

A Risk-Benefit Analysis of Omega-6 Fatty Acids in One's Diet

ABSTRACT

Omega-6 fatty acids (O6) are found especially in four-legged animal sources such as meat and dairy products, while omega-3 fatty acids (O3) are found in foods like fish, walnuts, and flaxseed oil. The ratio of O6 to O3 in the average American diet often exceeds 25:1. The optimum ratio is 2:1, which is the ratio consumed by our ancestors prior to farming and domesticated farm animals. The elevated ratio has contributed to many illnesses such as atherosclerosis, asthma, and other inflammatory illnesses. O6s are converted metabolically into fatty molecules called leukotrienes that cause inflammation. I have found peer-reviewed articles and studies, including a case study of a specific population that consumes O6 in excess of the 25:1 ratio. A high ratio causes many respiratory inflammatory disorders. In addition, an overabundance of O6 in a person's diet can contribute to the development of heart disease and other cardiovascular illnesses. To remedy this, people should consume more O3 foods in their diet and cut back on the amount of animal products they consume. A diet composed of whole, plant-based foods and fish contributes to health. Diets containing high levels of animal meat and dairy should be avoided.

INTRODUCTION

Essential fatty acids (EFAs) are integral in maintaining a healthy body. However, they cannot be produced by our bodies. Humans must therefore consume EFAs with structures named omega-6 (O6) and omega-3 (O3). These fats then produce the metabolites necessary to regulate metabolic processes like inflammation and to build bodily structures like hair and brain cells (1). The structures of these O6 and O3 fatty acids are different because the double bond that is present in O3 and O6 fatty acids occurs between different carbon atoms, as shown in Fig 1. For O3 it is on the double bond that begins at the third carbon from the end of the fatty acid. For O6 it is on from the sixth. The presence of additional double bonds makes both O3 and O6 polyunsaturated fats (3).

When O6 fatty acids are metabolized in the body, they are changed from linoleic acids (LA) into arachidonic acids (AA). AA can then be transformed into thromboxanes, prostaglandins and leukotrienes, which activate platelets in the blood, signal pain receptors, and moderate secretions in the gastric system (5). In this case, however, the most important products of AA metabolism are inflammatory molecules known as Series 2 prostaglandins (4). The process of metabolism is shown in Fig 2. The figure also demonstrates that for the other essential fatty acids, O3 (omega-3), the pathway produces anti-inflammatory prostaglandins (4). It is important in one's diet to maintain the balance of O3 fatty acids to O6 fatty acids so that the inflammation caused by O6 is balanced by the anti-inflammatory qualities of O3 (2). This requires eating a diet with adequate amounts of each EFA. Their content in many foods are shown in Figure 3.

It is my hypothesis that the higher the ratio of O6 fatty acids to O3 fatty acids is, the more inflammation will be caused, leading to cardiovascular disease development.

METHOD

I found and understood case studies, tables, graphs, and charts in scientific research and experiments in peer-reviewed literature and reference books. Charts and graphs justifying safe amounts of O6 were reviewed. I have discovered how O6 interacts with the body to either help prevent or encourage the development of cardiovascular illness. I have also reviewed a case study linking heart disease and an overabundance of O6.

RESULTS

The optimal ratio of omega-6 (O6) to omega-3 (O3) fatty acids is between 2:1 and 4:1. However, the ratio of an average North American diet can be anywhere from 14:1 to 25:1 O6/O3 (1). Reducing this ratio to 4:1 has demonstrated a 70% reduction in cardiovascular disease mortality (10). In the Lyon Heart Study, this was ratio was tested and achieved through replacing corn oil with olive oil to increase the amount of O3 in an effort to counter the amount of O6 (10). Other studies done in addition to the Lyon Heart Study demonstrated that reduced bone density, breast cancer, asthma, depression, and dry eye syndrome result from an imbalance of O6/O3. All of these are adverse effects on health (10).

Further, in a study of Bahraini citizens with and without coronary heart disease, it was discovered that populations with an O6/O3 ratio closest to 1:1 had far fewer coronary heart events (7). Research has suggested that this is a result of the Bahraini diet, which focuses heavily on O3 rich foods such as nuts and fish.

