

Whitepaper by
Dr John E. Bauer

 veramaris[®] *pets*

The science supporting the health benefits of Veramaris® *pets*

The benefits for human health of EPA & DHA Omega-3 fatty acids have long been known. Now, research has also shown that they are just as important for animal health and well-being, including skin health and coat condition, the immune response, healthy joints and kidney and heart well-being. They also help vision and brain health, puppy development, trainability, and cognitive function. External sources of EPA & DHA Omega-3 and ARA Omega-6 are important because dogs can only generate limited amounts and in cats neither can be generated which makes it imperative that both species receive it in their diet.

The main source of these fatty acids has traditionally been fish oil. However, the level of these essential fatty acids in fish oil has been falling and remains inconsistent. The source of fish oil, ocean forage fish is declining, making fish oil unsustainable in the long term. So now natural marine algal oil, which provides twice the amount of essential fatty acids has presented itself as the solution to the problem.

As **Dr. John E. Bauer** explains in his White Paper below, Veramaris Pets is both a natural, sustainable and richer alternative, offering the consistency, in both quality and supply, that fish oil cannot deliver.



WHITE PAPER

Natural Marine Micro-Algae Rich Omega-3 Fatty Acids are an Environmentally Sustainable and Biologically Equivalent Alternative to Fish Oil

INTRODUCTION

Health benefits of omega-3 fatty acids in dogs and cats:

Long chain omega-3 fatty acids [i.e. eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)] are among the most extensively studied dietary components in both human and animal nutrition. Numerous investigations in dogs have shown metabolic and health benefits specifically relating these fatty acids to skin health and coat condition, the immune response, healthy joints and kidney and heart well-being. In addition, vision and brain health, puppy development, trainability, and cognitive function are also supported (Hadley et al, 2017, Heinemann et al, 2005, Milgram, 2016, Zicker et al, 2012, Reviewed in Bauer, 2011 and Bauer, 2016). Although cats have yet to be as extensively studied in this regard, current evidence in this species provides similar beneficial effects (Pan et al, 2013, Bauer, 2011). As new discoveries regarding omega-3 benefits in health and disease are made canine and feline health will continue to benefit.

Omega-6 and omega-3 fatty acids are dietary essentials:

Both omega-6 and omega-3 fatty acids support important physiologic functions while maintaining healthy cell membrane balance (Gutierrez et al, 2019). When incorporated into various cell membranes such as white blood cells, heart, kidney, skin, or joint tissues long chain fatty acids serve as substrates for the production of important cell mediators such as eicosanoids, resolvins and protectins (Dennis, 2015, Serhan, 2018). Working both in concert and separately, each provides distinctive health benefits.

In dogs, arachidonic acid (ARA), an omega-6 fatty acid, can be synthesized from short chain omega-6 precursors. By contrast, there is limited conversion of short chain omega-3 precursors to EPA and DHA in dogs as in many other species. However, in cats neither ARA nor the long chain omega-3s can be synthesized necessitating their dietary source. Thus, all are essential in feline species (Rivers et al , 1975).

It is noteworthy that the amount of omega-3 EPA synthesized from precursors in dogs, under usual conditions, may be sufficient for health maintenance (Dunbar et al, 2010) but perhaps not for optimal function. The problem is the degree of synthesis varies from dog to dog, as do their requirements, so dietary supplementation with EPA is recommended for all dogs to ensure the animal's nutritional baseline requirements are being met.

Regarding DHA, conversion of precursors is even more limited. Thus, DHA should be considered a conditionally essential fatty acid for optimal health under most conditions and especially for growth, reproduction and development and therefore dietary supplementation with DHA is also recommended. There is both structural and functional evidence to support this conclusion (Bauer, 2016).

Meeting the demand for sustainable and safe sources of omega-3 fats with algae:

In view of the above benefits and requisites, the demand for supplementation with EPA and DHA in both human and companion animal health has generated a global demand for these nutrients. Meeting this need, whether via whole marine fish or marine fish-derived oils, has raised questions of environmental sustainability. The environmental impact of depending solely on marine fisheries-based products for proteins or lipids is being addressed by governmental and non-governmental bodies (fisheries.noaa.gov).

