical symptoms and the infection can be very inconspicuous with adult pigs. Usually ACH is transferred by a direct contact between animals, but the virus can survive as long as 7 hours in the air with 55% humidity and it can expand as far as distance of 2 kilometres. Hunting dogs are a risk group for this disease, because they are used to hunt wild boar. These dogs are in danger when they get in contact with pigs. Dogs can infect themselves from rodent which lives in pig farms, by swallowing meat of infected pigs or by dermal contamination. Viral infection of dogs causes their death as far as after 6 hours of infection and very small amount of them survived longer than 48 hours. ACH can be eliminated only by using vaccines, modified alive or inactive antigens. This vaccination is now used only for the pigs. In the 2011 referential laboratory of Aujeszky's disease of pigs SVÚ Olomouc published the results of analyses ACH tests in pigs from a different region. The result from December 2011 was: from a twenty wild board from regions eské Budjovice, Vsetín, Píbram, Písek, Tábor and Jindichv Hradec, 9 pigs positive to ACH and 11 negative. Almost half of tested pigs came into contact with with ACH. These results suggest the possibility of infection of hunting dogs with ACH and force owners of dogs to take steps to prevent infection.

14. Investigating the links between dog health and human health in remote Australian indigenous communities

G. Brown[1], L. Schrieber[1], C. O'Connor[1]; [1]Faculty of Veterinary Science University of Sydney NSW Australia. *Email: graeme.brown@sydney.edu.au*

The health and well-being of Indigenous Australians residing in remote communities, has been well documented. However, the impact of the dogs on human health in these communities has become a contentious issue and has largely been ignored. Before European settlement, the nomadic lifestyle and low population density protected Indigenous people and their dogs from many infectious diseases. People have now settled in communities with their dogs and are no longer nomadic. The additional burden of infectious diseases represented by dog-to-human transmission in these communities has always been considered an unknown quantity. In order to address some of these important issues, in 2007 the University of Sydney's 'Healthy Dogs-Healthy Communities' project was commenced. The aim of this project was to examine the relationships between culturally-appropriate education and training, dog health and welfare, and human health and welfare in 6 remote Indigenous communities across Australia. Establishing a definite link between dog health and human health in these remote Aboriginal communities has been challenging. Every community has its unique set of socio-cultural, historical, economic and epidemiologic factors to be considered. The zoonotic diseases scabies, salmonellosis, campylobacteriosis, cryptosporidiosis and giardiasis were all known to be present in community members. Unfortunately, there were no reliable records available from the community clinics to determine the prevalence of these diseases. However, canine levels of these and other potentially zoonotic diseases were able to be measured. Special emphasis was also placed on the type of housing where dogs were living as it was hypothesised that it was in and around the houses that transmission of zoonotic diseases would occur. All the dog health surveys have now been completed. Many of the problems associated with obtaining diagnostic samples from remote areas were overcome with the application of new isolation and detection techniques. This has involved using DNA technology to detect potential zoonotic organisms such as Salmonella spp and Campylobacter spp and using PCR technology to detect the presence of tick-borne diseases. In addition, intestinal parasites such as Giardia, Cryptosporidium and Ancylostoma spp were genotyped to compare them with the isolates detected in people living in the same regions. Streptococcal skin infections are quite common in people living in these remote communities and part of the study involved the detection of the virulence factors associated with these infections in dogs in one community. In addition, in another community a survey was performed to check whether dogs were carriers of Community-Acquired MRSA. This paper will discuss whether the conditions present in these typical Aboriginal communities favoured the transmission of diseases between dogs and humans (and vice versa) and secondly, will look at the Public Health implications of the potentially zoonotic diseases detected and linking them with the unique association that Indigenous people have with their dogs. It is believed that in these remote Australian Indigenous communities, circles of infection between both dogs and humans are likely to occur.

