

Time to find solutions to mineral oil contamination

Food packed in recycled paperboard has got a bad press over the risk of mineral oil contamination. **Nick Kernoghan**, UK director of Pira International, examines the facts behind the headlines and warns the industry to take the time to find the right solutions.

On 8 March 2011, BBC Radio and the *Daily Telegraph* in the UK ran stories about mineral oil contamination of food packed in recycled paperboard packaging, followed on 9 March by the *Daily Mail*. By the morning of 10 March a Google search on mineral oil in recycled paper and board brought up 4,430 citations. News travels fast in the modern world.

However, news does travel somewhat slower from the scientific community to the wider world. The evidence cited in the media coverage came from two studies undertaken by the Official Food Control Authority of the Canton of Zurich, both published in the journal *European Food Research and Technology*.

The first study was published in February 2010 and identified the inclusion of newsprint in recycled paper and board as the main source of the mineral oil and highlighted quite high levels of migration, as well as the conflict between meeting European recycling targets and controlling migration.

The second study was published in October 2010 and analysed 119 samples of dry food packed in paperboard boxes for migration of mineral oil. Once again mineral hydrocarbons were found in all the foods packed either without an inner plastic bag or with a polyethylene bag, with saturated hydrocarbons at concentrations of 4-28 mg/kg and aromatic hydrocarbons at concentrations from 0.7-6.1 mg/kg depending on the food type and time in contact.

Nick Kernoghan

Nick Kernoghan is UK director of Pira International. He manages Pira's chemical and physical testing laboratories which help clients comply with food contact legislation, notify regulators regarding new food contact substances and prove the efficiency of recycling processes.



How safe are these levels?

Different hydrocarbons have different toxicological properties as illustrated by the list below:

- Microcrystalline wax is the direct food additive E905.
- Highly refined mineral oils may be used as plastic additives and do not have a specific migration limit in either directive 2002/72/EC or Regulation (EC) No 10/2011 which will soon replace it. However, there is a strict specification for them stating that:
 - they must be white mineral oils, paraffinic, derived from petroleum-based hydrocarbon feedstocks
 - they must have an average molecular weight not less than 480Da
 - they must have a viscosity at 100°C not less than 8.5cSt
 - the content of mineral hydrocarbons with carbon number less than 25 must not be more than 5% w/w.
- An unofficial specific migration limit can be calculated for white mineral oils that meet the requirements of the specification outlined above based on an acceptable daily intake derived by the joint FAO/WHO Expert Committee on Food Additives in 2002. This unofficial specific migration limit is 0.6mg/kg and has been used for risk assessment purposes by both the Official Food Control Authority of the

Canton of Zurich and the German BfR. However, it should be noted that this unofficial specific migration limit has not been adopted by the European Commission in the legislation for plastics.

- Technical grades of mineral oils which are mixtures of paraffinic and aromatic hydrocarbons. The latter class of hydrocarbons merit an unofficial specific migration limit of not detected at 0.01 mg/kg unless there is toxicological evidence to support a higher limit.

It appears that it is mainly the technical grades of mineral oils that are used in newsprint and these are the main source of both the paraffinic and the aromatic hydrocarbons being found in foods packed in recycled paperboard. Other sources of mineral oils include:

- The printing inks used on the packaging; the Official Food Control Authority of the Canton of Zurich estimated that this source accounted for about a quarter of the mineral oil contamination.
- Recycled paperboard used as secondary or tertiary packaging, probably a minor source given relatively short contact times
- Contamination during bulk shipment and processing of foods. >>

Toxicological information on mineral oils indicates that they bio-accumulate in the liver, heart valves and lymph nodes and cause inflammation of these organs. Additionally, there are additional concerns of potential carcinogenicity caused by the aromatic fraction.

However, these are all long-term chronic effects and people eating a balanced diet should not suffer any adverse health consequences in the short or medium term, and maybe not in the longer term unless their exposure is particularly high. Therefore there is time to develop solutions to this problem and the industry can afford to avoid knee-jerk decisions such as switching packaging to all virgin fibre.

