

Fatty Acid Analysis

measured according to the Omegamatrix method

Fatty Acid Analysis

Analyse-ID	1661ywpnwmbg	Name	Labor Musterbefund	On Behalf of
Test Date	2023-5-5	Date of Birth	1970-01-01	Norsan
Sample Receipt	2023-05-05	Gender	Female	10243 10243, DE
Validated on	2024-11-27	Retest	Yes	

Automatically generated, medically validated final report.

Your Analysis Result – Summary

Index	Your Result	Recommendation	Evaluation*
HS-Omega-3 Index	9.82 %	Between 8% and 11%	Green
Omega- 6/3 -Ratio	2.5	Between 1:1 and 2.5:1	Yellow
HS-Trans Index	0.65 %	Under 1.04 %	Green

Related to the respective value:

-  Green *Indicates good nutrition and fatty acid structure.
-  Yellow *Indicates slight potential for improvement in nutrition and fatty acid structure.
-  Orange *Indicates a clear potential for improvement in nutrition and fatty acid structure.
-  Red *Indicates significant potential for improvement in nutrition and fatty acid structure.

Contents of the Findings Report

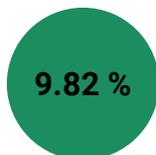
- Your Analysis Result – Summary
- Your HS-Omega-3 Index
- Your Omega-6/3-Ratio
- Your HS-Trans Index
- Your Fatty Acid Levels
- General Nutritional Recommendations
- About the Analysis

HS-Omega-3 Index

Nutritional Considerations

The HS-Omega-3 Index represents your personal level of marine omega-3 fatty acids as a parameter. The optimal range for promoting health is between 8 and 11 %. An optimal HS-Omega-3 Index can increase life expectancy and quality of life, since not only the structure and function of the heart, brain, muscles and other organs, but also the course of a pregnancy, for example, depend on the body's omega-3 supply. Numerous diseases and health problems can be positively influenced or even prevented if the HS-Omega-3 Index is within the target range. In the case of existing chronic inflammatory diseases, the Omegamatrix laboratory recommends an HS-Omega-3 Index in the extended target range of 11 – 15 % in order to reduce the symptoms and progression of the disease. An index above 16 % is not recommended, since such elevated levels have been linked to an increased bleeding tendency.

Your Result



Reference range



Your HS-Omega-3 Index

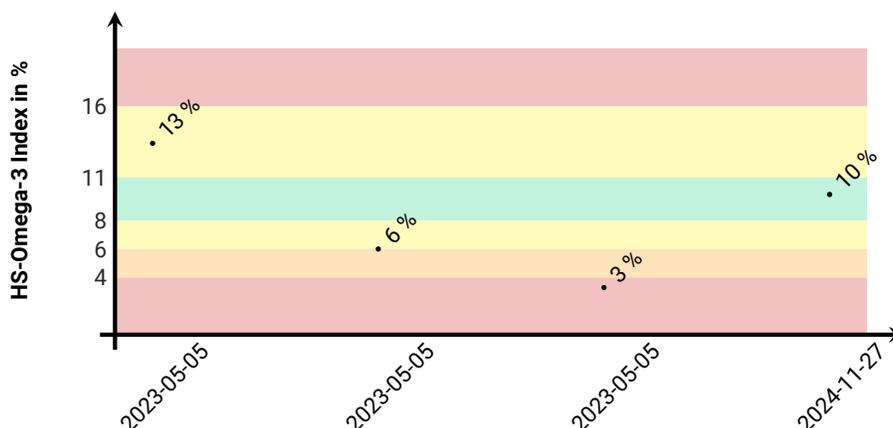
Congratulations! Your measured value of **9.82 %** represents an optimal level of the HS-Omega-3 Index and is within the target range (8 – 11 %). Based on the latest scientific findings, it is in the optimal range to prevent the development of diseases or to support therapies. Thus, marine omega-3 fatty acids are already contributing to maintaining your health.

The achieved index indicates an optimal intake of marine fatty acids from fish, sea products or algae. Based on your levels, it is recommended that you maintain your daily consumption of marine omega-3 fatty acids (EPA, DPA, DHA).

If you maintain your intake and diet, the HS-Omega-3 Index can be expected to remain within this range. It can be checked every one to two years.

Additional note: If you suffer from a severe, chronic inflammatory disease (e.g. rheumatism or multiple sclerosis), you may also benefit from a slightly higher index of 11 – 15 %. Those affected report further symptom relief when they reach an index in this slightly elevated range.

