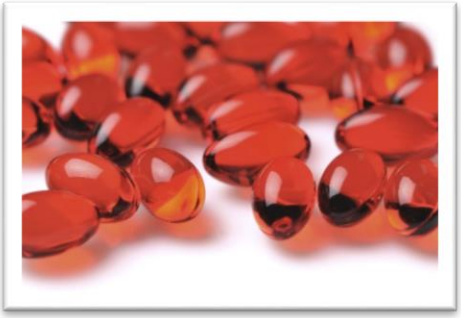
Krill Oil and Blood Lipids



- **Active component[s]:** Eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]
- **Other speculated active components:** Alpha-linolenic acid [ALA], astaxanthin, flavanoids, Vitamin A, vitamin E.
- **Source material:** Body oil from *Euphausia pacifica* [Pacific Krill] and *Euphausia superb* [Antarctic Krill].
- **Dosage route:** Oral.
- **Directions of use:** A clinical literature search did not yield specific results pertaining to directions of use.
- **Duration of use:** 3 months (Bunea et al., 2004).
- **Target Population:** Adults.
- **Risk Information:**
    - Consult your health care practitioner if you are pregnant or breastfeeding.
    - Do not take if you are allergic to shellfish.
    - Avoid if you have a known allergy to shellfish.
    - The following have been reported with krill oil supplementation of 2g/day for 4 weeks: gastrointestinal complaints like flatulence, gas, bloating, and/or diarrhoea (Maki et al., 2009).

HUMAN HEALTH INDICATIONS:

Recommended Use or Purpose	
General	**Adults**
Helps lower total blood cholesterol and low-density lipoprotein [LDL]-cholesterol levels and improve high-density lipoprotein [HDL]-cholesterol levels. Helps lower total blood cholesterol, triglyceride [TG] and LDL-cholesterol levels and improve HDL-cholesterol levels.	1 - 1.5 g/day*§ 2 – 3 g/day*

*Potency specific to a 3 month supplementation period
§With follow up of 500 mg/day krill oil for a subsequent 90 days
(Bunea et al., 2004)

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Krill Oil

Krill is a Norwegian term meaning "young fry of fish" given to small shrimp-like crustaceans belonging to the order Euphausiacea (Tou et al., 2007). The body oils derived from Krill are rich in long-chain omega- 3 [n-3] polyunsaturated [PUFA] fatty acids – namely EPA and DHA – and contain high amounts of phospholipids, flavonoids, vitamin A, vitamin E, and ALA (Bunea et al., 2004; Tou et al., 2007; Ulven et al., 2011; Zhu et al., 2008). As compared to fish oil, krill oil contains high amounts of astaxanthin [a xanthophyll carotenoid pigment found in marine animals] shown to significantly reduce TGs, improve HDL-cholesterol and increase serum adiponectin [anti-obesity hormone] levels in humans (Ulven et al., 2011; Yoshida et al., 2010). In contrast to fatty fish [i.e. salmon, sardines, mackerel etc], krill oil contains greater amounts of EPA and is comprised of n-3 fatty acids in their phospholipid form [a more bioavailable form] rather than the TG form (Tandy et al., 2009). While fish oil is well known to reduce TGs and improve HDL-cholesterol levels, this report will evaluate current scientific evidence pertaining to the effects of krill oil supplementation on the modulation of the blood lipid profile (Balk et al., 2006; Harris, 1997).

Krill oil and Blood Lipids

Although it has been well documented by systematic literature reviews that greater fish oil consumption positively modulates TG and HDL-cholesterol levels (Balk et al., 2006; Harris, 1997) only 2 randomized control trials focus on krill oil consumption and the modulation of the blood lipid profile in humans (Bunea et al., 2004; Ulven et al., 2011).

The first study is a multi-centered, double-blinded, randomized, clinical trial conducted to evaluate the role of krill oil on blood lipids in patients with hyperlipidemia. Only those individuals able to maintain a healthy diet and blood cholesterol levels between 194 and 348 mg/dL were allowed to participate. Patients were randomly assigned to one of four groups for a 3 month period: Group A received krill oil at body mass index [BMI]-dependent doses [i.e. BMI < 30 = 2g/d, BMI > 30 = 3g/d]; in a similar fashion, Group B was given less krill oil than Group A [i.e. BMI < 30 = 1g/d, BMI > 30 = 1.5g/d, with a follow-up dose of 500 mg/d for 90 days]; Group C received fish oil [i.e. 3 g/d containing 180 mg EPA and 120 mg DHA per gram]; and Group D received a placebo. The krill oil doses given to Groups A [2-3 g/day] resulted in the greatest reductions in glucose, total cholesterol, TGs, LDL-cholesterol, and increases in HDL-cholesterol; whereas Group B [1-1.5 g/day] yielded similar results with the exception of a significant effect on TGs. Overall, krill oil supplementation effectively improved the blood lipid profile of hyperlipidemic individuals without mention of serious adverse events (Bunea et al., 2004).