15. Molecular epidemiology of rabies in Southern People's Republic of China

Q. Tang[1], X.Y. Tao[1], H. Li[1], Z.J. Mo[1], H.Zhang[1], D.M. Wang[1], Q. Zhang[1], M. Song[1], A. Velasco-Villa[1], X. Wu[1], C. E. Rupprecht[1], G.D. Lian[1];[1]Institute for Viral Disease Control and Prevention,China CDC.
Email: qtang04@sina.com

In recent years, the number of human rabies cases in the People's Republic of China has increased during severe epidemics in 3 southern provinces (Guizhou, Guangxi, and Hunan). To analyze the causes of the high incidence of human rabies in this region, during 2005–2007, we collected 2,887 brain specimens from apparently healthy domestic dogs used for meat consumption in restaurants, 4 specimens from suspected rabid dogs, and 3 from humans with rabies in the 3 provinces. Partial nucleoprotein gene sequences were obtained from rabies-positive specimens. Phylogenetic relationships and distribution of viruses were determined. We infer that the spread of rabies viruses from high-incidence regions, particularly by long-distance movement or transprovincial ranslocation of dogs caused by human-related activities, may be one cause of the recent massive human rabies epidemics in southern China.

16. Neuter and return project in Romania

R. Coates Smith1, N. L. Klinge1 ;1F.P.C.C. -Foundation for the Protection of Community Dogs-, Romania.
Email:robertcoatessmith@mailme.ae

In 2003 the Municipality of the Romanian city of Oradea (210,000 inhabitants) gave exclusive dog management rights to F.P.C.C. (Foundation for the Protection of Community Dogs). Our policy is to return neutered and vaccinated dogs to their owners or to their community or territory, unless those dogs show unprovoked aggression to people or other animals or unless they are unable to lead

acceptable lives in their original environment. We do not put dogs to sleep unless they are incurably ill, in severe pain or aggressive. We follow the policy of the World Health Organization's "Guidelines for Dog Population Management" (Geneva 1990) and various other academic studies which show that killing dogs is ineffective. In 2003 the roads in and around Oradea were littered with live and dead dogs. Adoptions from the municipal shelter where zero. Today we are unlikely to see either a single dead dog or more than a couple of live dogs on the roads. Often not a single unsupervised dog is visible. Currently 85% of our dogs in our city adoption centre is adopted locally. his is because since 2003 F.P.C.C. has neutered and vaccinated about 15.000 dogs in Oradea alone. We can therefore proudly claim that F.P.C.C's project in Oradea is probably the most successful Neuter & Return project in Eastern Europe. This was confirmed by Oradea's Community Police in June 2011, who surveyed the streets of the city and estimated the unsupervised dog population as 350 (about 8% of the starting level in 2003). Since Oradea is not an island it is therefore clear that in order to solve the unwanted dog problem for ever we had to extend our neutering program to the whole county of Bihor: 600,000 inhabitants with an estimated dog population of 100,000. In 2007 F.P.C.C. therefore launched SOS Dogs Bihor. F.P.C.C. is promoting Responsible Pet Ownership through its Education Project for Schools and information stands in front of city halls and shopping centres. We offer free neutering of owned dogs and have permanent neutering centres in Oradea, Marghita and Beius and Salonta. We operate two mobile clinics and a field hospital. Today F.P.C.C. has written agreements to manage dog control with over 45 municipalities. Besides our city adoption centre we've also set up an open shelter for shy, non rehomable and older dogs. The success of F.P.C.C. didn't stay unnoticed. In 2010 the Bulgarian Ministry of Agriculture and Food invited Robert Smith and Nathalie Klinge to advice 200 of its civil servants on a national dog population management program. In 2011 the mayor of Sofia invited them as well to advice the Council of Sofia Municipality.