Many studies, however, produce inconclusive results. For example, in the National Heart, Lung, and Blood Institute Family Heart Study, it was demonstrated that increased polyunsaturated fatty acid (PUFA) intake correlated with a lower incidence of coronary heart disease (9). This result was considered to be inconclusive because it failed to distinguish between O3 and O6 fatty acids, making it unclear as to whether the O3 or the O6 was lowering the amount of CHD.

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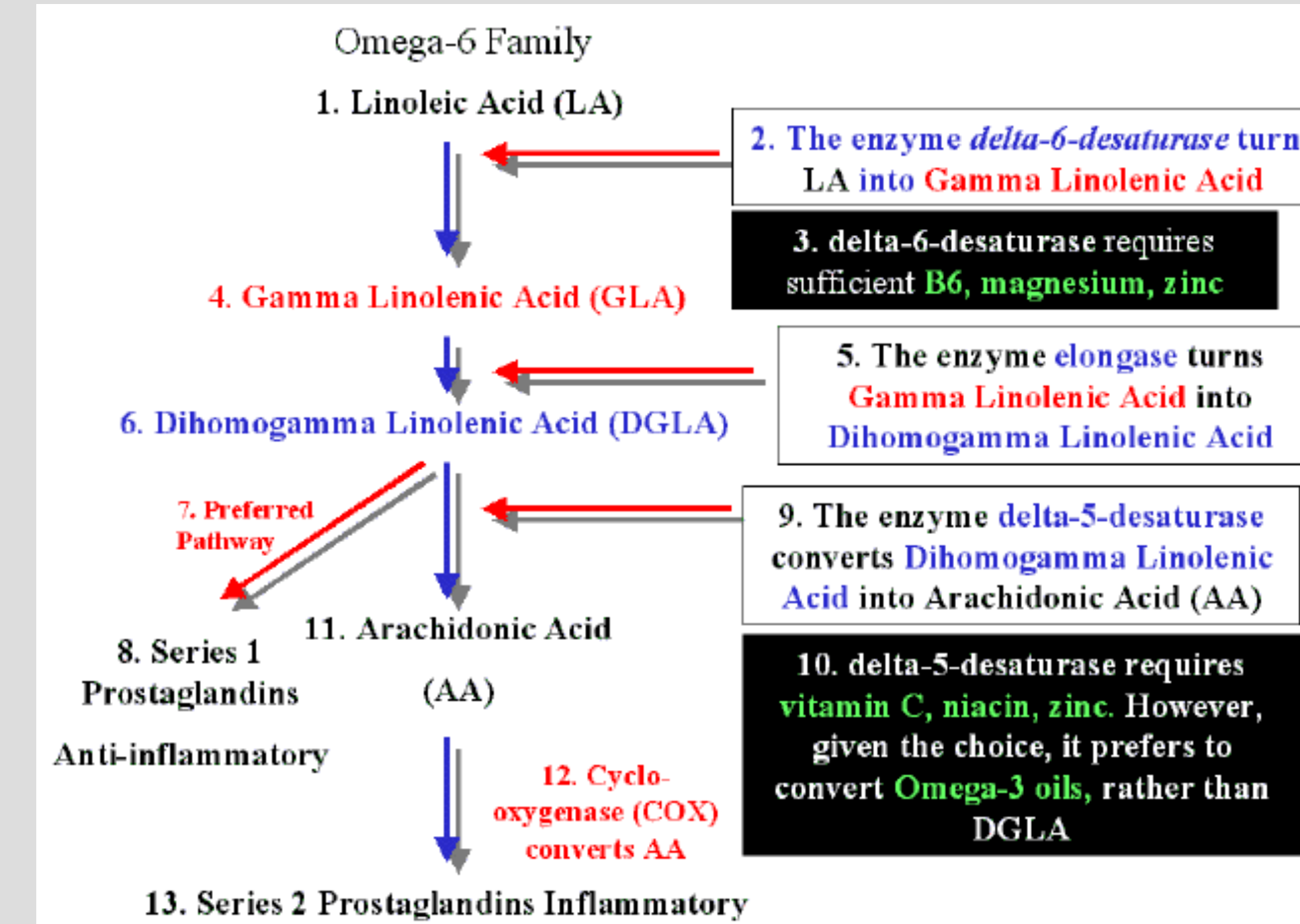


Figure 2:

When O6 fatty acids are metabolized in the body, linoleic acids are transformed into inflammatory (arachidonic) acids. To produce Series 1 prostaglandins, which fight inflammation within the body, humans must consume O3. Whether these processes happen or not is dependent upon the amount of O3 and O6 in a person's diet.

