

## Companion Animals: New Advances in Pet Health, Nutrition and Reproductive Management

**655 Maximizing conception rates using fresh cooled or frozen canine semen.** R. Hutchison\*, *Animal Clinic Northview, Inc., North Ridgeville, OH.*

Since the American Kennel Club's recognition of litters conceived from frozen semen in 1981 and the subsequent acceptance and fresh chilled semen, practitioners are being asked more frequently to assist clients with maximizing conception rates using these breeding techniques. The gratification one feels when successful is one of the great rewards in veterinary medicine.

The basis of fresh chilling and freezing semen is energy conservation within the sperm cell so that the semen can be shipped or used at a later date. The drawback to these methods is that even though some energy is conserved, enough energy is used to shorten the sperm cell's life.

Fresh semen is thought to easily live 4-6 days in utero. Some papers have reported live sperm found in the uterus 11 days post-breeding. The natural sperm length of life allows for successful breeding when the bitch first exhibits standing and acceptance of the male, even though in many cases the timing is 4-6 days before the prime fertilization period of the mature ova.

Fresh chilled semen uses energy as it is cooled to 40 f (4 c) and eventually rewarmed to body temperature. The life in utero of a spermatozoa having experienced the chilling and subsequent warming process is 24 to 72 hours, necessitating a more precise manner of ovulation timing and breeding.

**Key Words:** Reproduction, Canine, Semen

**656 Improving puppy trainability through nutrition.** R. Kelley\*, *The Iams Company - Research & Development, Lewisburg, OH.*

Nutrition is seldom discussed as influencing an animal's trainability. However it is becoming increasingly clear that key nutrients can dramatically impact various physiological systems, especially during critical developmental windows. The present study was undertaken to examine the effect of dietary omega-3 fatty acids (n-3 FA) on trainability, particularly docosahexaenoic acid (DHA), during pre- and post-weaning puppy development. Beagle purpose-bred bitches (27) were selected based on estrous date and randomly assigned across 3 dietary treatment (TRT) groups that varied in n-3 FA content (High, Med and Low). Puppies were maintained on the respective maternal diet following weaning. Puppies were socialized (weeks 7-8) and then received 5 days of pretraining/acclimation in a Two-Arm T-Maze. Following pretraining, all puppies were tested by a Win-Stay, Lose-Shift format using 2 distinct symbols, a cube or a sphere. Briefly, puppies were trained to associate a symbol with a direction in the maze. Correct choices were rewarded with a highly palatable treat, with no treat given for an incorrect choice. Each puppy received 2 testing sessions (10 trials per session) per day until a puppy correctly responded 8 out of 10 trials for 2 consecutive sessions (defined as a success criterion). Findings from this study demonstrate that both the maternal and puppy DHA status were sensitive to TRT. High-DHA reared puppies had significantly higher DHA content in the red blood cell membranes at days 14, 28 and 42 (weaning) as well as at 7, 11 and 15 week of age compared to the Med- and Low-DHA groups. Success in the maze testing was also found to dose-dependant relative to dietary DHA content. High-DHA reared puppies achieved at least 1 success criterion with greater ( $P < 0.02$ ) frequency compared to Low-DHA reared puppies, with Med-DHA puppies not differing from either group (68% vs 42% vs 30% respective to DHA level). These data suggest that DHA is a critical nutrient during pre- and post-weaning

development of puppies and that improved nutrient status can improve canine trainability.

**Key Words:** Canine, Docosahexaenoic Acid, Trainability

**657 Research advances in carotenoid nutrition and immunology of dogs and cats.** B. Chew\* and J. S. Park, *Washington State University, Pullman, WA.*

Carotenoids occur in abundance in nature. Early reports have generally considered domestic dogs and cats as poor absorbers of carotenoids. Recently, we showed that both dogs and cats absorb significant amounts of  $\beta$ -carotene, lutein, astaxanthin and bixin across their intestinal mucosa. Furthermore, these carotenoids are taken up by subcellular organelles of circulating leukocytes. In both dogs and cats, the mitochondria take up the largest fraction of total carotenoids. Because the mitochondria consume most of the oxygen during ATP production, they too contribute most of the harmful oxygen radicals found. In addition, domestic dogs and cats are exposed to the same ionizing radiation, environmental toxins and atmospheric pollutants as their owners. These oxidative and nitrosative stressors have been blamed for the development of chronic diseases. Carotenoids, by nature of their antioxidant activity, serve to quench these harmful oxygen species to maintain a favorable oxidant:antioxidant balance for optimal immune function. Only until recently have studies become available to examine the possible role of antioxidants on immune response and health in dogs and cats. We conducted several studies on the immune-modulating, antioxidative and anti-inflammatory action of dietary carotenoids ( $\beta$ -carotene, lutein, astaxanthin, and bixin) in domestic dogs and cats. Overall, results consistently showed that these carotenoids enhanced both cell-mediated and humoral immune responses in both species. Differences occurred in the specific immune measure affected by the different carotenoids; also, the effective dose of each carotenoid differs for a given immune response. Studies have reported greater immune-enhancing action of carotenoids in geriatric dogs than in younger dogs. Besides immunity, dietary carotenoids generally reduced oxidative biomarkers including DNA damage, protein oxidation, lipid peroxidation, and inflammation; the latter are positively associated with the development of cancer and other chronic diseases. Therefore, carotenoids can improve the oxidant:antioxidant balance of dogs and cats, and consequently enhance their immune function.

**Key Words:** Antioxidants, Immunity, Carotenoids

**658 Critical issues in aging and cancer: Implications for effective cancer prevention.** D. Waters\*<sup>1,2</sup>, <sup>1</sup>*Purdue University Center on Aging and the Life Course, West Lafayette, IN,* <sup>2</sup>*Gerald P. Murphy Cancer Foundation, West Lafayette, IN.*

Cancer is one of the most prevalent and life-threatening age-related diseases affecting pet dogs. The purposes of this paper are: (1) to explore the possible mechanisms and extent to which aging influences cancer risk; and (2) to consider prevailing principles of disease prevention that must be exploited to develop practical cancer prevention strategies. This discussion is intended to provide a conceptual framework for designing studies that will determine whether nutritional intervention during the life course can significantly reduce cancer incidence and mortality.

**Key Words:** Cancer, Aging, Nutrition