

Nonylphenol in food contact plastics and migration into foods

Area of research interest: [Chemical hazards in food and feed](#)

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Conducted by: The Food and Environment Research Agency (FERA). Sub-contractors: Smithers Rapra Technology and Pira International Ltd

Background

Nonylphenol (NP) is a generic term used to describe a complex commercial mixture of mainly nonyl-substituted phenol. The presence of NP in certain food contact materials has been reported. Although NP itself is not authorised for use in food contact plastics it may be present as an impurity or a breakdown product of alkylphenol ethoxylates or tris(nonylphenyl)phosphite. Alkylphenol ethoxylates are used as dispersing or stabilising agents in some food packaging polymers (plastics and rubber) and papers. Tris(nonylphenyl)phosphite is an antioxidant used to stabilise some food contact plastics. To confirm the presence of NP in food contact materials we commissioned a previous project (A03047) to develop a method of analysis for NP in different types of food packaging and the subsequent analysis of a range of material types. NP was detected at parts per million levels in examples of polystyrene (PS) and polyvinyl chloride (PVC), but also in ethylene vinyl acetate, polycarbonate and rubber at much lower levels. This new project aimed to provide between laboratory validation data for the method of analysis developed in our earlier FSA funded work and to derive information on the source of NP in foods, i.e. migration from food contact materials or from environmental contamination.

Research Approach

A standard operating procedure and method validation report for the determination of NP in food contact materials was prepared. The methodology was provided to two additional laboratories to derive between laboratory validation data. The analysis of foodstuffs packaged in NP containing food contact materials and migrating from cling film into foods was performed. Evaluation of the food concentration data derived was used to determine the relative contribution of migration compared to NP occurrence from other sources.

Results

The between laboratory validation studies highlighted a number of critical steps in the method that must be controlled to ensure satisfactory performance. The standard operating procedure (SOP) was revised accordingly although performance of the method in the other laboratories was still not satisfactory. It was concluded that the SOP for packaging analysis is suitable as a general screening method giving semi-quantitative results, but that fully quantitative analysis remains the preserve of laboratories experienced in NP analysis, evidenced for example by accreditation for this or similar contaminants.

Two NP containing PVC films were tested for migration in contact with cheese and cake for 4 days at 20°C. For the conventional packaging ratio of 1 kg food in contact with 6 dm² the results obtained correspond to a NP migration of about 0.2 to 0.8 mg/kg into cheese and 0.3 to 0.6 mg/kg into cake. The foods packaged in three NP containing HIPS samples were tested. The surface layer of the solid foods was tested, since this could be expected to be where any migration would be located and concentrated. However, any migration was below the detection limit which was estimated to be about 0.2 mg/kg. These experimental findings were supported by migration modelling results which indicated a low migration potential, given the concentrations of NP determined in the HIPS itself and the fact that HIPS is a low diffusivity plastic.

Since it is an impurity or a degradation product and not an authorised substance, no EU specific migration limit has been assigned to NP. A Tolerable Daily Intake (TDI) of 5 µg/kg body weight has been proposed by the Danish Institute of Safety and Toxicology. Migration from PVC cling film has the potential to result in exposures approaching or exceeding this proposed TDI.

Additional Info

[Method development for the analysis of nonylphenol in different types of packaging \(A03047\)](#)

Research report

England, Northern Ireland and Wales

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