Omega-3
INDEX COMPLETE

Omega-3 Index Complete

Test for Fatty Acids with No Blood Draw, at a Great Price

Many studies have shown that people with higher (vs. lower) omega-3 index levels are at decreased risk for a variety of diseases and live longer than those with lower levels. Most chronic illnesses are caused by inflammation and many of the products of the omega-3 synthesis pathway are important for regulating and reducing inflammation. Inadequate levels of omega-3 fatty acids are associated with increased risk for depression, anxiety, dementia, obesity, heart disease, stroke, type II diabetes, breast cancer, weakened immune systems, and eye disorders.

Omega-3 fatty acids are found primarily in fish, especially "oily" fish such as salmon, herring, tuna, and sardines. The two most important omega-3 fatty acids are EPA and DHA. Omega-3 fatty acids from flaxseed oil (alpha-linolenic acid, ALA) may have insufficient impact on your EPA and DHA levels, therefore, ALA is not an adequate substitute for EPA and DHA from fish oil.

Clinical Significance of Fatty Acids Supplementation

- Fatty acids from fish oil are vital for brain function and help prevent cognitive decline and brain atrophy in older adults.
- Many psychiatric disorders, particularly schizophrenia, bipolar depression, and major depressive disorder (MDD), have shown positive results when fatty acids supplementation has been used.
- Omega-3 fatty acid supplementation provides a protective benefit in heart disease, and in particular the prevention of sudden cardiac death.
- Rheumatoid arthritis (RA) has been proven to benefit from fatty acid supplementation, with improvement in symptoms and a decreased need for use of nonsteroidal anti-inflammatory drugs (NSAIDs).
- Greater weight loss has been shown in adults taking fish oil supplements throughout their weight loss program compared to those who didn't take fish oil.

Analyte List *Also includes Saturated Fatty Acids, Trans Fatty Acids, and Monosaturated Fatty Acids*

Omega-3 Index

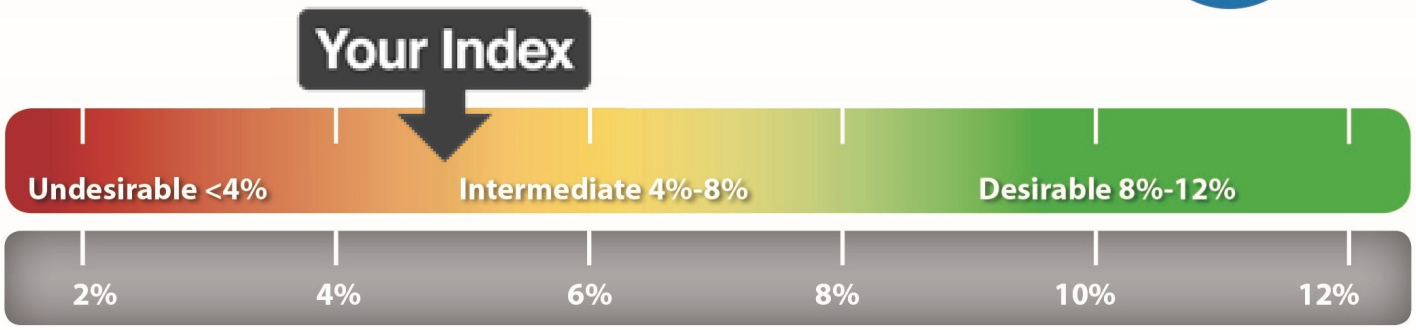
- *Alpha-Linolenic*
- *Eicosapentaenoic*
- *Docosapentaenoic*
- *Docosahexaenoic*

Omega-6 Fatty Acids

- *Linoleic*
- *Gamma-Linolenic*
- *Eicosadienoic*
- *Dihomo-gamma-linolenic*
- *Arachidonic*
- *Docosatetraenoic*
- *Docosapentaenoic*

Your Index 4.85%

Reference Range*: 2.90% - 12.90%



* Reference Ranges encompass about 99% of US adults. Visit our FAQ section for more information on ranges.

Your Omega-3 Index is 4.85% which is below the desirable range of 8%-12%.

