Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are found in certain fish oils and represent the active forms of the omega-3 polyunsaturated fatty acid (PUFA) family. Although studies using cell cultures, animal cancer models, and epidemiological and clinical trials in humans have provided evidence to support the use of EPA and DHA in the prevention and treatment of cancer, some studies still report inconsistent results.

The metabolism of PUFAs is complex and controlled by enzymes that are highly polymorphic and map to a genomic region frequently associated with cancer in humans. Single nucleotide polymorphisms (SNPs) in the genes involved in PUFA metabolism help to explain 28% and 12% of the variance in plasma levels of arachidonic acid and linoleic acid, respectively. Therefore, genetic heterogeneity in human cancer patients can result in differences in PUFA metabolism, and this may help to explain the inconsistent results between dietary PUFA intake and cancer in human population studies. Therefore, future studies aim to focus on gene-nutrient associations between SNPs and PUFAs in humans with cancer. The findings from such studies might allow for the identification of individual cancer patients with altered PUFA metabolism that may benefit from personalized diets.

Only a limited number of clinical trials on the effects of dietary omega-3 PUFAs in dogs with cancer have been published. One randomized, double-blinded, placebo-controlled clinical trial investigated a diet high in EPA and DHA on outcomes in dogs with cancer; 32 dogs with stage III or stage IV lymphoma were randomized to receive either a diet supplemented with menhaden fish oil and arginine or an identical diet supplemented with soybean oil. Dogs fed the experimental diet had significantly higher mean serum DHA and EPA compared to controls. Increasing serum DHA concentrations were associated with a longer disease-free interval and survival time for dogs with stage III lymphoma fed the experimental diet. Unfortunately, the design of this study was not ideal, as the potential benefits of arginine cannot be separated from those of omega-3 PUFAs. Also, the post-hoc subgroup analysis and the method of initial staging of lymphoma in the dogs have been criticized.

In a second clinical trial, 12 dogs with malignant carcinoma of the nasal cavity were randomized to receive either dietary menhaden oil or soybean oil (control) and then received radiation therapy. Dogs that were fed menhaden oil had significantly higher plasma concentration of DHA and EPA and significantly decreased tissue inflammatory eicosanoids compared with controls. Increased plasma DHA also was significantly associated with decreased matrix metalloproteinases. Although the dose of fish oil used in these two clinical trials was relatively high, a separate study showed that hemograms and serum biochemical profiles were not adversely affected by fish oil supplemented foods in dogs with lymphoma or hemangiosarcoma.

Unfortunately, no clinical trials assessing the effects of dietary omega-3 PUFAs in cats with cancer have been published. Due to the concern for platelet dysfunction and prolonged bleeding times in cats receiving dietary omega-3 fatty acid supplementation, as well as the absence of information on the long-term safety of omega-3 PUFAs in cats and the lack of a defined safe upper limit per the National Research Council, further studies may be needed in this species before their efficacy in cancer can be definitively determined.

References
