0430 Cognitive assessment protocols for use with companion animals. B. Milgram*, *CanCog Technologies, Toronto, ON, Canada.*

This presentation will provide an overview of the three main technologies that have been used to train and assess cognitive ability in companion animals, will discuss the utility of each and their relationship between all three. The first technology utilizes an approach, known as Operant conditioning, and is a method of training animals that follows a sequence of distinct steps—each of which uses reward to motivate the animals to learn and a process referred to as shaping in which reward is provided for incremental responses. This approach can be used to shape a broad spectrum of behaviors, such as responding to specific commands or stimuli. In dogs, these behavioral testing protocols have long been used to train groups of animals to carry out specific behavioral functions, and include military working dogs and seeing eye dogs as examples. The procedures followed have been well established and there is a large population of animal trainers who are highly skilled in the art.

The second type of protocol, which is one that we have used extensively, is one in which animals are presented with a specific problem and over repeated testing learn to solve the problem, initially by a process of trial and error learning. We have used this procedurel to try to understand the cognitive structure of the canine (and feline) brain, how cognition develops, how it changes with age and how it compares with that of the human. The specific problems are referred to as neuropsychological tests, because their performance can be linked specific neural structures. These protocols are useful for safety and efficacy screening drugs and other interventions. They can also be used in developing interventions for use in humans, with the dog serving as a translatable animal model.

The final technology involves the development of standardized questionnaire to assess cognitive function and is a procedure used only for assessment. The rationale for developing this questionnaire came from the realization that cognitive function can decline dramatically with age in dogs. This cognitive decline has been labeled cognitive dysfunction syndrome (CDS). The actual functions, however, are not limited to behaviors linked to cognition, but also behaviorsthat could be linked to other aging processes. To date, there is little evidence that CDS as defined by questionnaires is a correlate of other measures of canine cognition.

Key Words: operant-condition, neuropsychologal testing, cognitive dysfunction syndrome

0431 Objective evaluation of affective states in dogs. R. T. S. McGowan*, *Nestlé Purina Research, St. Louis, MO.*

It has long been the impression of most pet owners that dogs have rich emotional lives and that their experiences affect them profoundly in ways similar to how humans are affected. However, there is a lack of methodology to objectively assess affective states in animals, especially positive states. It is widely accepted that there is more to good well-being than the absence of negative states and it is increasingly being accepted that the wellbeing of an animal is greatly influenced by its affective state. Animals continually experience "reward cycles" as they pass through appetitive, consummatory and post-consummatory phases during their daily activities (e.g., eating, playing, problem-solving). High arousal positive emotions (e.g., excitement, anticipation) are associated with appetitive phases, sensory pleasure (e.g., comforting touch, hedonic taste) occur during consumption and low arousal positive emotions (e.g., satisfaction, relaxation) accompany post-consumption phases. This talk will highlight methodology that can be used to evaluate these positive states in dogs, providing examples from studies in both research and shelter settings. Dogs are an ideal non-human model for studying positive affective states because they have traditionally lived in close contact with people (so we are good at reading them and they are even better at reading us), are capable of forming close attachments to people (providing opportunity to study the human animal bond from the animal's perspective) and are kept throughout the world as both companions and working animals (a better understanding of their affective states will help to promote optimal wellbeing). Using behavioral tests (e.g., human interaction, cognitive bias, problem solving) coupled with non-invasive physiological measures (e.g., cardiac activity, salivary cortisol, thermal fluctuations) we can glean new insights into how to measure affective states in dogs. By using a holistic approach that incorporates both behavioral and physiological measures, we can produce scientifically sound evidence to identify which emotions animals experience and how animals express these affective states through their behavior. With this holistic approach we can develop a more objective understanding of animal wellbeing.

