Migration of Epoxidized Soybean Oil (ESBO) and Phthalates From Twist Closures into Food and Enforcement of the Overall Migration Limit

Nineteen samples of food in glass jars with twist closures were collected by the national food inspectors at Danish food producers and a few importers, focusing on fatty food, such as vegetables in oil, herring in dressing or pickle, soft spreadable cheese, cream, dressings, peanut butter, sauces and infant food. The composition of the plasticizers in the gaskets was analysed by gas chromatography with flame ionization detection (GC-FID) and gas chromatography-mass spectrometry (GC-MS). Epoxidized soybean oil (ESBO) and phthalates were determined in the homogenized food samples. ESBO was the principal plasticizer in five of the gaskets; in 14 it was phthalates. ESBO was found in seven of the food samples at concentrations from 6 to 100 mg kg$^{-1}$. The highest levels (91-100 mg kg$^{-1}$) were in oily foods such as garlic, chilli or olives in oil. Phthalates, i.e. di-iso-decylphthalate (DIDP) and di-iso-nonylphthalates (DINP), were found in seven samples at 6-173 mg kg$^{-1}$. The highest concentrations (99-173 mg kg$^{-1}$) were in products of garlic and tomatoes in oil and in fatty food products such as sauce bamaise and peanut butter. For five of the samples the overall migration from unused lids to the official fatty food simulant olive oil was determined and compared with the legal limit of 60 mg kg$^{-1}$. The results ranged from 76 to 519 mg kg$^{-1}$ and as a consequence the products were withdrawn from the market.