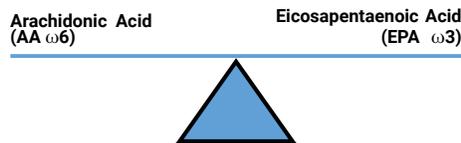
Development of the HS-Omega-3 Index



Omega-6/3-Ratio (AA/EPA Ratio)

Nutritional Considerations

The body can use the omega-6 fatty acid, arachidonic acid (AA), to form pro-inflammatory messenger substances, while the omega-3 fatty acid eicosapentaenoic acid (EPA) can form mediators that inhibit the development of inflammation. Therefore, the ratio of these two fatty acids is used to assess inflammatory status in the body ("silent inflammation"). A ratio between 1 : 1 and 2.5 : 1 (AA to EPA) is considered to be therapeutically advantageous, particularly in the case of pre-existing, chronic diseases. In the absence of disease, a ratio in the range of 2.5 : 1 to 5 : 1 can also be considered beneficial.



Your Result



Reference range



Your Omega-6/3-Ratio

Your measured ratio of **2.5:1** represents a slightly elevated but acceptable ratio of arachidonic acid (AA) to eicosapentaenoic acid (EPA). Both omega-6 and omega-3 fatty acids are essential fatty acids. This means that the body is dependent on their supply. You should therefore ensure an adequate intake of both AA and EPA.

Omega-6 fatty acids are found in a wide variety of common foods and a sufficient intake of omega-6 is usually ensured. Accordingly, your measured ratio indicates an almost optimal intake of omega-3 fatty acids. A ratio of up to 5 : 1 is considered to offer protection against disease, especially in terms of prevention. However, if you already have one or more chronic, inflammatory diseases, it is advisable to aim for a lower ratio, of less than 2.5 : 1.

Given your result, you might consider both reducing your omega-6 intake and increasing your omega-3 intake in order to further optimize your ratio. Please also refer to your individual measured values of fatty acids (see Page 5) and read the section "Nutritional recommendations".

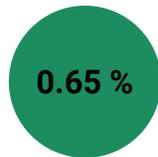
Your HS-Trans Index

Nutritional Considerations

The HS-Trans Index indicates the proportion of harmful trans-fatty acids from industrially produced products. An increased HS-Trans index ($> 1.04\%$) is associated with increased mortality, especially from heart disease. Dangerous trans-fatty acids are formed, for example, when deep-frying fat is kept hot for too long or is used several times. These fatty acids can also occur in food production. In fact, only a few people in Germany have elevated values (1.3 % of the samples measured), which is due to the voluntary actions of food producers. In other countries (e.g. USA, Austria, Switzerland, Denmark) legal measures have been instated, which is why only a few people in these countries have an elevated HS-Trans Index.

Information on the importance of natural trans-fatty acids for health can be found in the section "Nutritional Recommendations".

Your Result



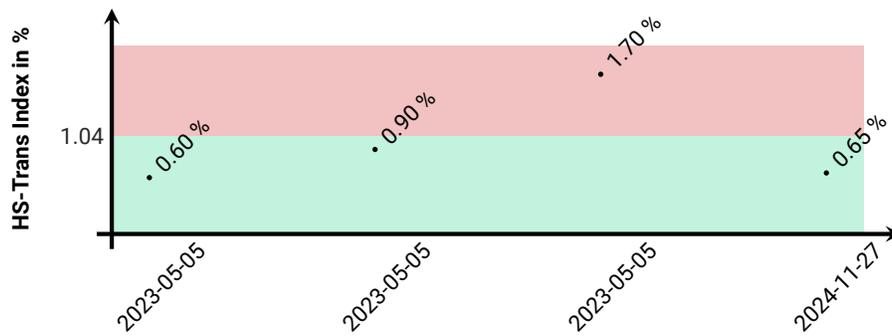
Your HS-Trans Index:

The value of **0.65 %** you measured is low and within the safe range. There is no need for action regarding the intake of industrial trans fatty acids.

