Lipid Oxidation in Milk Products. Early Events and Shelf-life Predictions

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The oxidative stability of dairy products depends on (i) the fatty acid profile as influenced by the feeding regime of the dairy cows, (ii) the presence of hydrophilic and hydrophobic antioxidants, (iii) the processing of the milk, and (iv) the packaging and storage condition of the products. Oxidative changes in dairy products go through four phases: starting with generation of radicals, followed by hydroperoxide formation, cleavage to secondary lipid oxidation products, and protein damage. The sensory quality of milk following storage seems to be predictable by the tendency of radical formation in the fresh milk, which may be determined by Electron Spin Resonance spectroscopy opening up for new analytical strategies. Initiations of lipid oxidation in milk seem to be initiated in the serum phase, stressing the importance of hydrophilic antioxidants. As for the processing of milk, heat treatment seems more important for the level of radicals produced by oxidoreductases naturally present in milk than mechanical treatment such as homogenization. Further processing like drying gives dairy products like milk powder, which are very sensitive to heat and moisture and for which physical processes such as lactose crystallization are critical for increase in water activity, radical formation, lipid oxidation, and non-enzymatic browning. Light exposure of dairy products activates riboflavin, and the triplet state has a high reactivity towards peptides and proteins making initial protein degradation important under such conditions. Plant phenols and urate, however, may quench triplet riboflavin, and new protection strategies become possible.


