AvailOm®

Spotlight Bioavailability

AvailOm®

- Combination of free fatty acids and an essential amino acid to form a solid omega-3 lysine complex
- Highly concentrated product with approx. 50 % EPA & DHA in powder
- Highly bioavailable form of omega-3 fatty acids
- Compressible into tablets, or easily miscible with other powdered goods for capsule filling, allowing the formulation of next-generation combination products

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BIOAVAILABILITY DEFINITION

Bioavailability refers to the proportion of a nutrient or supplement that enters the bloodstream and is available for use or storage in the body. In the context of omega-3 fatty acids, bioavailability determines how effectively these essential fats can be absorbed and utilized by the body to support health functions such as reducing inflammation, improving heart health, and supporting brain function.

Bioavailability is typically measured through pharmaco-kinetic studies, which assess the concentration of an ingredient in the blood over time after ingestion. These studies often involve measuring the levels of omega-3 fatty acids in the blood plasma at various intervals to determine how much of the active substance is absorbed and how long it stays in the system. The area under the curve (AUC) of the concentration-time graph is a key indicator of bioavailability.

DIFFERENT PRODUCTS IN THE MARKET

Omega-3 supplements are available from various sources and in various chemical forms, each with unique characteristics:

FISH OIL:
Rich in EPA and DHA, fish oil is the most common form and is available in both liquid and capsule forms.

KRILL OIL:
Contains omega-3s in phospholipid form, which may enhance absorption and provide additional antioxidants.

ALGAE OIL:
Preferred as vegan source of DHA (and EPA). It is typically used in triglyceride form.

ETHYL ESTERS:
A processed form where fatty acids are attached to ethanol, often used in concentrated omega-3 supplements.

TRIGLYCERIDES:
The natural form of omega-3s found in fish, known for better bioavailability compared to ethyl esters.

FREE FATTY ACIDS:
Omega-3s in their free form, which may offer improved absorption rates.

IMPORTANT ASPECTS WHEN STUDIES ARE PERFORMED

To accurately assess the bioavailability of omega-3 supplements, clinical trials must be carefully designed. Key standards include:

RANDOMIZATION:
Participants are randomly assigned to different treatment groups to minimize bias.

CONTROLLED CONDITIONS:
Trials often use a placebo or control group for comparison.

STANDARDIZED DOSING:
Consistent dosing regimens ensure reliable results.

BLINDING:
Double-blind studies, where neither participants nor researchers know who receives the supplement or placebo, help prevent bias.

APPROPRIATE SAMPLE SIZE:
Sufficient participants ensure statistical significance.

These standards help ensure that results are reliable and applicable to diverse populations.

MECHANISM IN THE HUMAN BODY

Omega-3 fatty acids, commonly found in supplements such as fish oil, are absorbed in the human body through a process similar to that of other dietary fats. Here's a general overview of the absorption mechanism for ethyl esters:

- Ingestion and emulsification
- Enzyme secretion is triggered by ingestion of significant amount of fats
- Enzymatic breakdown
- Absorption
- Reassembly and transport

COMPARISON

- Ethyl esters generally have lower bioavailability compared to triglycerides and free fatty acids due to the additional step of enzymatic conversion.
- Triglycerides also need an enzymatic breakdown but are absorbed efficiently and are the natural form found in dietary fats, making them familiar to the body's digestive processes.
- Free fatty acids are absorbed more efficiently because they do not require enzymatic breakdown.

BIOAVAILABILITY STUDY OF AvailOm®

BACKGROUND:

Omega-3 fatty acids, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are polyunsaturated fatty acids (PUFA) with notable health benefits. Due to limited physiological production and insufficient dietary supply, external supplementation is important.

OBJECTIVE:

This study aimed to compare the pharmacokinetics and bioavailability of EPA and DHA in AvailOm® omega-3-lysine salt, providing the omega-3s in free fatty acid (FFA) form, versus standard ethyl ester (EE) and triglyceride (TG) formulations after a single oral dose in healthy subjects.

DESIGN:

A randomized, three-way crossover study was conducted with 21 healthy subjects. Equal amounts of EPA+DHA were ingested with each product form.

RESULTS:

Twenty-one subjects (10 men, 11 women) completed the study. The average age was 41.7 years, and the mean body mass index was 23.0. The Lys-FFA formulation showed significantly higher uptake of omega-3 fatty acids (EPA+DHA combined, and each individually) compared to EE. Specifically, Lys-FFA had a 9.33-fold (0-12h) and 8.09-fold (0-24h) higher bioavailability of EPA+DHA than EE, and a 1.57-fold (0-12h) and 1.44-fold (0-24h) higher bioavailability than TG. ΔCmax and Tmax also favored Lys-FFA over EE.

DISCUSSION:

Under fasting conditions, the absorption of EPA and DHA from EE and TG is limited due to the need for enzymatic cleavage before absorption. This requirement is bypassed with Lys-FFA, which does not need cleavage.

CONCLUSIONS:

The study demonstrates that EPA and DHA lysine salt (Lys-FFA) offers superior bioavailability compared to ethyl ester and triglyceride forms, presenting a more effective supplementation option. It supports the finding from the first study from Manusama et al.

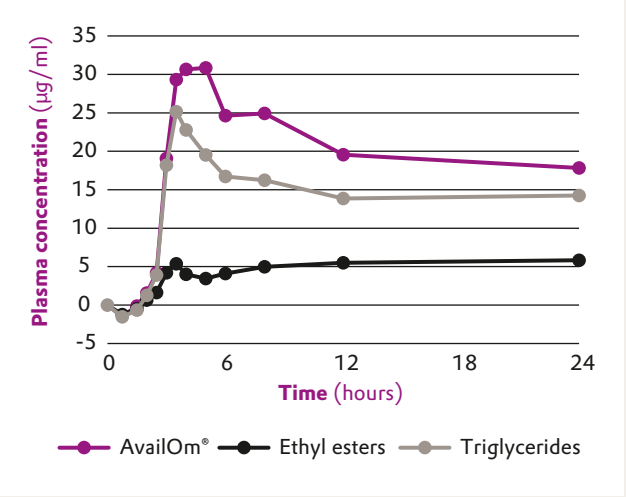

Figure 1: Baseline-adjusted and dose-adjusted EPA+DHA concentration in the plasma obtained after the administration of the single dose of AvailOm® versus Ethyl ester and Triglyceride comparators (n = 21, each). Arithmetic mean versus the 24-hour time axis. (Schön et al.)

AvailOm® BIOAVAILABILITY TAKEAWAYS

- Enhanced bioavailability helps the potency of the ingredient to achieve a better effect in the human body with the same concentration
- Fasting state is a specific use case, but also at non-fasting state superiority is expected, which may be less pronounced when consumed with higher amounts of fat
- Specific benefit for people
  - with low fat diet
  - with an empty stomach
  - who don't combine supplement intake with a fatty meal
  - with reduced bile activity
  - with inflamed gut, which hampers bile salt availability

REFERENCES

- Food & Nutrition Research 2024, 68: 11028
- Manusama et al. PLEFA (Prostaglandins, Leukotrienes and Essential Fatty Acids), 2021 Jan; 164:102232

- More information incl. external references can also be found in our scientific overview: AvailOm® product information from Evonik

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