Reference range



Development of the HS-Trans Index



Your Fatty Acid Values (in % of total fatty acids)

Omega-3 Fatty Acids	Previous Values 2023-05-05	Your Values	Orientation Values*
Alpha linolenic acid (ALA, 18:3 ω 3)	0.59	0.59	0.36
Eicosapentaenoic acid (EPA,20:5 ω 3)	1.00	4.22	3.78
Docosapentaenoic acid (DPA,22:5 ω 3)	1.13	1.13	2.03
Docosahexaenoic acid (DHA, 22:6 ω 3)	1.50	5.60	6.00
Total Omega 3	4.22	11.54	12.17

Omega-6 Fatty Acids

Linoleic acid (LA, 18:2 ω 6)	24.29	14.49	16.72
Gamma linolenic acid (GLA,18:3 ω 6)	0.17	0.17	0.14
Eicosadienoic acid (EDA, C20:2 ω 6)	0.35	0.35	0.20
Dihomo- γ -Linolenic acid (DGLA ,20:3 ω 6)	1.83	1.83	1.29
Arachidonic acid (AA, 20:4 ω 6)	16.00	10.50	8.94
Docosatetraenic acid (DTA, 22:4 ω 6)	1.25	1.25	0.76
Docosapentaenoic acid n6 (22:5 ω 6)	0.18	0.18	0.25
Total Omega 6	44.07	28.77	28.30

Omega-7 Fatty Acids

Palmitoleic acid (16:1 ω 7)	0.42	0.42	0.70
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Omega-9 Fatty Acids

Oleic acid (18:1 ω 9)	21.30	16.00	18.74
Gondoic acid (20:1 ω 9)	0.40	0.40	0.21
Nervonic acid (24:1 ω 9)	0.44	0.44	0.38
Total Omega-9	22.14	16.84	19.33

Trans Fatty Acids

Trans palmitoleic acid (16:1 ω 7t)	0.03	0.03	0.13
Trans-elaidic acid (18:1 ω 9t)	0.95	0.35	0.20
Trans linoleic acid (18:2 ω 6tt/tc/ct)	0.75	0.3	0.17
Total trans fatty acids	1.73	0.68	0.50

Saturated Fatty Acids

Myristic acid (14:0)	0.75	0.90	0.72
Palmitic acid (16:0)	19.86	24.86	24.00
Stearic acid (18:0)	12.80	14.80	13.15
Arachic acid (20:0)	0.22	0.22	0.16
Behenic acid (22:0)	0.52	0.52	0.19
Lignoceric acid (24:0)	0.46	0.46	0.37
Total saturated fats	34.61	41.76	38.59

* The reference value is an average value of a defined group with "healthy" fatty acid values. The database is based on 2,000 blood samples. The reference values are intended to help with the analysis and explanation of the individual blood samples. The reference values should not be regarded as objectively correct values.

General Nutritional Recommendations

Challenges in Supplying Marine Omega-3 Fatty Acids

Our **diets** have changed drastically in the last few decades. Fish used to be a “poor man’s food” – it was much more common on our plates. In addition, it was caught in the wild after swimming long distances up rivers from the sea. Thus, high-fat sea fish with a good content of the long-chain marine omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) was also available inland. According to **data from the National Consumption Study** in Germany, **a third of young people no longer eat any fish at all**, and the **consumption quantities on average are far too low**. In addition, the fish we eat increasingly comes from farms. This is to be welcomed from an ecological point of view and in order to preserve fish stocks. However, fish and animal husbandry practices **are increasingly reliant on cheap feeds** such as soy and corn, which contain a high proportion of omega-6 fatty acids but no EPA and DHA. Fish cannot form these fatty acids themselves and, like humans, are dependent on the supply of long-chain omega-3 fatty acids (EPA & DHA). In the wild, fish absorb omega-3s from smaller fish, crustaceans and krill, and from algae. A study of Scottish farmed salmon showed that **omega-3 levels there halved between 2005–2015** (Sprague, 2016). This means we would have to eat twice as much of this farmed fish to supply adequate levels of omega-3s. On top of this, we cannot know the omega-3 content of each fish, making it difficult to estimate how much we are consuming. Therefore, the measurement of fatty acid levels in blood is playing an increasingly important role in checking and ensuring individual reserves of EPA and DHA. To date, no representative study of omega-3 status has been carried out in Germany. However, according to data from the Omegametrix laboratory, it can be assumed that **at least three out of four people in this country** are undersupplied with EPA and DHA. Canada is the first and, so far, only country to measure the Omega-3 Index representatively – with very frightening results: only 1.8 % of the people measured had an omega-3 Index in the recommended target range above 8 % (Demonty, 2021).

