



جامعة الفيوم
كلية الزراعة
قسم علوم وتكنولوجيا الأغذية



رقم البحث: الثالث

Synthesis of encapsulated fish oil using whey protein isolate to prevent the oxidative damage and cytotoxicity of titanium dioxide nanoparticles in rats

عنوان البحث باللغة الإنجليزية:

الباحثون المشاركون:

Mosaad A. Abdel-Wahhab ^{a,*}, Aziza A. El-Nekeety ^a, Hagar E. Mohammed ^b, Tamer M. El-Messery ^c, Mohamed H. Roby ^d, Sekena ^H. Abdel-Aziem ^e, Nabila S. Hassan ^f

a Food Toxicology & Contaminants Department, National Research Centre, Dokki, Cairo, Egypt

b Zoology Department, Faculty of Science, Al-Arish University, Al-Arish, Egypt

c Dairy Science Department, National Research Centre, Dokki, Cairo, Egypt

d Food Science and Technology Department, Faculty of Agriculture, Fayoum University, Fayoum, Egypt

e Cell Biology Department, National Research Centre, Dokki, Cairo, Egypt

f Pathology Department, National Research Centre, Dokki, Cairo, Egypt

ملخص البحث باللغة الانجليزية:

Fish oil exhibited several beneficial effects on human health; however, its applications face several challenges such as its effects on the organoleptic properties of food and its susceptibility to oxidation. Titanium dioxide NPs (TiO₂-NPs) are utilized widely in pharmaceutical and food applications although there are some reports about their oxidative damage to living organisms. The current work was undertaken to identify fatty acids content in mullet fish oil, encapsulation, and characterization of the oil, and to assess the protective efficiency of the encapsulated mullet fish oil (EMFO) against the oxidative damage and genotoxicity of TiO₂-NPs in rats. Sixty female Sprague-Dawley rats were distributed to 6 groups and treated for 21 days included the control group; TiO₂-NPs-treated group (50 mg/kg b.w); the groups treated with EMFO (50 or 100 mg/kg b.w) and the groups received TiO₂-NPs plus EMFO at the low or high dose. Samples of blood, liver, and kidney were taken for different assays and histological studies. The GC-FID analysis showed that a total of 14 different fatty acids were found in Mullet fish oil included 41.4% polyunsaturated fatty acids (PUFAs), 31.1% monounsaturated fatty acids (MUFAs), and 25.1% saturated fatty acids (SFAs). The structure of EMFO was spherical with an average diameter of 234.5 nm and a zeta potential of -6.24 mV and was stable up to 10 days at 25 °C with EE of 81.08%. The PV of EMFO was decreased at 5 days then increased at 15 days; however, TBARS was increased throughout the storage time over 15 days. The biological evaluation showed that TiO₂-NPs disturb the hepato-nephro functions, lipid profile, inflammatory cytokines, oxidative stress markers, antioxidant enzymes activity, and their corresponding gene expression along with severe pathological alterations in both hepatic and renal tissue. Co-administration of EMFO induced a strong antioxidant role, and the high level could normalize the majority of the parameters tested and the histological picture of the hepatic and renal tissues. These results pointed out that the encapsulation technology enhances the protective role of EMFO against oxidative stress and genotoxicity of TiO₂-NPs through the prevention of ω -3 PUFAs oxidation and controlling their release.