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The use of egg and soy phosphatidylcholines with attached caffeic acid enhances oxidative stability of high fat emulsion

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This study was carried out to investigate the effects of combined use of sodium caseinate (CAS), commercial phosphatidylcholine (PC) and modified PCs on physical and oxidative stability of 70% fish oil-in-water emulsions. Caffeic acid was covalently attached to both modified PCs (egg PC and soy PC; PCs originated from eggs and soy, respectively) in order to increase the antioxidant activity of PCs and investigate the advantage of bringing the antioxidant activity to the close proximity of oil-water interface. Results showed that the oxidative stability was improved when part of the PC was substituted with modified egg PC or soy PC. Emulsions containing a low concentration of modified PCs (10% wt of total PC) resulted in a prooxidative effect on the formation of hydroperoxides (peroxide value) compared to emulsions with free caffeic acid added. On the other hand, a decrease in the formation of volatile oxidation products was observed for emulsions containing higher levels of modified PCs (10% wt of total PC) compared to the emulsions with free caffeic acid added at its equivalent concentration. Increased concentration of modified PCs provided higher oxidative stability in high fat emulsions independently of the type of the modified PCs. Moreover, it was shown that the oxidation did not propagate from one droplet to another droplet by the use of microscopy. In this case, oxidation was initiated by singlet oxygen produced in a single droplet using a focused laser. Oxidation propagation was followed using the fluorescence of unoxidized and oxidized C11-BODIPY.