Recommendations for increasing Omega-3 Intake

Of the omega-3 fatty acids, alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the most well-known. In the past, it was assumed that **ALA (e.g. from linseed oil, hemp oil, rapeseed oil)** can be converted into EPA and DHA by the body. However, thanks to modern fatty-acid diagnostics, it has become clear that the **body’s capacity for this conversion is only very limited** (ALA to EPA = approx. 5 % and EPA to DHA = 1 %). The body’s conversion capability is therefore not sufficient for an optimal supply, which is why it is now recommended that people regularly consume **EPA and DHA from marine sources such as high-fat sea fish** (e.g. herring, salmon, mackerel) in addition to the classic plant-based ALA sources such as flaxseed or walnuts.

Despite this, recommending people increase their fish consumption in order to increase EPA and DHA has become problematic due to increasing levels of contamination with **environmental pollutants**. In particular, we recommend against eating larger predatory fish such as tuna or swordfish, as they are now highly contaminated (e.g. with heavy metals such as mercury, dioxins, PCBs). Low-fat fish such as cod or pollock contain only very small amounts of EPA and DHA. Small, fatty fish such as sardines, anchovies, herring and mackerel are therefore the most suitable fish sources.

Purified omega-3 products (e.g. NORSAN Omega-3 Oils) offer a **safe alternative**. A triple-phase purification process using molecular distillation offers a modern manufacturing process for the production of high-grade fish oils. The oil is filtered to remove heavy metals, pollutants and PCBs. The aim here is not only to comply with the maximum limits for environmental contaminants, but significantly undercut them. At the same time, processing within a vacuum ensures the quality and freshness of the oil. A fresh oil can be recognized by a pleasant smell and taste. For **vegan oil, microalgae** are cultivated in a controlled environment modeled on seawater and are therefore not contaminated with the heavy metals and pollutants that occur in the sea. High-quality products are regularly **tested by independent laboratories** and manufacturers should offer to provide analysis results.

Advice on EPA & DHA Supplementation

The required dosage of marine omega-3 fatty acids varies from person to person. For the majority, however, an amount of **2,000 mg omega-3 per day is a reasonable amount** for the start of supplementation. In the case of a particularly large deficit (Omega-3 Index < 4 %), **a higher dosage can also be useful initially to compensate for the deficit**. This should be discussed with the attending therapist. An individual’s omega-3 level increases over about three months. It therefore makes sense to control levels at the earliest three months after beginning supplementation **ideally after half a year**, in order to correct the dosage if necessary. Factors such as regular intense exercise, an existing chronic inflammatory disease or being overweight / obese can also lead to a long-term elevated requirement. The European Food Safety Authority states that a daily intake of up to 5,000 mg (EFSA, European Food Safety Authority, 2012).

For fatty acids to be absorbed, it is essential that digestive enzymes and gallbladder secretions are readily available. It is therefore strongly recommended that **Omega-3 oils or capsules are taken with a main meal containing fat**. The liquid oils offer the advantage that they can be stirred into lukewarm and cold dishes, while the capsules are particularly practical for on the go.

Recommendations for Reducing Omega-6 Intake

Of the omega-6 fatty acids, linoleic acid (LA) and arachidonic acid (AA) are the most well-known. **Linoleic acid** is referred to as **vegetable omega-6 fatty acid** and is found primarily in **sunflower seeds and some nuts** (e.g. Brazil nuts, almonds, hazelnuts), as well as in **cereals such as corn and in soy**. **Arachidonic acid**, on the other hand, is referred to as **animal omega-6 fatty acid** because it is found in **meat and animal fats such as lard**, and to a lesser extent in eggs and dairy products.

Since AA in particular acts as an antagonist to the marine omega-3 fatty acids, not only should the intake of EPA and DHA be optimized, but the level of AA should also be considered and reduced if necessary. The main options here are a quantitative **reduction** in the consumption of animal products or switching to lower-fat meat sources (lean meat, not eating the skin). As with fish, the **quality** of the animal products should also be taken into account. Animals that feed on wild grasses and herbs in fields or in the forest (pasture fed cattle, game) also have a more balanced fatty acid profile than animals from conventional factory farming, which are fed on corn- or soy-based feed.

