

# The effects of krill oil administration on Inflammatory Bowel Diseases (IBDs): a promising new therapy

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**Summary.** Recent research carried out in Norway on rats affected by experimental colitis have proved that the supplementation of high doses of krill oil in diet determined a significant improvement in some indices of inflammation. Existing few and partial similar investigation on humans triggered this trial conducted on 32 patients, who were administered high doses of krill (krill oil, no. 3 capsules of 500 mg a day for 90 days). The measurement of the trend of intestinal inflammation in each patient was checked every 30 days for 90 days through faecal immunochromatography of calprotectin, which at present, as it is well known, is the gold faecal biomarker of the evolution of intestinal inflammation. The results obtained show that 25 patients out of 32 experienced a clinical reduction of the symptoms and normalization of the values of faecal calprotectin. These results justify the use krill oil in IBD.

**Key words:** krill oil, astaxanthin, faecal calprotectin

## Introduction

Recent research projects carried out on humans, experiencing inflammatory events of osteoarticular system (1) and digestive tract (2), showed good clinical results when patients were administered dietary supplements of krill oil, a well-known antidyslipidemic dietary supplement. More recent studies in Norway, inducing experimental colitis on rats with dextran sodium sulphate (DSS), showed that administration of high doses of Krill oil as a dietary supplement determine a significant improvement in certain inflammatory indices (3). These data provide the basis for future studies on humans and surely open up new perspectives for the use of krill oil in inflammatory digestive diseases. However, as interesting as the results may be, the number of trials is still limited to have statistical significance. These considerations led us to administer, more extensively and for longer periods, krill oil to patients suffering from IBDs.

## Nutritional facts

Krill are tiny crustaceans (65 mm long) of the order Euphausia Superba, living in swarms in the salt icy

waters of the Antarctic Ocean, where they are food for largest fish, such as penguins, sharks and whales (krill = whales' food).

Krill oil is obtained through sophisticated extraction procedures carried out in 11 sequential steps (SUPERBA), whose accurate execution preserves the original quality of the product. Oil obtained through the procedure consists mainly of Omega 3 and Omega 6 essential polyunsaturated fats (EPA, DHA), whose titration is higher than the one of algal oil and other fish oils (cod, herring, sardine, tuna, anchovy, mackerel, and salmon oil). It is well known that Omega 3 and 6 have antioxidant and anti-inflammatory functions.

Chemical characterization of krill oil is actually different, in some ways, from that of other fish oils - where Omega 3 are attached to triglycerides - as in krill oil Omega 3 are bound to phospholipids. Besides, the proportional relationship between Omega 3 and 6 is more favourable than in other fish oils. Krill oil also contains vitamin A and vitamin E, whose antioxidant properties are well known. Finally, krill oil contains, unlike other oils, a carotenoid: Astaxanthin which responsible, among other things, for the pink colour of some aquatic animals, like salmon. It has a significant



Figure 1. II Krill (N, Gray, 2011)



Figure 2.

anti-inflammatory action and the best antioxidant properties in the world: 550 times more than vitamin C and 47 times more than vitamin E. Its production is solely due to a microalga (*Haematococcus pluvialis*), which is food for molluscs and crustaceans like krill, if present.

It should be noted that natural Astaxanthin is different from synthetic Astaxanthin, obtained in labs and used to give fish the pinkish colour that makes it look fresh. The latter is to be avoided as it is considered an oil derivative.

Due to the above-mentioned chemical features, krill oil is by far better than other fish oils.

## Experimental protocol

For this study, 32 patients aged between 20 and 70 were selected. They suffered from various forms of IBD (diverticulitis, infectious enterocolitis, ulcerative colitis, Crohn's disease, "indeterminate colitis") and tested positive with a non-invasive immunochromatographic test.

More specifically, for diagnosis purposes, we excluded invasive diagnostic methods, having uncomfortable psychophysical impact on patients, such as colonoscopy and histological biopsies, and resorted instead to a non-invasive high sensitivity and specificity test using faecal calprotectin immunochromatographic test strips. It is considered today the gold standard among faecal biomarkers for inflammatory bowel diseases (4-6). It's a cytosolic protein contained in cytoplasmic granules of polymorphonuclear neutrophil leukocytes, which is released when there is a specific inflammatory activation, of which it therefore becomes a direct and true marker.

It is able to differentiate inflammatory bowel diseases (IBDs), from functional diseases, like irritable bowel syndrome (IBSs), being faecal concentration much higher in the first case than in the second (7-11). Qualitative assessment is carried out by detecting its particular colour on the immunochromatographic test strip, whereas quantitative assessment is carried out by visualizing on a specific reading tool and on the computer the numerical values corresponding to calprotectin concentration expressed in  $\mu\text{g/g}$  of faeces. Values below  $50 \mu\text{g/g}$  of faeces are considered to be negative, as they are deemed not significant. It has also been proved that, for the diagnosis of IBDs, the higher the intensity of the intestinal inflammatory process, and the greater the amount of calprotectin in faeces.

Therefore, the test can be used not only for the diagnosis of IBDs, but also to follow-up over time both the inflammatory affection and the treatment, which enables to check if the IBD that is being treated healed, had a remission or relapsed (8).

Next to calprotectin, for each patient clinical typical parameters of IBDs - such as abdominal pain, bowel evacuations and hematochezia, if present - were also assessed.

Each patient suspended traditional therapy hitherto followed, and was allowed the intake of krill oil only (500 mg Colecril capsules, Erbozeta, San Marino), one capsule 3 times a day on an empty stomach for 90 days.

The chromatographic control of faecal calprotectin was performed starting from the twentieth day of treatment and repeated in 30-day intervals, until the ninetieth day of treatment. The strip test determined if treatment had to be continued or suspended.

## Findings and final considerations

Initially, krill oil became very popular for its Omega 3 content and special structure, whose effectiveness is proven to treat dyslipidaemia (disruption of triglycerides and cholesterol). The presence of Astaxanthin, having an extremely powerful anti-oxidant action, and a significant anti-inflammatory one, led, as mentioned, to use krill oil in new therapeutic fields (arthropathy and metabolic syndrome) (1, 12-14). More recently,

finally, interest sparked again for this food supplement, when it was used, with successful results – however partial – to treat inflammatory bowel diseases (IBDs) (2,3), a therapeutic field of application of krill oil so far largely unexplored.

The results of our current research studies suggest, first of all, that they are statistically reliable. Out of 32 patients treated, 25 showed gradual easing of symptoms, after only 20 days of treatment, followed by complete remission of clinical symptoms (abdominal pain, hematochezia, mucorrea, diarrhoea); besides, calprotectin reduced progressively reaching normal values. While the majority of patients obtained positive results (76%), 7 cases, although clinically significantly improved, showed persistence of positivity, albeit in low titre, of calprotectin values, after 60 days of treatment. For such patients traditional therapy was reintroduced as a support to the one with Colecril. Two other patients interrupted therapy upon their own initiative a month after having started the treatment. Globally, results obtained support the conclusion that administration of krill oil for at least 60 days has strong beneficial effects on inflammatory bowel diseases (IBDs), with remarkable results already after 30 days. It justifies the use of the product both as exclusive therapy, and as a support to traditional anti-inflammatory therapies (mesalazine and budesonide) or to more recent ones (with anti-TNF drugs), after having carefully evaluated the specific case from a clinical and laboratory point of view.

### Aknoledgements

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