

Facts About Fats for Birds

By Debra McDonald

The importance of fat (lipid) in the diets of birds is often misunderstood. It is true that excess dietary fat can lead to obesity or fatty deposits in vital organs but fat also has an important role to play.

Fats are composed of fatty acids, with those that are essential to the diet important precursors of many hormones. Fats are also required for the uptake of fat-soluble vitamins so a diet free of all fat is not recommended. Instead, we need to understand individual requirements for fat and fatty acids and adjust diets accordingly.

Dietary Fats and Obesity

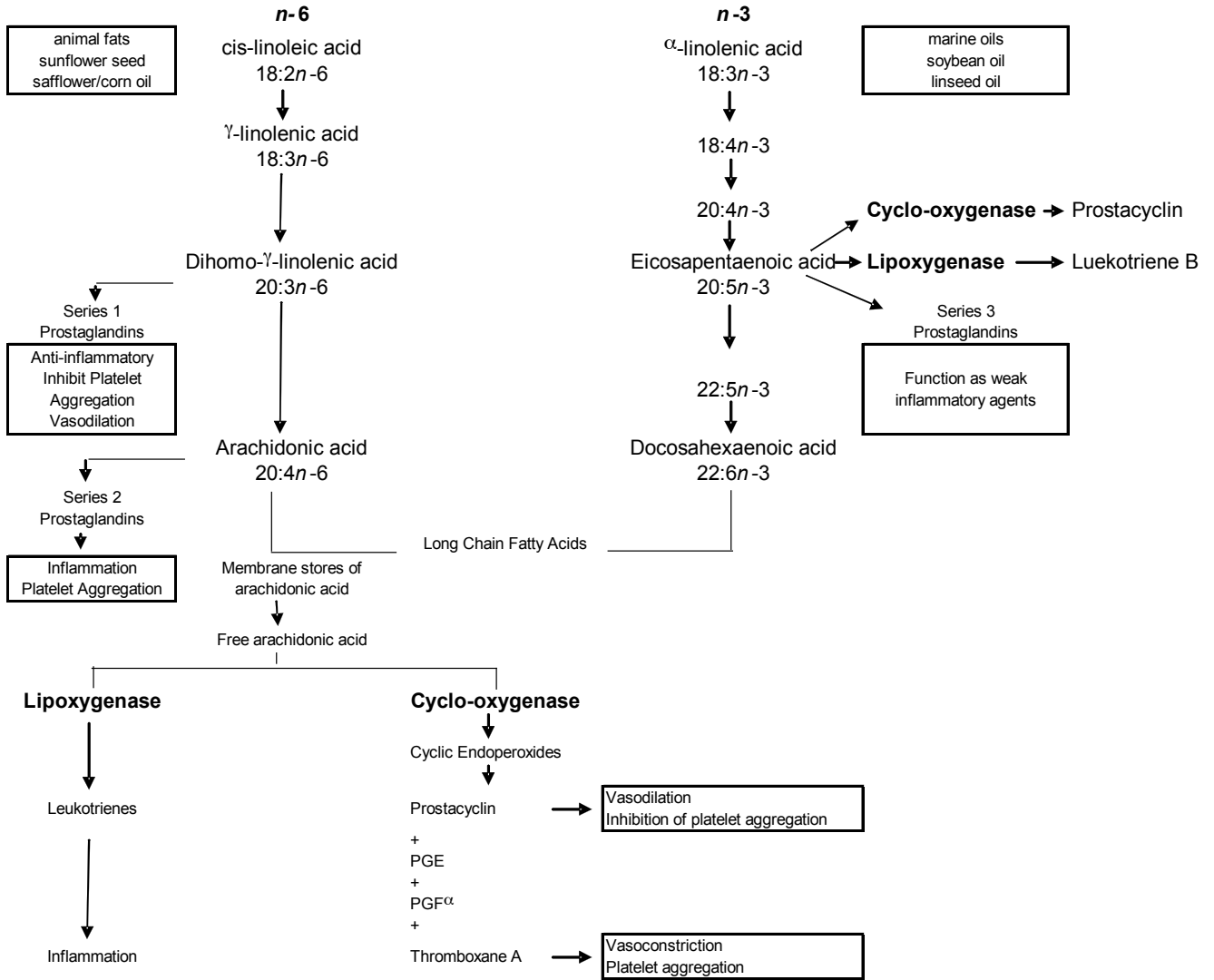
Obesity generally occurs when the consumption of energy-rich foods exceeds dietary requirements. Obesity can have detrimental impacts on health and longevity, leading to congestive heart failure or decreased tolerance of heat, and may dispose a bird to diabetes mellitus or exacerbate this illness.

