PROTEIN OXIDATION IN FOODS

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Protein oxidation is one of the key causes of food deterioration. The mechanisms of protein oxidation include amino-acid side chain modification, protein cross-linking, and protein fragmentation (1). We have investigated the oxidative stability of both dairy and meat proteins as well as oxidative reactions of proteins isolated from various plant sources such as oats, fababeans, quinoa, and amaranth. In these studies, versatile tools including both conventional spectrometric and fluorometric tools as well as newly developed LC-MS methods have been applied. It is well understood that protein oxidation pathways are complex and cannot be explained by any universal method of monitoring a single type of oxidation product, such as protein carbonyls. Lipid oxidation products such as hydroperoxides and carbonyls are known to interact with amino acids, peptides and proteins. Recently, it was shown by using LC-MS tools that malondialdehyde does form protein-lipid adducts with peptides isolated from whey protein, lactalbumin (2). However, oxidation of food proteins is not only catalyzed by lipid oxidation products, but also proteins in fat-free food products or in foods with reduced fat content undergo oxidative changes. Depending on the amino acid composition, tryptic isolates of whey proteins produce methionine sulfoxide and sulfone, formylkynurenine, and dityrosine when oxidized in a metal catalyzed reaction in a non-lipid environment (3, 4). Lysine oxidation in for example meat products may be monitored by following semialdehyde formation using LC-MS (1). Oxidation of essential amino acids such as methionine, lysine, tyrosine and tryptophan may be of concern due to processing and storage. In addition to decrease in nutritional v alue, protein oxidation products may be of health concern such as formylkynurenine resulting from oxidation of tryptophan. Food proteins also have many functional properties including stabilizing of emulsions, gels and foams, and water binding properties. In our recent studies, the impact of plant derived proteins on the oxidative stability food emulsions has been investigated (5).

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