Figure 1A: Diet EPA (mg/day)

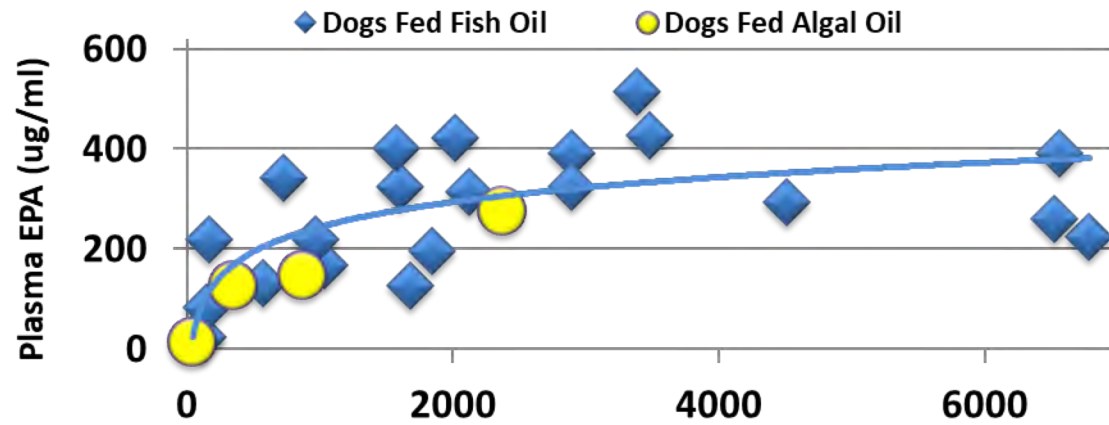
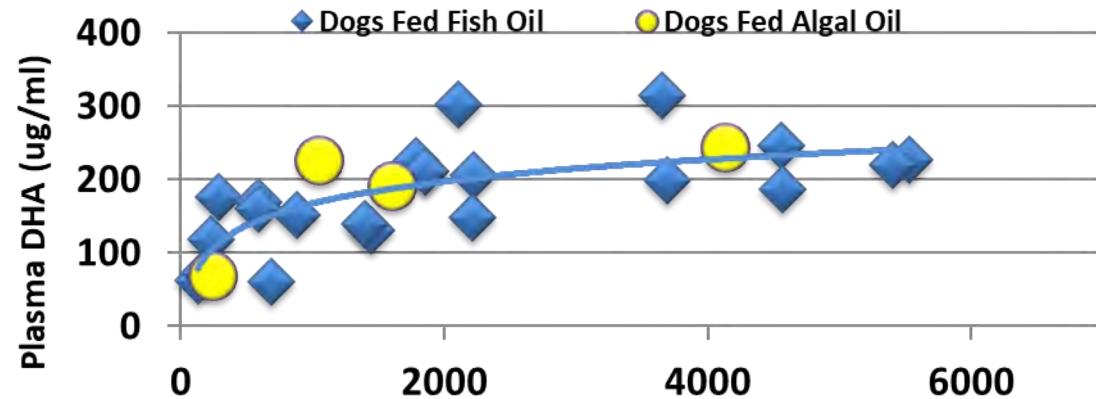


Figure 1B: Diet DHA (mg/day)



This is required given that a serious decline in global fish stocks is expected (Jenkins et al, 2009). There is an ongoing need for more research to further elucidate the benefits of omega-3 fatty acids and understand their nutritional significance. However, it is also important to realize that alternative sources of omega-3 fatty acids should be sought and evaluated to conserve existing supplies by reducing dependence on marine fish harvests. One such source has been the development and availability of VPAO (a.k.a. AOCED in scientific references Dahms et al, 2019 and Vuorinen et al, 2019). This resource provides a viable alternative to fish-based marine oils.

Safety of VPAO in companion animals for all life stages:

Several important studies have been recently published using VPAO demonstrating its safety for all life stages of dogs (Dahms et al, 2019) and cats (Vuorinen et al, 2019) including gestation, lactation and growth. No changes in hematology, blood chemistry, and coagulation parameters in both generations of dogs and cats fed these diets compared to control were found in any case. In addition, plasma levels of DHA and EPA were increased demonstrating the bioavailability and safety of VPAO up to the highest levels fed. The overall conclusion from these studies is that VPAO is a safe and bioavailable source of Omega-3 EPA and DHA and it meets the nutritional requirements of both canine and feline species

Figure 1C: Diet EPA + DHA (mg/day)