17. Population structure of introduced dogs *Canis lupus familiaris* and cats *Felis silvestris catus* in Isabela Island– Galapagos, Ecuador

X. M. Herrera-Alvarez[1], Leonardo Ortega[1], Damaris P. Intriago-Baldeon[1], Jaime Grijalva[1]; [1]San Francisco de Quito University, Department of Env. and Biological Sciences, Ecuador.
Email: xime43sany@hotmail.com

The Isabela Island, located in the Galapagos Archipelago, is one of the islands with the highest number of endemic species. Such species are being threatened by introduced domestic species, including dogs *Canis lupus familiaris* and cats *Felis silvestris catus* that affect mainly iguanas and birds populations. In this pilot study, we analyzed the population structure of these two species in the parishes of Puerto Villamil and Tomas de Berlanga in this island. The variables analyzed were: total number of individuals of each species, number of males, number of females, number of sterilized animals, and mean of the age of the individuals. We carried out surveys in every family in the two parishes. We found no significant differences in the studied variables between the two areas with the exception of the number of sterilized individuals. We also found that the populations of the two species are relatively young and that their numbers appear to be increasing. It is important to develop ethical management policies to control the populations of the two species to avoid their spread in the island.

List of Contributors (Presenting and first authors only)

Settimio Adriani
Dept. of Science and Technologies for Agriculture, Forestry, Nature and Energy (DAFNE),
University of Tuscia,
Via S. Camillo de Lellis snc,
01100, Viterbo, Italy
Email: adrianisettimio@libero.it

Heather Bacon
Jeanne Marchig International Centre for Animal Welfare Education,
University of Edinburgh,
Easter Bush Campus, Roslin,
Midlothian EH25 9RG, UK
Email: Heather.Bacon@ed.ac.uk

Shanis Barnard
Human-Animal Relationship and Animal Welfare Laboratory,
Istituto G. Caporale,
Torre del Cerrano,
Teramo, Italy
Email: shanis.barnard@gmail.com

Scott C. Bender
Navajo Nation Veterinary Program,
Chinle,
Arizona 86503, USA
Email: scottbender@navajo-nsn.gov

Joyce Briggs
Alliance for Contraception in Cats & Dogs,
14245 NW Belle Court
Portland, OR 97229, USA
Email: Joyce@acc-d.org

Graeme Brown
Faculty of Veterinary Science,
Room 235, B14 - McMaster Building,
The University of Sydney,
NSW 2006, Australia
Email: graeme.brown@sydney.edu.au

David Burrows
GPO Box 10266 GPO,
Central District,
Hong Kong
Email: burrowsvet1@yahoo.com

Gabriele Casciani
Dept. of Science and Technologies for Agriculture, Forestry, Nature and Energy (DAFNE),
University of Tuscia,
Via S. Camillo de Lellis snc,
01100, Viterbo, Italy
Email: adrianisettimio@libero.it

Piers Claughton
RSPCA,
London Rd, Patcham,
Brighton, BN1 8ZH, UK
Email: pclaughton@rspca.org.uk

Sarah Cleaveland
Institute of Biodiversity, Animal Health and Comparative Medicine,
College of Medical, Veterinary & Life Sciences,
Graham Kerr Building,
University of Glasgow
Glasgow G12 8QQ, UK
Email: sarah.cleaveland@glasgow.ac.uk

Anna Czupryna
University of Illinois at Chicago,
845 W. Taylor St.,
Chicago,
Illinois, 60607, USA
Email: aczupr3@uic.edu

Paolo Dalla Villa
Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise “G.Caporale”,
Via Campo Boario,
64100 Teramo, Italy
Email: p.dallavilla@izs.it

Van Dang Ky
Division of Department of Animal Health,
Ministry of Agriculture and Rural Development,
Hanoi, Vietnam
Email: vandangky@yahoo.com

Katinka DeBalogh
Food and Agriculture Organization of the United Nations,
Viale delle Terme di Caracalla,
00153 Rome, Italy
Email: Katinka.DeBalogh@fao.org

Ricardo Augusto Dias
Laboratory of Epidemiology and Biostatistics,
Faculty of Veterinary Medicine,
University of Sao Paulo,
Av Prof Dr Orlando Marques Paiva,
87 SP 05508270, Brazil
Email: dias@vps.fmvz.usp.br

Harry Eckman
International Fund for Animal Welfare (IFAW)
87-90 Albert Embankment,
London SE1 7UD, UK
Email: harry.eckman@yahoo.co.uk

