

Today I have been studying a paper by Burrion et al (2024) regarding the balance of n-6 and n-3 fatty acids in canine, feline and equine nutrition. This subject has been one of my favourite subjects for more than 25 years.

I was supervisor for a graduate student in the beginning of this century, who studied the same issues on female mink during reproduction and early growth of the pups. Interestingly we came to the same conclusions, that the ratio between n-6 and n-3 is extremely important for normal brain development of the foetuses and young kits. However, our concern was the opposite of now because we had normally too high levels of n-3 in the food, coming from fresh/frozen herring, therefore we added n-6 in the form of sunflower oil to create different n-6:n-3 ratio. We had three groups High (12.4:1), Middle 4.1:1, and low 0,25:1.

We measured fatty acid composition of milk, and in organs (liver, brain, heart, and adipose tissues) taken from newborn kits. In this study, fatty acid composition was clearly affected by maternal dietary fatty acids. In the sunflower oil rich diet (H), there were significantly higher levels of Linolenic (LA) in milk from both day 2 and day 28 compared to the fish oil rich diet (L). The opposite effect was found regarding n-3 fatty acids where the L-diet induced higher levels of DHA and EPA in milk from day 28 compared with the H-diet, where no DHA and EPA were found. Analyses of brain tissue showed significantly more n-6 in group fed the H-diet, while the group fed the L-diet had higher content of n-3. Interestingly we found no LA in brain tissue from newborn kits or 28 days old kits. However, we found surprisingly high levels of alfa-linolenic acid (ALA) in brain tissue, which was not expected. We speculated if this was caused by a low capacity for the foetal mink brain to convert ALA to its longer derivates. Fatty acid composition in the liver was also affected by the maternal dietary pattern. The ratios between n-6 and n-3, were significantly higher in the H-group compared with the L-group, but there were no differences between H and M groups or between M and L groups. In adipose tissue the n-3 fatty acids were significantly lower in the H group compared to the two other groups and no detectable levels of DHA were found in the H-group. These interesting results are published in a Master Thesis from The Royal Veterinary and Agricultural University, Copenhagen by Mette Ulf Hansen in 2004.

What do I think about the present paper? I think it is a very interesting and useful review of the current knowledge about the importance of a correct balance between n-6 and n-3 in dog- and cat food. This I have emphasized many times in discussions both in my former work and in my current situation. In the present paper they also discuss whether AAFCO, NRC, and FEDIAF recommendations regarding n-3 fatty acids in dog- and cat food should be revised. Based on the discussion in the paper regarding results from different research, it seems like optimal ratio between n-6 and n-3 in dog- and cat food is between 3.5:1 to 10:1. The current maximum recommendation from AAFCO is 30:1 and this is far too high in my opinion. I also think we need to revise the current recommendation, because the sources of n-3 fatty acids are changing from sources of marine origin to sources of plant origin.

None of the sources of plant origin contains EPA and DHA, but only ALA, while marine plant organisms like algae contains rather high amounts of DHA but smaller or no quantities of EPA. However, some of them contains Docosapentaenoic acid (DPA), which is a reservoir and may be metabolized into DHA or retro-converted back to EPA. This is the regulator of the ratio between EPA and DHA, because like with n-6 and n-3, there must also be a balance between EPA and DHA and DPA maintains this balance. This is not discussed in the current review, but DPA is important for male reproduction, so it has also another physiological function.

In the paper, they also refer to a paper by Dominguez et al from 2020, where they showed that ALA could not be used in formation of EPA and DHA in dogs. However, they do not discuss two similar papers by the

same research group (Burri et al 2020, Lindqvist et al 2023), where they show the difference between omega-3 phospholipids and omega-3 triglycerides. They also suggest a washout time of 8 weeks before the actual trial, to be certain to get accurate results from the treatment. This has not been done in all the referred studies in the paper. Regarding phospholipids and triglycerides, n-3 phospholipids are more easily absorbed and is also able to directly pass the blood-brain barrier, while n-3 triglycerides must be metabolised to a phospholipid before they can pass the blood-brain barrier. Krill oils together with algae oils is the most complete and sustainable sources of n-3 fatty acids to be used in dog-and cat food.

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