The importance of omega-6 and omega-3 polyunsaturated fatty acids (PUFA) to human health was first identified over 90 years ago. As the body does not make these essential fats they must be obtained from the diet. An adequate intake of both omega-3 and omega-6 oils is necessary for the maintenance of a range of biological activities from brain and skin development and function to immune system modulation. However as omega-3 and 6 PUFAs are metabolically linked (see Figure 1), each PUFA should be ingested in roughly the same amounts. This is because conversion of the shorter omega-3 and 6 fatty acids to their longer, biologically active metabolites use the same enzyme system (Figure 1). Excessive intakes of one type of PUFA such as omega-6, will inhibit the synthesis of the longer chain omega-3’s such as eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). This effectively reduces the concentration of EPA and DHA in the body resulting in related cellular dysfunction. It has been suggested that a ratio of omega-6 to omega-3 of <4:1 is acceptable, though a ratio of 1:1 is probably ideal.

An important function of these essential fatty acids, that help explain their influence on a range of pathologies, is their role in inflammatory modulation. Broadly classified, omega-3 PUFAs are associated with anti-inflammatory activity while crucial omega-6 PUFAs are pro-inflammatory (see Figure 1). For most people omega-6 is ingested in much higher quantities than omega-3. This is because a typical western diet contains an abundance of pro-inflammatory omega-6 PUFAs from poultry, red meats, eggs and dairy and processed foods containing vegetable oils such as corn, safflower, grape seed, sunflower, peanut and soybean. This same diet provides very little omega-3. Thus consumption of omega-3 PUFAs, (found in oil / fish, and some nuts and seeds such as walnuts, chia and linseeds), is likely to be deficient in most people. A recent study by the Australasian Research Institute found that >50% of adolescents, including those on Sydney’s Upper North Shore and Central Coast regions, have below optimum cell membrane omega-3 levels2 (Figure 2). For optimum health a person needs to ingest enough omega-3 (EPA & DHA in particular) to increase the ratio to at least 8% (0.08) of the total membrane fatty acid content. This is called the omega-3 index. On the basis of this index, a high risk of cardiovascular disease has been identified in those with an index of <4%, while an index of 4-8% = intermediate risk, and those considered low risk have an index of >8%4,5. This is consistent with the recently reported association between omega-3 levels and the cardiovascular disease risk marker homocysteine6. Importantly an omega-3 Index of <4% has also been identified as an independent risk marker for major depressive disorder (MDD) in adults6 and potentially, adolescents7.

In addition to their effect on anti-inflammatory processes, the multiple beneficial effects of the omega-3’s are linked to a range of biochemical pathways8. Through these pathways the omega-3’s influence, neuronal signalling, cell growth and tissue repair11. Sufficient intakes of the anti-inflammatory omega-3 PUFAs have therefore been shown to be beneficial, in addition to cardiovascular disease and depression to reduced symptoms.
WHY MEASURING OMEGA-3 LEVELS CAN BE CLINICALLY IMPORTANT

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in asthma, rheumatoid arthritis, psoriasis and potentially some types of pain. Because of the relationship between essential PUFA levels and common health conditions quantifying an individual’s omega-3 status seems prudent.

San Pathology (with the Australasian Research Institute) now offers tests for omega-3 including the omega-3 index test, and omega-3-omega-6 ratio. These tests are performed on red blood cells. Ideal sampling conditions include collection of a heparin tube blood sample which can be stored at 4-8°C for arrival at San Pathology within 24 hrs. There is no item number for this test.

Contact San Pathology 9487 9500.

Figure 2: Distribution of whole blood omega-3 levels, expressed as the omega-3 Index, in a cohort of Australian adolescents aged 15-17 years.