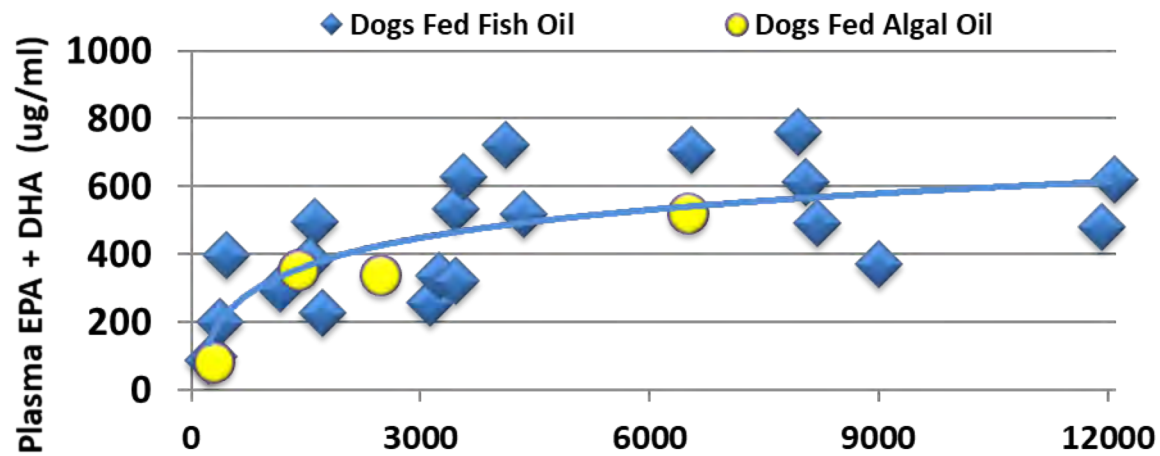
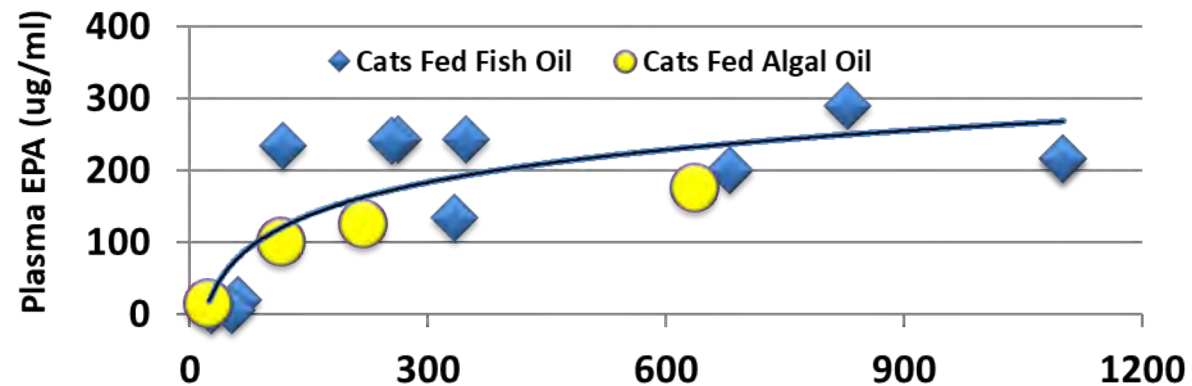


Figure 2A: Diet EPA (mg/day)



Biological equivalence, plasma enrichment and utility of VPAO.

In view of its unique manufacturing process, VPAO provides both a vegetarian and natural alternative supporting diet formulations where such specifications are desired (Buff et al, 2014, Carter et al, 2014). Additionally, the production of VPAO allows a guaranteed minimum EPA and DHA content given the consistency of a controlled closed vessel fermentation manufacturing process; Thereby avoiding the innate variability associated with seasonal and geographic harvests of marine fisheries-based oils. An analysis and comparison of the extent to which VPAO results in equivalent plasma enrichment of EPA and DHA in dogs and cats vs marine fish oil has now also been conducted. An abstract of these findings has been submitted for presentation (Global Nutrition Summit, Guelph, Ontario, Canada, August 2020) and are summarized below. By doing so the comparative bioavailability of VPAO and marine fish oils in dogs and cats was demonstrated.

Figure 2B: Diet DHA (mg/day)

