

## Chapter 7

# Plasma Fatty Acid Profiles During the First Year in Dogs with and without Hip Dysplasia: Preliminary Results

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**Abstract** At the Military Veterinary Center of Grosseto, where operative dogs from the Italian Army are raised and trained, more than 70 % of the discharges for unfitness are due to articular pathologies like hip and elbow dysplasia. The aim of this study was to investigate fatty acid metabolism of dogs during the growth phase, and its modulation by a fish-based diet. Only 2 out of the 32 subjects were affected by articular pathologies during the study. Still, both subjects had lower levels of arachidonic acid and higher levels of docosahexaenoic acid. Moreover, we observed that the ratio of eicosapentaenoic to docosahexaenoic acids, an indicator of delta-6 desaturase activity, drops dramatically during the first year in the German shepherd.

**Keywords** Dog · Dysplasia · Fatty acids

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## 7.1 Introduction

Hip dysplasia is one of the most common inherited joint diseases affecting large breed dogs. It can lead to secondary hip osteoarthritis, resulting in pain and lameness. In dogs with hip dysplasia, the head of the femur does not fit well into the acetabulum, resulting in painful friction (Lust 1997). This pathology has a genetic basis but is also influenced by the environment. Animals with a similar genetic background may show different levels of dysplasia, and animals with a genetic background that predisposes them to develop the disease may remain clinically normal (Willis 1989). Nutrition is one of the main environmental factors. Indeed, a diet too rich in energy is a predisposing factor for dysplasia. Lipid metabolism can interact with bone metabolism through various mechanisms, such as through the balance between adipocytes and osteoblasts. Osteoblasts and marrow adipocytes have the same bone marrow progenitor, and bone loss is often associated with an expansion of marrow adipose tissue. Another mechanism is through the *de novo* synthesis of fat. Melhus et al. (2008) demonstrated that the fracture risk in elderly men is strictly correlated with the activity of stearoyl-CoA desaturase (SCD), which is a key enzyme of fat synthesis. Moreover, a diet rich in palmitic acid leads to a reduction of the calcium concentration in bones. Also involved is the synthesis of eicosanoids, hormones that generally act at a local level and are also known for their role in inflammatory processes. Eicosanoids are synthesized from arachidonic acid, an omega-6 fatty acid. Among these, the prostaglandin (PG) E2 is known as an important mediator of bone remodeling by inducing osteoclast formation and increasing the synthesis of collagen and fibronectin from osteoblasts. At the Centro Militare Veterinario in Grosseto, Italy, where operative dogs from the Italian Army are raised and trained, more than 70 % of the discharges for unfitness are due to articular pathologies such as hip and elbow dysplasia. As this pathology has a high incidence and no treatment is proved to be effective, this study aimed to investigate fatty acid profiles and the effect of dietary poly-unsaturated fatty acids as a preventive solution.

## 7.2 Materials and Methods

The study was conducted on 32 puppies from the Italian Army that were born and raised at the Centro Militare Veterinario in Grosseto, Italy.

The subjects included one litter of seven Belgian shepherds, three litters of German shepherds (six puppies each), and one litter of seven crossbreed dogs. Half of the puppies from each litter received a standard diet (Premium, Eukanuba) and the other half received a fish-based diet (SANYpet S.p.A.). Each diet was fed from weaning until the end of the experiment. Both hips and elbows were radiographed (MAXIVET® H.F. High Frequency, Multimage) at 5 and 12 months of age. For fatty acid analyses, blood samples were collected in EDTA tubes from the brachial