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Krill oil extract inhibits proliferation of human colorectal cancer cells through mitochondrial pathway

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Colorectal cancer (CRC) is one of the major causes of cancer death worldwide. The currently available chemotherapy is associated with numerous side-effects. Therefore, the effective nutraceutical agents with low or no side-effects are desirable. Krill oil (KO) is a rich source of long-chain omega-3 polyunsaturated fatty acids, mainly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Our preliminary data showed that the free fatty acid extract (FFAE) from the KO suppresses cell growth and induces apoptosis of human CRC cells. The aim of this study was to investigate the effect of FFAE from KO and potential mechanism underlying its anti-cancer effect on human CRC cells. DLD-1, HT-29 and LIM-2405 cell lines were treated with EPA (50-200 μM), DHA (50-300 μM) and FFAE of krill oil (0.03-0.24 μL/100 μL) for 24 h and 48 h to evaluate their effect on cell proliferation using a water-soluble tetrazolium-1 (WST-1) assay kit. The effect of FFAE from KO (0.12 μL/100 μL), EPA (200 μM) and DHA (250 μM) on mitochondrial membrane potential was determined using a JC10 mitochondrial assay kit and the effect on reactive oxygen species (ROS) was determined using a MitoSOX™ Red M36008 kit. The FFAE of KO (0.06-0.24 μL), EPA (200 μM) and DHA (200-300 μM) significantly inhibited the cell proliferation in all three CRC cell lines. Moreover, they have reduced the formation of ROS. Treatment with the FFAE of KO also resulted in a significant increase in the mitochondrial membrane potential. However, no such change was observed after EPA and DHA treatments. These results suggest that the anti-proliferative effect of FFAE from KO may be associated with the intrinsic (mitochondrial) pathway although other active components are yet to be determined. The supplementation with krill oil may provide a novel and safe therapy for CRC treatment.

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