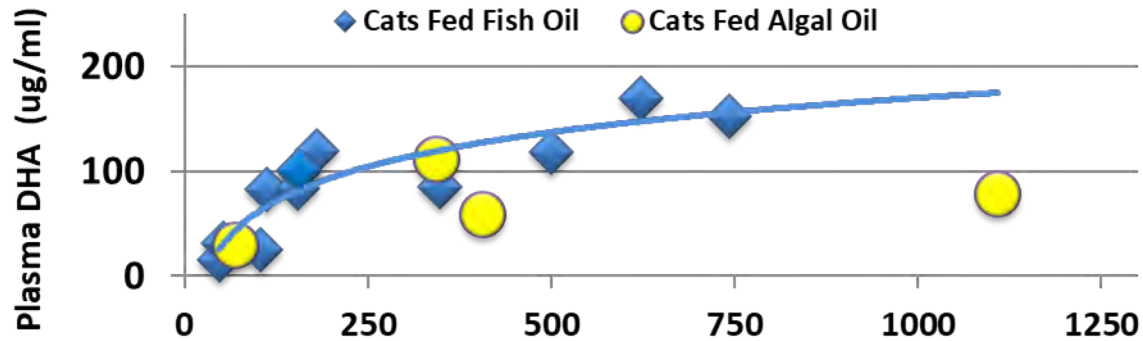
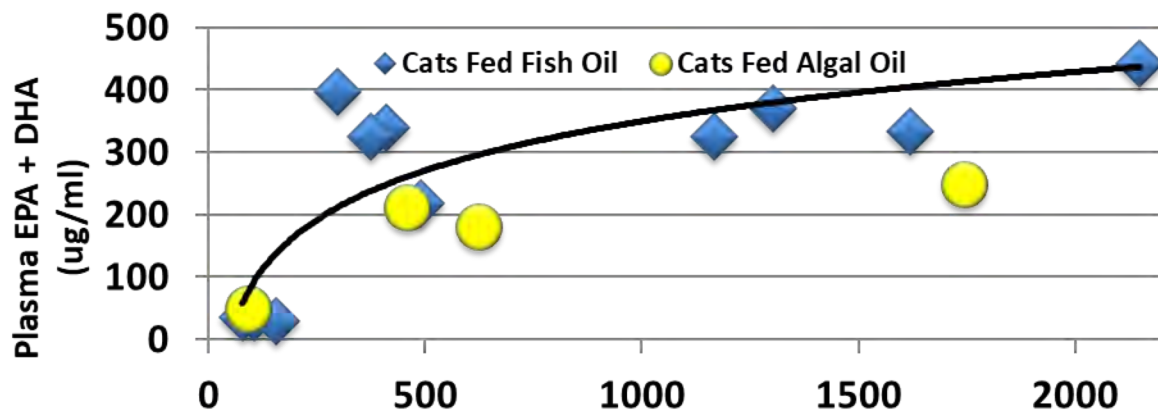


Figure 2C: Diet EPA + DHA (mg/day)



Feeding trial comparisons between VPAO and marine fish oils:

Four separate data-sets from studies commissioned by Veramaris V.O.F. in clinically normal animals were evaluated, (two in dogs and two in cats) after feeding VPAO enriched diets. Plasma EPA, DHA and combined EPA+DHA levels, as a function of diet content, were assessed. These data were graphically compared in a dose response fashion with values from the published literature where marine fish oil was similarly fed for approximately the same time periods. Both clinically normal adult animals and those with various clinical disorders that had been fed marine fish oil were included.

In the canine group, the VPAO diet data for EPA, DHA and combined EPA+DHA were all observed to lie within the same logarithmic trend line as marine fish oil demonstrating similar plasma enrichment and equivalence (Figure 1). One noteworthy feature from this analysis, however, is that a slight decrease in combined EPA+DHA plasma enrichment at the highest levels of diet omega-3 fed (>8000 mg/day) may have occurred when omega-3 from marine fish oil was fed (Figure 2C). More data points will be needed in this region to fully evaluate this possibility.

In the feline group, plasma EPA levels with the VPAO diets were well within the dose response trend line seen with marine fish oil (Figure 2A). However, in the case of DHA, plasma levels were somewhat reduced by comparison especially at the highest 5.1% inclusion level (ca. 1100 mg/day, Figure 2B). The combined EPA+DHA amounts were also similarly affected as a result (Figure 2C).

The possibility exists that there may be some adaptation of the response to dietary omega-3 fatty acids when higher amounts are fed as was noted for dogs. Reasons for this finding include possible tissue conservation via retro-conversion or perhaps utilization at higher dietary levels. The significance of this observation is that it helps define a useful range of dietary concentrations where optimal plasma enrichment likely exists.

Conclusion:

It should be noted that only average data values taken from previous published works were used in analyzing the data from the marine fish oil groups. Thus, no measure of statistical variability could be estimated. In some cases marine fish feeding study values were transformed in order to express all data in the same units as in the VPAO studies for comparison (i.e. microgram lipid/ml plasma). The amounts of EPA and DHA consumed per day were estimated based on typical intakes for the size of animal studied or directly from the reported intakes. Although these calculations were performed a priori before any graphs were constructed, the parallels between algae and marine based omega-3 containing oils can be interpreted as a comparative trend between them. As such, it can be concluded that the present analysis and comparison demonstrates that algae-based omega-3 oils, specifically the VPAO used in these studies, support its use as a suitable dietary alternative to marine fisheries-based oils. In addition, VPAO looks to be a safe and sustainable source of dietary omega-3 fatty acids compared to marine fisheries derived products. VPAO is designed to readily deliver consistently defined amounts of EPA and DHA in contrast to the seasonally and geographical variability seen with marine fisheries derived oil harvests.

An abstract of these findings was presented at the Global Animal Nutrition Summit (GANS), Guelph, Ontario, Canada, August 2020 (globalanimalnutrition2020.uoguelph.ca) and was published in the proceedings.

A brief by John E. Bauer, DVM, PhD, ACVN, Board Certified Veterinary Nutritionist®

A copy of the GANS proceedings available upon request

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