Kathleen Fagerstone
USDA/APHIS/Wildlife Services/National Wildlife Research Center,
4101 Laporte Avenue, Fort Collins, CO 80521, USA
Email: kathleen.a.fagerstone@aphis.usda.gov

Pei Feng Su
Deepashree Balaram ACTAsia for Animals,
PO Box 1264,
High Wycombe,
HP10 8WL, UK
Email: pei@actasia.org

Elena Garde
Veterinarians Without Borders Canada,
Latin America Branch,
Carlos Anwandter 561,
Valdivia, Chile
Email: elena.garde@vwb-vsf.ca

Armando Giovannini
Istituto 'G. Caporale' di Teramo,
Via Campo Boario,
64100 Teramo, Italy
Email: a.giovannini@izs.it

Cristina Gobello
Faculty of Veterinary Medicine
National University of La Plata,
60 and 118, CC296, 1900 La Plata,
Buenos Aires, Argentina
Email: cgobello@fcv.unlp.edu.ar

Frances Goodrum
WSPA UK,
5th Floor,
222 Grays Inn Road,
London, WC1X 8HB, UK
Email: *FrancesGoodrum@wspa-international.org*

Aline Gil Alves Guilloux
University of São Paulo,
Department of Preventive Veterinary Medicine and Animal Health, Brazil
Email: aline_gil@hotmail.com

Alexandra Hammond-Seaman
RSPCA (International),
Wilberforce Way,
Southwater, Horsham,
West Sussex RH13 9RS, UK
Email: ahammond@rspca.org.uk

Katie Hampson
Institute of Biodiversity, Animal Health and Comparative Medicine,
College of Medical, Veterinary & Life Sciences,
Graham Kerr Building,
University of Glasgow
Glasgow G12 8QQ, UK
Email: katie.hampson@glasgow.ac.uk

Barbara Häsler
Royal Veterinary College,
Hawkshead Lane,
North Mymms,
Hatfield AL9 7TA, UK
Email: bhaesler@rvc.ac.uk

Tracy Helman
Department of Primary Industries,
475 Mickleham Road Attwood,
Victoria, 3049, Australia
Email: Tracy.Helman@dpi.vic.gov.au

Ximena Herrera
San Francisco de Quito University,
Department of Env. and Biological Sciences,
Diego de Robles y Pampite S/N,
Quito, Ecuador
Email: xime43sany@hotmail.com

Elly Hiby
WSPA UK,
5th Floor,
222 Grays Inn Road,
London, WC1X 8HB, UK
Email: ellyhiby@wspa-international.org

Lex Hiby
Conservation Research Ltd
110 Hinton Way,
Great Shelford,
Cambridge, CB22 5AL, UK
Email: lexhiby@gmail.com

Joelene Hughes
Wildlife Conservation Research Unit
Department of Zoology, University of Oxford,
Recanati-Kaplan Centre, Tubney House
Abingdon Road, Tubney,
Oxfordshire OX13 5QL, UK
Email: diana@candiinternational.org

Kuladip Jana
Division of Molecular Medicine,
Bose Institute, P1/12,
Calcutta Improvement Trust Scheme VIIM,
Kolkata- 700 054, India
Email: kuladip@bic.boseinst.ernet.in

Mark Jones
Humane Society International UK,
5 Underwood Street,
London, N1 7LY, UK
Email: mjones@hsi.uk.org

Malika Kachani
College of Veterinary Medicine,
Western University of Health Sciences,
California, USA
Email: mkachani@westernu.edu

Nathalie Klinge
Foundation for the Protection of Community Dogs (FPCC)
Bdul Dacia Nr. 51,
AN52, 5th Floor, Ap. 17,
Oradea, Romania
Email: barkbark@planet.nl

Omesh Kumar
Dept. of Epidemiology
Government of Himachal Pradesh,
India
Email: bhartiomesh@yahoo.com

Susan Kutz
Faculty of Veterinary Medicine,
University of Calgary,
Calgary, AB, Canada
Email: sabbaticalsue@gmail.com