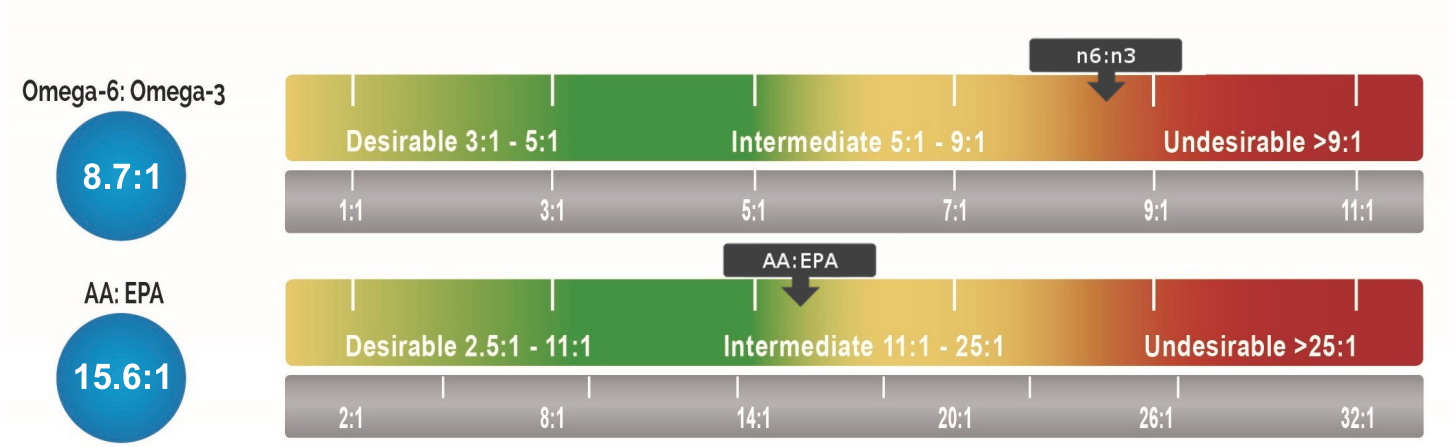
We would suggest that you increase your intake of EPA+DHA by 500-1200 mg/day.

An Omega-3 Index in the range of 8%-12% is an indicator of better overall health. This is based on studies reporting that people with a higher Omega-3 Index are at decreased riska for heart disease[1-3,b], loss of cognitive function[4-8], bipolar disorder[9], ADHD[10], depression[11] and age-related macular degeneration[12]. Importantly, people with higher levels live longer than those with lower levels[13-15,†].

The best way to increase your Omega-3 Index is to eat more omega-3 fatty acids. These are found primarily in fish, especially "oily" fish and in dietary supplements (fish, krill, and algal oils). The two most important omega-3 fatty acids are EPA and DHA. The amount of EPA and DHA you would need to take in order to raise your Omega-3 Index into the target range cannot be predicted with certainty. Many factors –age, sex, weight, diet, genetics, smoking, medications you may be taking, other medical conditions, etc. – all can influence your body's response to additional EPA and DHA. Nevertheless, we would recommend you increase your current EPA and DHA intake by about 500-1200 mg/day[16]. Our Omega-3 Calculator™ can be used to estimate a recommended intake based on your personal Omega-3 Index. It should be noted that omega-3 fatty acids from flaxseed oil (alpha-linolenic acid, ALA) will have little to no effect on your Omega-3 Index[17]. Therefore, ALA is not an effective substitute for EPA and DHA.

After you increase your intake of EPA and DHA, your Omega-3 Index will begin to go up within a few days but will take 3-4 months to reach your new level[18]. The only way to know how your body will respond to an increased intake of EPA and DHA is to re-measure your Omega-3 Index. Since it takes 3-4 months to reach your new Omega-3 Index, you should retest in this timeframe to confirm your dietary and/or supplementation changes are working. Once you reach the desirable Omega-3 Index range, you should retest every 6 months to make sure it is staying there.