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The second study is an open label, single-centered, randomized parallel study designed to examine the effects of krill oil and fish oil supplementation versus control [no supplementation] on serum lipids and markers of oxidative stress and inflammation. One-hundred and thirteen healthy individuals with normal or slightly elevated blood cholesterol and TG levels completed the study. Participants were divided into three treatment arms; the first arm received 3 grams [EPA + DHA = 543 mg] krill oil per day; the second received 1.8 grams [EPA + DHA = 864mg] fish oil per day and the third did not receive treatment for a total of 7 weeks in duration. In contrast to the positive results mentioned above, changes in serum lipids or makers of oxidative stress and inflammation were not statistically significant between groups. However, the within-group change in the HDL-cholesterol/TG ratio in the krill oil group was statistically significant. Furthermore, krill oil treatment was able to increase EPA and DHA levels comparable to those noted in the fish oil group despite having 62.8% of the total n-3 PUFAs found in the fish oil supplements. Other than minor gastrointestinal symptoms and a rash experienced by one subject in the krill oil group, no other serious adverse events were reported. In all, poor study design such as a lack of blinding, dietary screening, a weak control group and the use of relatively healthy subjects could account for differences seen between this study and the one mentioned above (Ulven et al., 2011).

Two recent animal studies, have also shed light on improvements in the blood lipid profile in rats fed high fat diets. Results indicate improvements in total cholesterol, LDL-cholesterol and TGs (Tandy et al., 2009; Zhu et al., 2008). Despite some positive results in animal and human studies, more human research is recommended in order to justify the use of krill oil in normal and hyperlipidemic individuals.

SAFETY AND TOXICITY:

A randomized, double-blind control trial administering krill oil at 2g/day for 4 weeks to overweight and obese subjects reported 3 cases of hyperglycemia [12% of subjects] and 2 cases of flatulence [8% of subjects] in the krill oil group (Maki et al., 2009). Bunea et al., (2004) administered up to 3 grams of krill oil per day for 3 months and did not report any adverse events. In further support of safety, the Natural Health Product Directorate [NHPD] of Canada outlines an upper limit for krill oil of 4.1 g/day (AbLS, 2009); however, there are currently no known toxicity levels for krill oil (Anonymous, 2010).

It is also advisable that patients consult their healthcare practitioner prior to use if pregnant, breastfeeding (AbLS, 2009) or if taking antihypertensive, antiplatelet, and/or anticoagulant medications or natural health products (Prisco, 1998; Toft, 1995; Sacks, 1994; Vandongen, 1993; van den Berg, 1999; Terano, 1983).

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Cautions, Warnings, Contraindications and Interactions

Consult a health care practitioner prior to use if you have a pre-existing medical condition, are taking prescription medications, or are pregnant or breastfeeding.

For additional information from the clinical literature regarding interactions, please refer to the following tables:

Drug	Interaction with Krill Oil
Anticoagulant/antiplatelet drugs	Drugs with anticoagulant/antiplatelet potential [i.e. Coumadin/Warafin, Aspirin, etc.] in combination with krill oil could increase the risk of bleeding (Terano, 1983).
Antihypertensive drugs	Drugs with antihypertensive potential in combination with krill oil could lower blood pressure via a synergistic reaction (Prisco, 1998; Toft, 1995; Sacks, 1994; Vandongen, 1993).

Natural Health Products [NHP] Substances	Interaction with Krill Oil
Carotenoids	Carotenoids [i.e. beta-carotene, lutein, canthaxanthin, lycopene, etc.] in combination with krill oil could decrease the absorption of astaxanthin by competing for absorption in the gastrointestinal tract (van den Berg, 1999).
Anticoagulant or Antiplatelet Substances	Natural Health Products with anticoagulant/antiplatelet potential [i.e. angelica, clove, danshen, garlic, ginger, ginkgo, *Panax ginseng*, red clover, turmeric, etc.] in combination with krill oil could increase the risk of bleeding in certain individuals (Terano, 1983).

Food	Interaction with Krill Oil
Food	A clinical literature search did not yield any results with regards to krill oil and interactions with food ingredients.

You might also be interested in our reports on:

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- ✓ Plant Sterols and Cholesterol Levels
- ✓ Royal Jelly and Blood Lipids
- ✓ Whey Protein Isolate and Blood Lipids

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