Luis Lecuona
USDA/APHIS/IS-WS/
Mexico City DF,
11000 Mexico
Email: Luis.Lecuona@aphis.usda.gov

Joy Lee
Humane Society International UK,
5 Underwood Street,
London, N1 7LY, UK
Email: jlee@hsi.uk.org

Hanna Lentz
International Fund for Animal Welfare (IFAW)
1350 Connecticut Avenue NW
Suite 1220,
Washington, DC 20036, USA
Email: llentz@ifaw.org

Raffaella Leoci
University of Bari,
Department of Animal Production,
SP per Casamassima km 3,
70010 Valenzano (BA), Italy
Email: leocivet@yahoo.it

Kevin Le Roux
Veterinary Services,
458 Town Bush rd Pietermaritzburg
KwaZulu-Natal, South Africa
Email: K.LEROUX@kzndae.gov.za

Elaine Lissner
Parsemus Foundation,
Box 410505,
San Francisco, CA 94141, USA
Email: Lissner@ParsemusFoundation.org

Petra Literakova
Mendel University,
Faculty of Forestry and Wood Technology,
Zemedelska 1,
Brno, 613 00, Czech Republic
Email: petra.literakova@centrum.cz

Marta Martinez Aviles Mariela Varas
World Organisation for Animal Health (OIE)
12, rue de Prony,
75017 Paris, France
Email: m.martinez@oie.int

Giovanna Massei
Food and Environment Research Agency,
Sand Hutton,
York, North Yorkshire
YO41 1LZ, UK
Email: giovanna.massei@fera.gsi.gov.uk

Alessandro Massolo
Department of Ecosystem and Public Health,
Faculty of Veterinary Medicine,
University of Calgary,
Alberta, Canada
Email: amassolo@ucalgary.ca

Tom McPhee
World Animal Awareness Society
2531 Jackson Ave., # 246
Ann Arbor, MI 48103, USA
Email: tommcphee@wa2s.org

François Meslin
World Health Organization,
Avenue Appia 20 1202,
Geneva, Switzerland.
Email: meslinf@who.int

Stefano Messori
Human-Animal Relationship and Animal Welfare Laboratory,
Istituto G. Caporale,
Torre del Cerrano,
Teramo, Italy
Email: s.messori@izs.it

Michelle Morters
University of Cambridge
Department of Veterinary Medicine,
Madingley Road,
Cambridge, CB3 0ES, UK
Email: mm675@cam.ac.uk

Eugenia Natoli
Azienda USL Roma D,
Veterinary Hospital,
via della Magliana 856, 00148,
Rome, Italy
Email: enatoli@tiscali.it

Kate Nattrass Atema
International Fund for Animal Welfare (IFAW)
Javastraat 56, 2585 AR,
Den Haag, The Netherlands
Email: katema@ifaw.org

Christelle Navarro
Virbac Animal Health,
Medical Department,
13ème rue LID,
06515 Carros, France
Email: christelle.navarro@virbac.fr

Antonio Ortega-Pacheco
Universidad Autonoma de Yucatan,
Facultad de Medicina Veterinaria y Zootecnia
AP 4-116 Merida Yucatan, Mexico
Email: opacheco@uady.mx

Gina Paola Polo Infante
Laboratory of Epidemiology and Biostatistics,
Faculty of Veterinary Medicine,
University of Sao Paulo,
Av Prof Dr Orlando Marques Paiva,
87 SP 05508270, Brazil
Email: gina@vps.fmvz.usp.br

Guillermo Pérez
Veterinarians Without Borders Canada,
Latin America Branch,
Carlos Anwandter 561,
Valdivia, Chile
Email: guillermo.perez@vwb-vsf.ca

Katherine C. Polak
Maddie's Shelter Medicine Program,
College of Veterinary Medicine,
University of Florida,
Gainesville, Florida, USA
Email: polakk@ufl.edu

Jack Reece
Help in Suffering,
Maharani Farm,
Durgapura, Jaipur,
Rajasthan, 302018, India
Email: jack@his-india.in