The Omega-6:Omega-3 and the AA:EPA Ratios

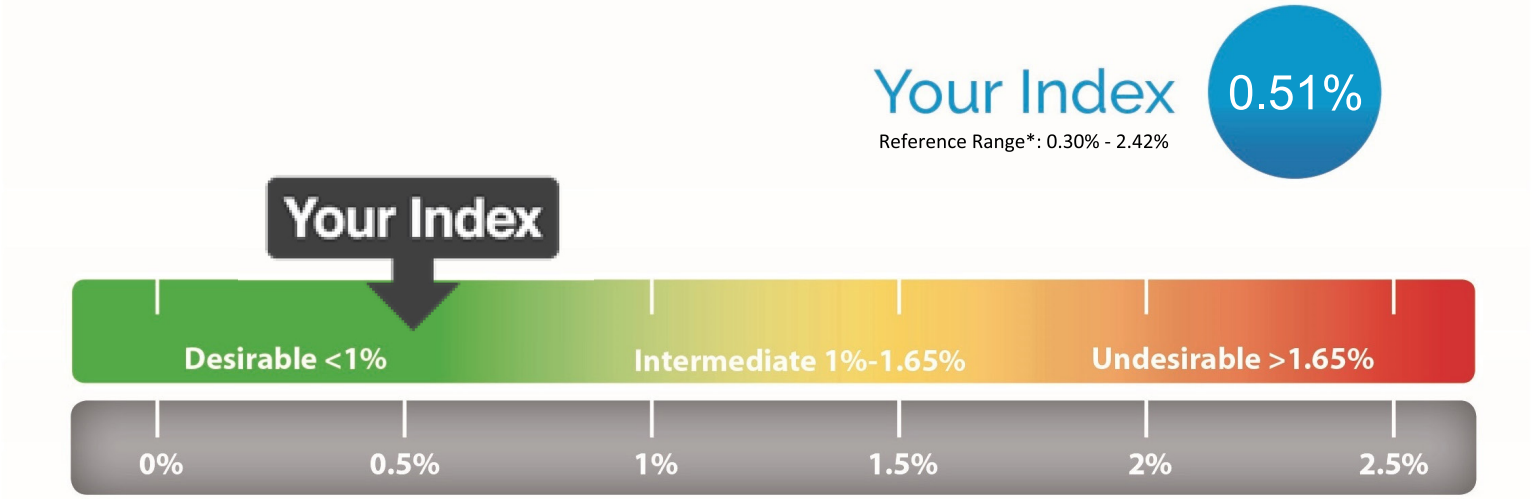


Omega-6:Omega-3 ratio is calculated by dividing the sum of all the omega-6 fatty acids by the sum of all the omega-3 fatty acids. The only two fatty acids included in the AA:EPA ratio are arachidonic acid (AA, 20:4n-6) and eicosapentaenoic acid (EPA, 20:5n-3).

The ranges shown in this table were derived from about 8900 individuals whose dried blood samples were analyzed for the Omega-3 Index and for these two ratios. Because the Omega-3 Index is so strongly related to each of these ratios, the ratio-based risk a ranges shown below are derived from those defined for the Omega-3 Index.

	Omega-3 Index	Omega-6:Omega-3	AA:EPA Ratio
Undesirable	<4%	Over 9:1	Over 25:1
Intermediate	4% - 8%	5:1 - 9:1	11:1 - 25:1
Desirable	8% - 12%	3:1 - 5:1	2.5:1 - 11:1
Elevated	Over 12%	Below 3:1	Below 2.5:1

As described in the Omega-3 Index report, the quickest and most efficient way to lower both the Omega-6:Omega-3 and the AA:EPA ratios is to consume more EPA and DHA. Based on a significant body of research, we cannot recommend that you reduce your intake of the principal dietary omega-6 fatty acid, linoleic acid. Raising your intake of EPA and DHA from seafood and/or supplements will not only increase blood EPA and DHA levels (which itself will lower these ratios), it will also lower blood omega-6 fatty acid levels, which will lower the ratios even more. As described in the Omega-3 Index report, it will take 3-4 months for these ratios to reach their new levels and this is the timeframe you should retest in.



* Reference Ranges encompass about 99% of US adults. Visit our FAQ section for more info.

Your Trans Fat Index is within the desirable range of less than 1%.

You are advised to maintain your current dietary pattern.

Like the essential omega-3 and omega-6 fatty acids, trans-fatty acids (fats) come only from our foods; that is, they cannot be made in the body like saturated and mono-unsaturated fats can. Although a small amount of these fats are found "naturally" in foods like dairy products and beef, the great majority (80-90%) of trans fats come from the "partial hydrogenation" of liquid vegetable oils. This is a chemical process that converts these oils into solid margarines and shortenings. Consumption of these "industrial trans fats" has been linked to a higher risk for heart attacks[23]. In 2013, the US Food and Drug Administration (FDA) began to take steps to remove as much industrial trans fats from the American diet as possible.

