Investigation of oxidative degradation and non-enzymatic browning reactions in krill and fish oils

The aim of this research was to investigate the oxidation progress and pathways of krill and fish oil during 21 days of incubation at 40°C. The oxidative stability of the oils was investigated through: (i) classical methods such as peroxide value (PV), anisidine value (AV), thiobarbituric reactive substance (TBARS), conjugated dienes and trienes, and antioxidant content, and (ii) advanced methods such as determination of volatiles content by dynamic headspace (DHS)-GC/MS, lipid classes, and pyrrole content. In addition, the oxidative stability of the oils was evaluated under accelerated oxidation conditions using the Oxipres™ at 90°C. The results from analysis of PV, AV, TBARS, conjugated dienes and trienes, and the antioxidant content suggested that krill oil was more oxidatively stable than fish oil. However, the color or other constituents of the krill oil might affect the result of these classical methods. Nevertheless, the conclusion was supported by the results of the Oxipres™ measurements, which showed that the oxygen consumption was higher for fish oil. Furthermore, the level of most volatile lipid oxidation products was higher for fish oil. The development of Strecker degradation products and pyrroles formed as a result of non-enzymatic browning reactions could only be observed in krill oil. The presence of pyrroles might have contributed to the higher oxidative stability of krill oil. Krill oil also contained a higher level of tocopherol, astaxanthin and phospholipids than fish oil, which could have resulted in better protection against oxidation. The results demonstrated that the classical methods for measuring oxidative deterioration of lipids were not useful for krill oil.