Iris Margaret Reichler
Small Animal Reproduction,
Vetsuisse Faculty,
University of Zurich,
Zurich, Winterthurerstr. 260,
Switzerland
Email: ireichler@vetclinics.uzh.ch

Andrew N. Rowan
Humane Society International,
2100 L Street NW,
Washington,
DC 20037, USA
Email: arowan@humanesociety.org

Esmeé Russell
WSPA,
5th Floor,
222 Grays Inn Road,
London, WC1X 8HB, UK
Email: esmeerussell@wspa-international.org

Oswaldo Santos
University of São Paulo,
Department of Preventive Veterinary Medicine and Animal Health,Brazil
Email: oswaldo@vps.fmvz.usp.br

Khageshwaar Sharma
Himalayan Animal Rescue Trust (HART),
35 Gaurighat Marg,
Lakeside 6,
Pokhara, Nepal
Email: k.sharma@hartnepal.org

Christina Siettou
University of Kent,
School of Economics,
Canterbury, Kent,
CT2 7NZ, UK
Email: cs453@kent.ac.uk

Ganga de Silva
Blue Paw Trust,
30/42 Longdon Place,
Colombo 7, Sri Lanka
Email: gangadesilva@hotmail.com

Graham Smith
The Food and Environment Research Agency,
Sand Hutton,
York, YO41 1LZ, UK
Email: graham.smith@fera.gsi.gov.uk

Richard K Ssuna
Lilongwe Society for the Protection and Care of Animals,
P/bag 151,
Lilongwe, Malawi
Email: richardssuna@gmail.com

Ruth Steinberger
Spay FIRST! a non-profit organization
7949 S I-35 Service Rd,
Oklahoma City,
OK 73149, USA
Email: ruth@spayfirst.org

Enid Stiles
Veterinarians without Borders Canada,
PO Box 8373,
Victoria, BC,
V8W 3R9, Canada
Email: enid.stiles@vwb-vsf.ca

Aung Swi Prue Marma
Communicable Disease Control Division,
Directorate General of Health Services,
Mohakhali,
Dhaka-1212, Bangladesh
Email: draungsprue@yahoo.com

Qing Tang
Institute for Viral Disease Control and Prevention,
China CDC
Nanwei Road 27, Kuanwu District
Beijing 100050, China
Email: qtang04@sina.com

Marijana Vucinic
Department for Animal Hygiene,
Faculty of Veterinary Medicine,
University of Belgrade,
Bulevar oslobodjenja 18,
11000 Belgrade, Serbia
Email: mery@vet.bg.ac.rs

Alexander I. Wandeler
Scientist Emeritus,
Canadian Food Inspection Agency,
Ottawa Laboratory,
Fallowfield Ottawa, Canada
Email: alexwandeler@rogers.com

Min Wang
MD Ark Sciences,
Inc. Center of Reproductive Science and Technology, Columbia,
Missouri 65203 USA
Email: mwang@arksciences.com

Lisa Warden
DOGSTOP
Bungur Indah No. 2,
Kemang,
Jakarta Selatan,
12730, Indonesia
Email: lisa.warden@gmail.com

Diana Webster
Vice President-Project Development,
CANDi-Cats and Dogs International
350 Motor Parkway Ste 300,
Hauppauge NY 11788,USA
Email: diana@candiinternational.org

G. Robert Weedon
College of Veterinary Medicine,
University of Illinois,
3505 Veterinary Medicine Basic Sciences Building,
2001 South Lincoln Avenue
Urbana, IL USA 61802
Email: weedonr@illinois.edu

James Yates
RSPCA (International),
Wilberforce Way,
Southwater, Horsham,
West Sussex RH13 9RS, UK
Email: jyates@rspca.org.uk

Andrew Yoak
The Ohio State University,
Department of Evolution, Ecology, and Organismal Biology,
318 W. 12th Avenue,
Columbus, OH 43210-1293, USA
Email: yoak.4@osu.edu