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Improving Puppy Trainability through Nutrition

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BACKGROUND: The long chain polyunsaturated fatty acids (LCPUFAs), arachidonic acid (AA), and in particular docosahexaenoic acid (DHA) are known to support correct neural and visual development in mammalian species. During foetal growth low DHA production creates a need for a maternal supply, initially via the placenta and importantly after parturition, via the milk. The level of DHA in the milk reflects maternal DHA levels. In humans, supplemental DHA and AA during only the first 4 months following birth increased problem solving at 10 months of age and led to a lower mean arterial pressure at 6 years of age when compared to babies not supplemented with LCPUFAs. And, babies from high DHA status mothers demonstrate sleep patterns in their first 2 days of life suggestive of greater central nervous system maturity as compared to babies from low DHA status mothers. In the canine species previous data shows that puppy fatty acid (FA) status reflects maternal FA status.

OBJECTIVE: Based on the role of DHA on neural development, and evidence from babies and infants on the benefits of LCPUFAs, a study was undertaken to examine the effect of DHA in the canine species. Our objective was to determine the effect of maternal and post-weaning dietary fish oil on trainability and DHA status in Beagle puppies.

METHODS: Selected Beagle bitches (parity 2-3) were randomly assigned to 2 treatment diets at breeding and maintained on those diets through lactation and weaning. Puppies selected from these litters (39 puppies in total) were maintained on their respective dam diets from weaning through to 16 weeks of age for trainability assessment by Discrimination Task Testing using a Two-Arm T-maze. In preparation for trainability testing, each puppy received daily socialisation and exposure to the testing environment which concluded with 5 days of pre-test T-maze training at 9 weeks of age. Trainability testing was conducted from 10-16 weeks of age with puppies participating in 2 sessions/day of 7-10 trials/session, 5 days/week for 30 days. A success criterion was achieved when a puppy achieved a correct score in at least 80% of trials for 2 consecutive sessions. In addition, all puppies were assessed for fatty acid (FA) status at 7, 11, and 15 weeks of age based on Red Blood Cell (RBC) membrane FA profiles. The diets were poultry and grain based and formulated using the same base-matrix to contain 31.5% protein and 20.75% fat with 0% of the diet from fish oil (low-DHA group = 20 puppies were raised from these mothers), or 1.10% of the diet from fish oil (high-DHA = 19 puppies were raised from these mothers).

RESULTS: Fatty acid profiles (maternal and puppy) were significantly altered by diet, particularly regarding omega-3 fatty acids. RBC membranes from the high-DHA reared puppies (1.10% fish oil) contained approximately 4X the DHA content compared with puppies from the low-DHA diet (0% fish oil). Trainability scores in the puppies were also found to be sensitive to the diet, with a greater percentage ($P < 0.05$) of puppies from the high-DHA group (n=19) achieving at least 1 success criteria compared with puppies from the low-DHA group (n=20). In fact, over twice as many puppies (68%) from the high-DHA group passed the test compared to the low-DHA group (30%). In conclusion, these data demonstrate the importance of dietary lipid sources, in particular DHA, on neurological function (trainability) and nutrient status in the canine during critical developmental periods.