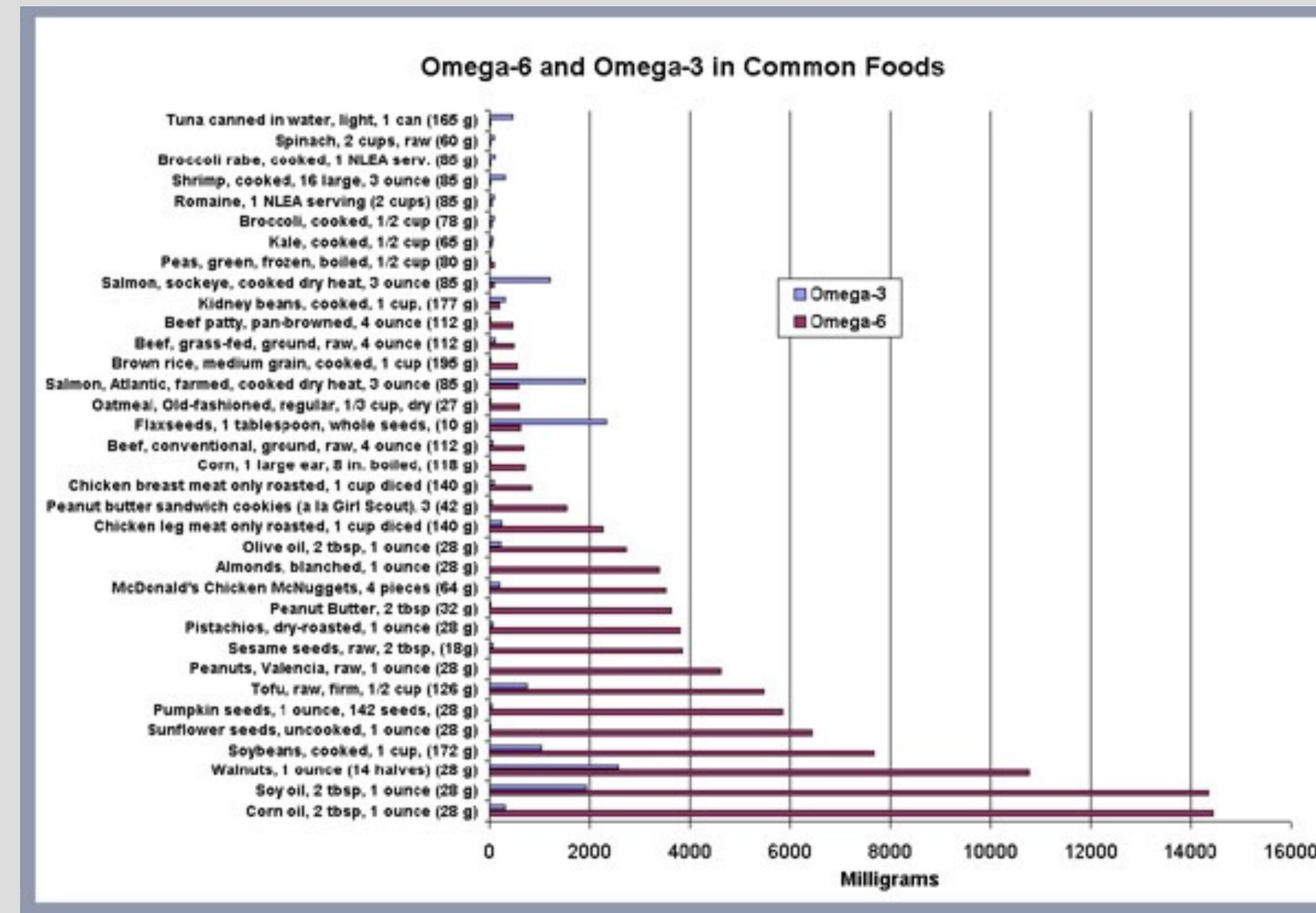


Figure 3:
O6 and O3 content by specific food. In general, foods with more cholesterol and higher saturated fat content contain a greater amount of O6 fatty acids.