Unfortunately, it is virtually impossible to know for certain how much trans fat is in your diet. This is because varying amounts of trans fats are included in literally thousands of food products, and the amounts in any given food product can change over time depending on the prices of the fats used to produce the food and the success of food companies in finding other fats to replace trans fats. In general, the foods that provide the most trans fats in the American diet include cakes, cookies, pies, pastries, french fries, tortilla chips, crackers, popcorn, and stick margarines.

The Trans Fat Index is simply the amount of "industrial" trans fatty acids that are in your red blood cell membranes. Blood levels of trans fats reflect levels in the diet. A Trans Fat Index of <1% has been associated with reduced risk for cardiovascular disease[24]. Individuals who have been eating typical American diets for decades have relatively high levels of trans fatty acids stored in their fat tissue. The more they have eaten (and the more fat tissue present), the larger the body's burden of trans fats. When a person cuts down on trans fats, these fatty acids start to slowly "leak" out of the fat tissue and eventually get burned up, but the process is slow. Unfortunately, research on the question of "How slow?" has never been done, so nobody really knows. Consequently, the only way to track the loss of trans fats from your body is to periodically test your Trans Fat Index every 6 to 12 months.

Omega-3 Fatty Acids

The four omega-3 fatty acids reported here include the "plant" omega-3 (ALA) and the three "fish" omega-3s (EPA, DHA and DPA n-3). ALA is one of the two essential fatty acids in the diet (like vitamins, we can't make essential fatty acids ourselves and so we need to get them from our

Dried Blood Spot Fatty Acid Profile

Fatty Acid Group	Total	Percentile Rank	Reference Range*
Omega-3 Fatty Acids	**4.36%**	**21st**	**2.92-13.29%**
Omega 3 Index	4.85%	30th	2.90-12.90%
Alpha-Linolenic (18:3n3)	0.45%		
Eicosapentaenoic (EPA, 20:5n3)	0.67%		
Docosapentaenoic-n3 (22:5n3)	0.80%		
Docosahexaenoic (DHA, 22:6n3)	2.44%		
Omega-6 Fatty Acids	**37.91%**	**49th**	**26.35-45.15%**
Linoleic (18:2n6)	24.12%		
Gamma-Linolenic (18:3n6)	0.44%		
Eicosadienoic (20:2n6)	0.21%		
Dihomo-y-linolenic (20:3n6)	1.22%		
Arachidonic (AA, 20:4n6)	10.43%		
Docosatetraenoic (22:4n6)	1.23%		
Docosapentaenoic-n6 (22:5n6)	0.26%		
cis-Monounsaturated Fatty Acids	**22.67%**	**70th**	**15.65-32.26%**
Palmitoleic (16:1n7)	0.81%		
Oleic (18:1n9)	21.00%		
Eicosenoic (20:1n9)	0.19%		
Nervonic (24:1n9)	0.67%		
Saturated Fatty Acids	**34.49%**	**74th**	**29.52-37.74%**
Myristic (14:0)	0.51%		
Palmitic (16:0)	20.92%		
Stearic (18:0)	11.43%		
Arachidic (20:0)	0.24%		
Behenic (22:0)	0.61%		
Lignoceric (24:0)	0.78%		
Trans Fatty Acids	**0.60%**	**7th**	**0.35-2.69%**
Trans Palmitoleic (16:1n7t)	0.09%		
Trans Oleic (18:1t)	0.29%		
Trans Linoleic (18:2n6t)	0.22%		
Trans Fat Index	0.51%	5th	0.30-2.42%
Ratios			
AA:EPA	15.6:1	63rd	1.4 – 52.6
Omega-6:Omega-3	8.7:1	76th	2.3 – 14.5

foods). The recommended intake of ALA is about 1.5 grams per day (which is about the average intake in the US today)[25]. ALA comes primarily from soybean oil (which is a component of many processed foods), but certain specialty foods/oils are particularly rich sources (chia seeds, flaxseeds, walnuts). With respect to the "fish" omega-3's, they are not dietary essentials, but they do have health benefits (see Omega-3 Index report). Recommendations for EPA and DHA in generally healthy adults range from 250 mg/day to 500 mg/day[26]. In patients with known heart

disease, the American Heart Association recommends 1000 mg/day[27]. Although a target range for the Omega-3 Index has been set at 8%-12%, at present[28], there is not enough research to recommend a target blood levels for ALA or DPA n3.