Body weight alone is not always an indication of obesity as tissue and fluid accumulation can also increase body weight so it is important to have a veterinarian evaluate the health of your bird. As it is easier to measure body weight than body fat, we use measures relative to a species' optimal body weight. As a general rule, the following criteria for body weight in excess of optimal body weight can be used:

- 1-9% is acceptable,
- 10-19% is overweight and
- greater than 20% is obese.

Essential Fatty Acids

Fats are generally comprised of fatty acids and are described by their chemical characteristics. Those with no double bonds are *saturated*, with one double bond *monounsaturated* and multiple double bonds *polyunsaturated*. There are many different fatty acids and birds can generally make most of the shorter chained fats from dietary precursors. However, there are some fatty acids that are only made by plants and these need to be taken directly from the diet. These fatty acids are referred to as 'essential' fatty acids and include those in the *n-3* (ω -3:omega three) and *n-6* (ω -6:omega six) families.



Metabolic Pathways of Essential Fatty Acids

Fatty Acids and Eicosanoids

Fatty acids are the constituents that make up fat molecules. They are important precursors to a group of molecules called ‘eicosanoids’. Eicosanoids function as local hormones and mediators of inflammation, so any changes to dietary intake of fatty acids can influence inflammatory processes. Eicosanoids produced from the *n*-6 fatty acid arachidonic acid (AA) are proinflammatory, while those derived from the *n*-3 fatty acid eicosapentaenoic acid (EPA) are anti-inflammatory. However, these two molecules compete for the same enzyme systems so it is important to provide them in the correct dietary ratios. Most commercial pet foods contain excesses of *n*-6 fatty acids because of the use of vegetable oils and vegetable ingredients but dietary sources of *n*-3 fatty acids can be obtained from fish oil and flaxseed (linseed).

Essential Fatty Acids and Brain Lipids

Docosahexaenoic (DHA), an *n*-3 fatty acid, is an important component of embryonic brain tissue. There is a surge in brain growth in the second half of the embryonic/early neonatal stage and deficiencies of this fatty acid may result in a range of cognitive, behavioural and visual impairments. While the avian embryo may be able to synthesise DHA from α -linolenic acid, this ability may be species specific. Some species may not be able to synthesise sufficient DHA and require a dietary source of this longer chained fatty acid.

Spermatozoa Lipids

There are high proportions of polyunsaturated fatty acids (PUFA) in avian spermatozoa, especially those of the *n*-3 family. These are highly susceptible to lipid peroxidation so a dietary deficiency of vitamin E may contribute to male infertility. Supplementation with 200 mg kg⁻¹ vitamin E can reduce susceptibility of sperm to lipid peroxidation and the associated decrease in sperm output that is correlated with age. All of Dr Mac's breeding diets have high concentrations of vitamin E to help protect sperm membranes and enhance fertility.

Changes to Nutritional Quality of Lipids

Storage conditions and processing methods can change the configuration of fats. Hydrogenation or heat processing changes the natural *cis* configuration of fats to the *trans* form. While this does not impact on the use of the fats for energy, only *cis* forms can function as essential fatty acids and act as precursors of eicosanoids. If there is a need to supplement diets of birds with essential fatty acids, it is important to provide 'cold pressed' oils that have not been heat treated or extracted with chemical solvents.

Lipid Peroxidation

The cells of plant and animal tissues are composed of lipid (fat) and protein. These lipids naturally break down in a process known as *lipid peroxidation*. In the process, free radicals are generated and are effectively scavenged by the antioxidant defence system. However, if lipid peroxidation is accelerated to a rate that the antioxidant system cannot cope with, it becomes uncontrolled and can contribute to many avian diseases.

Poorly preserved/stored foods undergo lipid peroxidation and exhaust the supply of antioxidants such as vitamin E. The oxidised fatty acids are then absorbed from the intestine and can initiate further lipid peroxidation in tissues. Diets high in polyunsaturated fatty acids (PUFA) are particularly susceptible to lipid peroxidation, especially those high in *n*-3 fatty acids. Diets high in PUFA require additional antioxidant protection, in the absence of which rancidity results. Rancidity of foods not only reduces palatability of food but also reduces vitamin activity and subsequent oxidation of body fat.

Combating Lipid Peroxidation

Lipid peroxidation can be slowed down by good storage conditions or the addition of antioxidants. There are a number of naturally occurring substances in food such as phenolic compounds, vitamins A, C, E, and yellow-coloured carotenoids such as β -carotene that have potent antioxidant properties. As Dr Mac's products are certified organic, the addition of synthetic antioxidants and preservatives are prohibited. Instead, we add natural vitamins and carotenoids and concentrate on premium packaging. The special foil/laminate packaging excludes air, light and moisture and helps preserve the nutritional quality of ingredients.