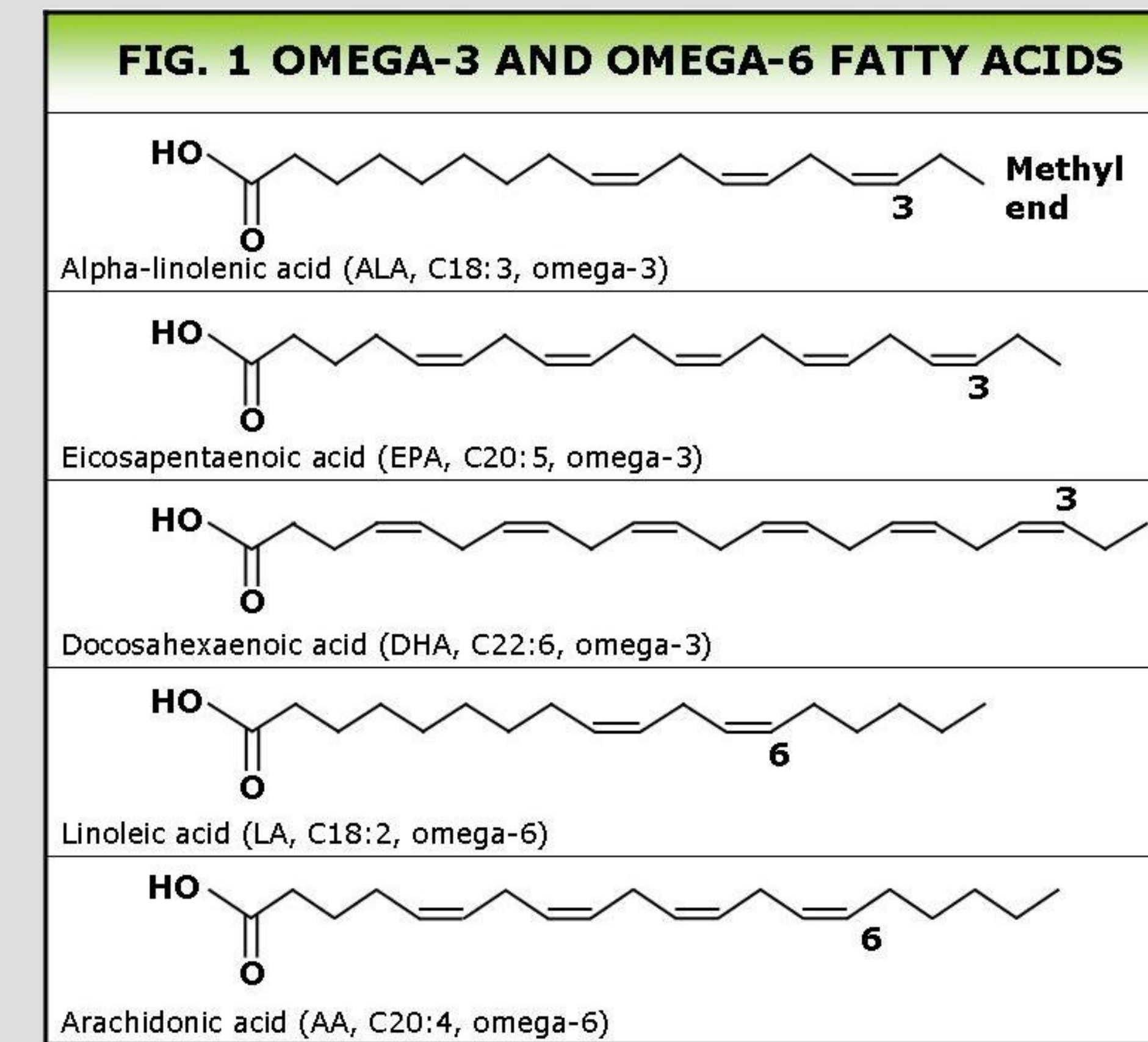


Figure 1:

O3 and O6 fatty acids are structurally different because of the location of the double bond farthest from the COOH. Linoleic and arachidonic acids (both O6) can cause inflammation in the body.

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