Omega-6 Fatty Acids

We measure levels of 7 fatty acids in the omega-6 family, but on average 85% of the total amount comes from only two of them – linoleic and arachidonic acids. The former is (like ALA) an essential fatty acid and is the starting material for the synthesis of the other omega-6s, including arachidonic acid, which is known to have multiple effects on cellular processes[29]. The level of linoleic acid in your blood is generally influenced by the amount you eat averaged over many months, whereas the level of arachidonic acid (and the other 5 omega-6s) are primarily determined not by your diet but by internal metabolism[30]. In other words, there is little you can do to alter the levels of 6 of the 7 omega-6s, and making significant changes in linoleic acid levels takes months to years. Most experts recommend somewhere between 12 and 24 grams per day of linoleic acid, with the average intake in America being around 15 grams per day[19]. There has been considerable controversy regarding whether the amounts of omega-6 fatty acids are "good" or "bad" for our health. Some point out that arachidonic acid is itself the starting material for the internal production of "pro-inflammatory" molecules, and since (chronic) inflammation is typically considered bad, then arachidonic acid must be part of the problem[31]. Others (including Dr. Harris[32,33] and most nutrition science organizations around the world) disagree[19,20,34,35], noting that in most studies, higher (vs lower) amounts of linoleic acid in the diet are associated with reduced risk for cardiovascular diseases[21]. A 2014 study found that higher (not lower) levels of arachidonic acid in the blood were associated with lower rates of heart attacks[36]. Thus, it is incorrect to view omega-6s as "bad" for heart health...they are in fact good. Nevertheless, it is difficult at the present time given the state of scientific research, to define a "healthy" arachidonic acid level. There are some studies that show that linoleic acid levels greater than about 16% are associated with better heart health than lower levels[37], but the strength of the evidence to date does not allow us to set a firm target.

cis-Monounsaturated Fatty Acids

There are 4 fatty acids in this class but 95% comes from only 1 fatty acid, oleic acid. This is a fatty acid that is ubiquitous in the diet and can be made from scratch inside our cells, so it is not an "essential" fatty acid. Although found in relatively high amounts in "the Mediterranean Diet" (owing to the large amounts coming from olive oil), the role of oleic acid in heart health is, like for the omega-6s, controversial. Some studies suggest higher is better[38], while others point to the opposite conclusion[39]. Therefore, we cannot provide a strong science-based recommendation for target oleic acid levels in your blood. Even if we could, oleic acid levels are (again like the omega-6 fatty acids) relatively hard to change and altering them takes months to years of concerted dietary change. At present, oleic acid levels are provided in the report for the sake of completeness, not to guide recommendations for dietary changes. Most vegetable oils are rich sources of oleic acid, with olive and canola oils being among the richest. The only other fatty acid in this family that merits comment is palmitoleic acid. It is normally present at only about 0.5% of total fatty acids in your blood (as opposed to about 15% for oleic acid), but it is being recognized as a marker of excess carbohydrate in the diet. Carbohydrates include sugar, flour, high-fructose corn syrup, etc. Too much carbohydrate causes the body to actually synthesize fatty acids, and palmitoleic acid levels go up in this setting. Again, the research in this field is immature and does not allow for firm target values to be set[40], but levels below about 0.5% are probably better than levels above this target.

Saturated Fatty Acids

There are 6 saturated fatty acids in the Omega-3 Index report. Saturated fatty acids are chemically distinct from unsaturated (whether mono- or poly-unsaturated) in that they do not contain "double bonds." Fatty acids without double bonds can be envisioned as straight chains of carbon atoms, but when double bonds are in the chain, they put a "kink" or "bend" in the chain, and that alters the function of the fatty acid. Saturated fatty acids, because their strait chains can stack together easily, become solid at room temperatures. Thus products/foods with predominantly saturated fatty acids are solids like butter, shortening, and lard; products/foods with predominantly unsaturated fatty acids are liquids, like vegetable or fish oils. Once again, the vast majority of saturated fatty acids are palmitic and stearic acids. Together these two constitute on average 98% of the saturated fatty acids in the blood, with palmitic making up 2/3rds of the total. Stearic acid does not appear to have any important health consequences, but higher levels of palmitic may. Diets high in palmitic acid raise blood cholesterol levels and thereby may increase risk for heart attacks[41]. On the other hand, other studies reported that higher levels of palmitic acid in the diet (or in the blood for that matter) are not associated with higher rates of heart attacks[36,42], so the conventional wisdom is being challenged and the real story is not clear. What is becoming clearer, however, is that higher levels of palmitic acid in the blood are linked with greater risk for diabetes[43], a disease that is becoming almost epidemic in the US today. So keeping palmitic acid levels below "average" (i.e., less than about 23%) would probably be wise although firm evidence that this will lower risk for diabetes has not yet been produced. Replacing foods high in saturated fats with those higher in unsaturated (particularly polyunsaturated, omega-6 and omega-3) is still a good idea even if we don't yet know for sure what the "right" blood levels of palmitic acid should be. Again more research is needed.

