

Allaire J, Harris WH, Vors C, et al. Supplementation with high-dose docosahexaenoic acid increases the Omega-3 Index more than high-dose eicosapentaenoic acid. Prostaglandin Leukot Essent Fat 2017;120:8-14.

How DHA and EPA Contribute to the Omega-3 Index

This double-blind randomized, controlled clinical trial is the first to demonstrate that, in adults with abdominal obesity and subclinical inflammation, daily supplementation with 2.7 g DHA (docosahexaenoic acid) leads to a greater increase in the Omega-3 Index than does the same dosage of EPA (eicosapentaenoic acid). These researchers also discuss the potential significance of the fact that the Omega-3 Index does not consider the omega-3 fatty acid docosapentaenoic acid (DPA).

The Omega-3 Index is the proportion of combined EPA and DHA in red blood cell (RBC) membrane phospholipids, and it is known to reflect phospholipid composition in the heart and other organs. A higher Omega-3 Index is associated with reduced coronary mortality and disease risk, but the relative contributions of EPA and DHA to this marker of cardiovascular health have not previously been investigated.

This team of researchers present their concern that levels of DPA, a lesser-known omega-3 fat, are not included in calculating the Omega-3 Index. Like DHA, DPA bears a conjugated 22-carbon tail, and DPA levels in RBCs have been linked to lower circulating levels of C-reactive protein (an inflammatory marker) and triglycerides in healthy adults. Conversely, lower tissue, serum, or plasma DPA has been associated with greater overall and cardiovascular mortality as well as higher risk for acute myocardial infarction and fatal coronary heart disease.

For this study, 154 men and women with abdominal obesity (based on waist circumference) and mild-to-moderately elevated C-reactive protein levels were randomized to a crossover series of three daily treatments (2.7 g EPA, 2.7 g DHA, or a corn oil control) for a median of 10 weeks each, in random sequence and separated by a 9-week washout period. Diets were controlled to exclude other dietary omega-3 fats, and study participants were assessed for Omega-3 Index,



RBC levels of DPA, blood lipid profiles, and gene expression related to omega-3 fat metabolism after each treatment period.

According to the authors:

“The increase in O3I [Omega-3 Index] is greater with high dose DHA supplementation than with high dose EPA, which is consistent with the greater potency of DHA to modulate cardiometabolic risk factors.”

Clinical Summary

Major findings from this three-part crossover study in abdominally obese adults included the following:

- Both EPA-only and DHA-only treatment periods led to significant increases in the Omega-3 Index, but in all participants, the increase was significantly greater after DHA supplementation than after EPA.
- While the increase in Omega-3 Index was not statistically different between men and women, men tended to show a more marked increase in Omega-3 Index after DHA supplementation (by 2.6%) than did women (a 2.2% increase). This difference was independent of baseline EPA and DHA levels and baseline Omega-3 Index.
- A novel finding was that docosapentaenoic acid (DPA) levels in participants' RBCs increased after the period of supplementing with 2.7 g EPA daily but decreased after the same dosage with DHA.
- The decrease in RBC DPA level correlated with increased expression of the ELOVL2 gene, which codes for an enzyme that elongates EPA into DPA. The researchers hypothesized that this conversion may partly explain why the Omega-3 Index increased less during EPA supplementation compared to DHA. They point out that if DPA RBC levels were factored into the calculation of the Omega-3 Index, the apparent response to EPA would be greater than that for DHA.
- RBC levels of EPA increased after the DHA supplementation period, which the authors attributed to retro-conversion of DHA into EPA.
- Women showed greater accumulation of EPA in their RBCs after EPA supplementation compared to men, while supplementation showed similar effects on RBC DPA and DHA levels in both men and women.
- Increases in Omega-3 Index correlated with decreases in triglyceride levels after EPA and DHA supplementation periods.



NUTRITION CONCLUSION

Supplementation with omega-3 fats—especially of longer-chain DHA, EPA, and DPA—is an increasingly crucial consideration for individuals with cardiometabolic concerns. The results of this study demonstrate that each of these elongated fatty acids presents different metabolic advantages to men and to women, and reinforces the importance of the Omega-3 Index as a key biomarker for immune balance and inflammatory potential.

This preclinical study shows that Tartary Buckwheat protein contributes greatly to these observed effects, and demonstrates its value for improving dietary influences on healthy lipid metabolism.