Key Words: dogs, affective state, non-invasive physiological indicators

0432 The human-animal bond: Science-based approaches to improving companion animal welfare and adoption outcomes. C. C. Croney*, *Purdue University, W. Lafayette, IN.*

There is substantial literature documenting the myriad mutually beneficial effects of the human-animal bond. While such relationships typically enhance the health and well-being of both people and their animal companions, the bond can

weaken or fail to be established if the animals do not meet the expectations of the people with whom they interact. The behavioral component of animal welfare is particularly important in this regard, and requires significant attention, as owners of companion animals are often intolerant of behavior problems. These include behaviors characterized as nuisances, such as excessive vocalizations, those that result in aggression toward people or other companion animals, or behaviors that result in injury to the animal or damage to property. Problem behaviors are among the most commonly stated reasons for cat and dog relinquishment, abandonment and euthanasia. Thus, understanding key factors that impact behavioral well-being in these species is important whether the animals are maintained in or intended to be rehomed from breeding programs, shelters, rescues or elsewhere. Consequently, a comprehensive assessment plan for meeting the needs of animal companions that includes their mental and behavioral well-being is necessary to protect the human–animal bond. It is therefore imperative to develop and validate key metrics of companion animal welfare that are practical for field as well as laboratory purposes. Considerations and challenges in developing such metrics will be reviewed, using the development of care and welfare standards for breeding dogs for illustrative purposes.

Key Words: behavior, companion animal, well-being

0433 2015 Corbin Award Winner: Behavior and training of companion and zoo animals.
C. L. Morris*, *Iowa State University, Ames.*

Activity or behavior varies tremendously across taxa and activity itself separate plants from animals. Regardless if we consider a dog competing on an agility course or a hyena standing for voluntary jugular blood collection, we must understand the science of behavior, the natural history and the instinct of the animal in order for successful training to occur. Repeated behaviors result from either positive or negative reinforcement, whereas behaviors diminish with application of positive or negative punishment. Once we identify reinforcements or punishments relevant to the behavior and specific animal, training and behavior modification become more black and white. This science and theory of animal training are well rooted in the work of Skinner and Pavlov. However, difficulties in animal training occur when trainers or animal managers fail to understand what motivates or reinforces a specific animal or the relevant species-specific natural histories. Animal trainers typically use food to motivate or train animals; however, the animal must want that food item for it to be of value. Subjects of same species may not find similar value in reinforcement items. In addition, failure to understand instinctive behavior patterns typically related to obtaining food or social structures may lead to limitations in training or behavior modification. The term "Instinctive Drift" occurs when animals have been trained to a new learned behavior that ultimately drifts back toward an instinctive behavior. Often this behavioral drift can

be mislabeled by animal trainers as disobedience or misbehavior but is frequently related to instinctive behaviors associated with feeding or obtaining food or other inate instlcts such as herding. Similarly, some aggression issues in dogs may be prevented or mitigated at a young age if owners had increased awareness of the dynamic social structure of dogs. Stereotypic behaviors are typically thought of as negative repetitive behaviors that originate from artificial environments that do not allow animals to satisfy their normal behavior repertoire, and these behaviors can be difficult to modify. While the science and theory of animal training and behavior are critical to excelling as an animal trainer and manager, it is equally critical to understand natural history, instinctive behaviors and motivation. Therefore, great animal trainers not only understand the science and theory of behavior, they also consider the uniqueness of individual animals they manage.

Key Words: training, behavior, companion animals, zoo animals

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COMPANION ANIMAL SYMPOSIUM: FUNDAMENTALS OF PROTEIN NUTRITION

0434 Global protein supply: Present and future considerations and availability. D. L. Schaefer*, *Cargill, Wichita, KS.*

A key differentiator in the development and marketing of pet food is the source of protein. Producers and marketers are reaching further and using more creativity in product development. This presentation will focus on global trends in the availability of protein for the use in pet diets.

Key Words: protein, companion animal, global source

0435 Alternative protein supplies for petfood.
G. Bosch*, *Wageningen University, Netherlands.*

The combination of a growing human population, increasing standards of living and urbanization in developing countries fuels global demand of protein sources for consumption by humans and animals. Increasing food production is, however, highly challenging as required resources such as land, water and fossil energy are limiting and the environmental impact of crop and livestock production already needs to be minimized. Various efforts are focused on changing the demand as well as on the production of proteins. Global food supplies can be increased by improving production efficiencies. Production of underperforming crop and livestock production systems can be improved through management and new technologies. In addition to increased production of conventional foods, alternative and sustainable foods are being developed. It is therefore clear that also the landscape of available ingredients for the pet food industry will change further the coming years. The additional