Trans Fatty Acids

Trans fatty acids all have at least 1 double bond, but this bond differs in its orientation from the more natural "cis" (opposite of "trans") orientation in the fatty acid molecule. A trans double bond between 2 carbon atoms removes the kink and straightens out the molecule. This makes it act more like a saturated than unsaturated fatty acid. Most trans fatty acids in our diets are "unnatural" and come from an industrial process called "partial hydrogenation" which converts liquid oils to solid fats. This converts some of the cis-polyunsaturated fatty acids in the oils into trans-mono-unsaturated fatty acids which allows the product to remain in liquid form. (Partially hydrogenated soybean oil, for example, is commonly used in salad dressings and for frying foods). These "industrially-produced" trans fatty acids are now universally seen as bad for heart health[23], and since their levels in the blood are a direct reflection of their levels in the diet[44], dietary changes will eventually be reflected by changes in blood trans fatty acid levels. However, trans levels will decrease at a much slower rate after lowering trans fatty acid intakes than, for example, omega-3 levels will increase after starting to take fish oils. We currently set the blood trans-fat target at less than 1% which is the level shown in a recent study to be associated with no increased risk for heart disease[45].

Ratios

The Full Fatty Acid Profile Report includes 2 fatty acid ratios: the omega-6:omega-3 ratio and the AA:EPA ratio. Although we include these ratios as a courtesy to some practitioners who find them useful, we believe that the Omega-3 Index is more informative and is the single most important (and actionable) component of our report[32]. We believe that the quickest and most efficient way to improve either of these ratios is by consuming more EPA and DHA, not by eating less omega-6 fatty acids. The reasons for this are (as described above) that eating less omega-6 fatty acids

has a very minor impact on blood omega-6 levels, and that reducing omega-6 intakes has been associated with increased, not decreased, risk for heart disease. Hence, we feel it is ill-advised to recommend reducing omega-6 intake and well-advised to raise omega-3 (specifically EPA and DHA) intakes. Target values for these ratios that roughly correspond to an Omega-3 Index of 8%-12% would be: omega-6:omega-3 ratio, 3:1–5:1; AA:EPA ratio, 11:1–2.5:1.

Included in the Test Report

- *Full 24 Fatty Acid Profile*
- *Omega-3 Index*
- *Trans Fat Index*
- *Omega-6:Omega-3 ratio*
- *AA/EPA ratio*

Recommendations

Depending on test results, follow-up may include:

- *Fish oil or cod liver oil as direct sources of EPA and DHA*
- *Omega-3 fatty acids from algae for strict vegetarians*
- *Evening primrose oil, borage oil, or black currant oil as sources of GLA if insufficiently synthesized*
- *Hemp oil as source of both ALA and GLA*

Specimen Requirements

Dried Blood Spot (DBS): One drop of blood on collection card.
Please see kit instructions for all collection details.

a) In this context, "risk" refers only to that associated with differing levels of omega-3 fatty acids. Risks associated with other factors such as cholesterol, blood pressure, diabetes, personal or family history of other diseases, smoking, physical inactivity, or other medical conditions are completely independent of the Omega-3 Index. Improving the Omega-3 Index will not correct these other risk factors, which – along with the Omega-3 Index - should all be addressed in consultation with your healthcare provider as part of a global risk reduction strategy.

b) 1-32 Full references to studies supporting these statements may be found at www.omegaquant.com/evidence.

†) These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease. Rather it is a wellness test to assess nutritional status. You are encouraged to discuss these results with your healthcare provider.

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