One might assume that a purely plant-based diet is automatically associated with low levels of arachidonic acid. Interestingly, however, **vegans and vegetarians occasionally have elevated AA levels**. The reasons for this have not yet been scientifically explained. However, it is thought that the body can convert arachidonic acid from the shorter-chain linoleic acid. In such cases, a high intake of linoleic acid can also have an indirect negative impact on the AA/EPA ratio and a **reduction in linoleic acid intake should be considered**. In addition to the sources mentioned above, linoleic acid is very often hidden in **industrially manufactured foods** (e.g. crisps, biscuits, convenience foods) and in vegetable spreads and substitute products. **Sunflower oil** is typically used here because it is cheap, relatively tasteless and easy to process. In ingredient lists, it is often just referred to as "vegetable oil". Consumption of large amounts of processed and substitute products, such as spreads based on sunflower oil, should therefore be reduced if possible. At home, it is advisable to avoid sunflower oil and products made from it, such as **margarine**, and to instead use oils low in omega-6, such as olive oil or coconut oil.

Industrial vs. Natural Trans-fatty Acids

Referred to as trans-fatty acids in the industry trans-oleic acid (18:1t) and trans-linoleic acid (18:2 ω 6tt/tc/ct) are mainly produced **when fats are heated to high temperatures**. For example, they can be found in processed foods such as **baked goods and ready meals** that contain hydrogenated or partially hydrogenated fats. **Fried foods** can also be a source, especially if the fat is reused multiple times. A major problem is that the trans-fatty acid content of food does not have to be declared in Germany. Overall, however, only very few people show elevated values. This is probably due to the fact that many manufacturers have already **voluntarily taken measures to reduce trans-fatty acids**.

Trans-palmitoleic acid (C16:1 ω 7t), on the other hand, is referred to as a natural trans-fatty acid. It occurs in the stomachs (rumen) of ruminants. Accordingly, it can be found in **milk, dairy products and beef**. In the case of trans-palmitoleic acid, increased levels are associated with **lower mortality** compared with lower levels, in particular from sudden cardiac death. It is still unclear to what extent an increase in the intake of natural trans-fatty acids reduces mortality. It is therefore not yet possible to define a target value in line with an index for natural trans-fatty acids.

Saturated Fatty Acids

For a long time, saturated fatty acids were disfavored and believed to increase the risk of cardiovascular disease. However, no distinction was made between the different fatty acids. Today, it is known that the **different saturated fatty acids have different effects in the body**. In addition, measurable levels are only marginally related to intake and are in fact rather determined by the body's own **metabolism**. The level of palmitic acid, for example, rises less through increased intake than through the body's own de novo lipogenesis. When an **excess of carbohydrates** is converted by the liver into saturated fat (especially palmitic acid, 18:0) and then stored, this is causing the level to rise. A reduced intake of palmitic acid would, therefore, have relatively little effect on lowering levels.

About the Analysis

Method Omegametrix

The HS-Omega-3 Index is determined using a standardized, strictly quality-assured analytical method that is supported by a large number of scientific publications. The results depend on many sensitive factors, such as the thickness of the test tube in which a reaction takes place. Other methods may not take these factors into account, so target ranges may differ or not be directly comparable. Furthermore, the entire fatty acid spectrum can be determined with this method (26 fatty acids including the HS-Omega-3 Index and HS-Trans Index).

The method results are secured by a validated system that goes beyond the usual quality measures of clinical chemistry. The extensive scientific data and the strict quality controls make the HS-Omega-3 Index and the HS-Trans Index so informative and valuable. The differentiated analysis of the 26 fatty acids not only enables research to move beyond focusing on just a few fatty acids (e.g. omega-3), but also to develop insights into the medical importance of all other fatty acids.

The Omegametrix Laboratory

Omegametrix® is the central European laboratory for fatty acid analysis in Europe. The laboratory's method has been used in 391 publications and more than 50 research projects (as of May 2023). The reliability and accuracy of the method led to collaborations with the most renowned working groups worldwide (e.g. Harvard, Charité Berlin, Framingham and the universities in Munich). Furthermore, the laboratory collaborates with all major doctors, pharmacists, therapists, specialists, and other laboratories working on the subject worldwide.

Report Design & Advice

This findings report was designed according to the specifications of NORSAN GmbH (texts and layout). The analysis and determination of the values were carried out by Omegametrix, the European central laboratory for standardized fatty-acid analysis. We are happy to answer any questions about the fatty-acid analysis. Please contact NORSAN or the Omegametrix laboratory, depending on your request:

Findings, Nutritional Recommendations & Use of Omega-3 Supplements:

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