What do the regulators say?

The German BfR carried out a risk assessment of mineral oil exposure in 2009. They concluded that there is an urgent need to reduce the exposure from recycled paperboard, but did not introduce any specific legislation. The Swiss authorities have concluded that consumers who eat a balanced and varied diet are safe.

“ There is time to develop solutions to this problem and the industry can afford to avoid knee-jerk decisions such as switching packaging to all virgin fibre. ”

In the UK the Food Standards Agency (FSA) has stated that it does not believe that the current data shows there to be a health risk to consumers who eat a balanced and varied diet, but the organisation is keeping the situation under review and carrying out research of its own. Once again these opinions point to a conclusion that there is time to develop solutions to this problem.

Finding solutions

There probably will not be a universal solution that fits all cases. It will vary for different combinations of pack, food and shelf life. However, possible solutions, in no particular order, include those listed here:

- Use an inner bag that is a barrier to mineral oil migration. This has cost implications and needs some research to determine suitable barriers to either prevent or sufficiently reduce the migration.
- Incorporate more virgin fibre in paperboard food packaging. This does not eliminate the problem unless 100% virgin fibre is used. There are cost and environmental

implications and it is potentially tremendously disruptive to the packaging supply chain if universally adopted in the short-term.

- Improve the sourcing of recycled fibre so that newspapers do not find their way into food packaging. This would vastly reduce exposure to mineral oil, but not completely eliminate it because some cardboard is printed with mineral oil containing inks. Also there are there are practical issues in collection and sorting.

There are undoubtedly others, but the important thing is that industry is allowed the time to develop solutions. ■

David Workman

David Workman, director general of the Confederation of Paper Industries, responds to recent news about packaging ink migration and the use of recycled fibre in cartons, which has led some breakfast cereal brands to seek a remedy.



The recent study to emerge from continental Europe on mineral oils found in paper-based packaging is one which the industry cannot ignore and the paper industry will be working with competent authorities throughout the summer in order to establish the extent of the problem – indeed if that is what it turns out to be.

It needs to be understood that mineral oils come in many forms and are commonly present in food, anyway. The issue here is whether additional traces are entering food as a result of migration from the inks present both on the printed surface of the packaging and in recycled fibre, principally newspapers, used in the production of packaging.

There have never been any toxicological studies on the effects of human exposure to traces of mineral oils, and so there is an absence of clear evidence upon which to base any regulatory guidance. Indeed, what is interesting is that none of the Food Standards Agencies in any European country have either called for the practice of recycling fibres to be curtailed or for recycled fibres to be excluded from the manufacture of packaging.

Dr Koni Grob undertook his research at a government-run food safety laboratory in Zurich. His report is but one piece of research, which took samples from one supermarket chain in one European country (Germany), so there is a need for wider investigation. A report from the European Food Safety Authority is expected in September 2011.

The paper industry, however, is not and never has been complacent about such issues. It has been a pioneer in developing and setting standards for food contact paper-based packaging and regularly issues guidance, most recently in 2010.

The industry is now actively seeking ways of reducing or eliminating mineral oils from inks. Indeed, many of the world's leading packaging companies already use alternative water based inks when printing onto packaging products. It is also worth pointing out that barrier materials are used so that food very rarely, if ever, comes into direct contact with paper containing recycled fibres.

The recycling of paper, board and corrugated products has been a huge success story for our industry. In Europe, the average recycling rate is 72%, making paper one of the most recycled of all materials. The environmental benefits are huge, reducing energy consumption and carbon emissions in production and allowing for the responsible management of forest plantations.

The paper industry treats consumer protection as its highest priority and is committed to pursuing its objective of providing safe food packaging, while at the same time playing a major role in ensuring environmental sustainability through managed forestry and optimising recycling levels.