Foreign bodies cause most recalls

Ray Gibson

The author
Ray Gibson is Business Development Director, Reading Scientific Services Ltd, UK.

Keywords
Product recalls, Contamination, Food

Abstract
Foreign body contamination of food and drink products is the single biggest cause of product recalls in the UK. However, not every foreign body incident need result in a recall, and immediate scientific investigation of the nature and cause of the foreign body can help manufacturers determine the best approach to dealing with a specific incident and in preventing its recurrence.

Electronic access
The current issue and full text archive of this journal is available at http://www.emerald-library.com

It is now relatively common to see an advertisement from one of the major retailers or manufacturers in the national press announcing a product recall. On average, one such notice appears every week, not only for food and drink products, but also for electrical goods, household and health-care products, etc. However, food and drink products are frequently the subject of recall notices reflecting the genuine concern from manufacturers to protect consumers and their brands when a problem occurs.

Reading Scientific Services Ltd (RSSL) has recently carried out a study of all the product recalls advertised in the UK press since January 1994. This analysis of over 200 recalls revealed that over 60 per cent of those involving food and drink products were initiated due to the presence of foreign bodies. The remaining 40 per cent comprised a wide variety of problems, from ambiguous “quality faults” to more specific fears of microbial spoilage, heavy metal contamination, etc. The most commonly cited foreign bodies in the recall notices were fragments of glass, metal or plastic. Other cases involved nuts, insect parts, and in one case mice droppings.

This finding corresponds well with RSSL’s own experience of investigating foreign body incidents on behalf of food and drink manufacturers and retailers. Since 1987, RSSL has worked on over 2,500 product emergencies, not just foreign body incidents but also taints, microbial spoilage, extortion, etc. Nonetheless, a great many of these emergencies have involved glass, plastic and metal fragments being found in food and drink.

To some extent, glass contamination grew as a public concern following the cases of deliberate tampering of Heinz baby food in 1989. During this period the frequent news reports carrying pictures of mothers with children who had consumed or nearly consumed glass fragments was mirrored by a parallel rise in glass contamination incidents presented to RSSL for investigation. The majority of these cases were not the result of deliberate tamper by a third party, and indeed some were the result of fraud by the consumer who had brought the complaint.

However, glass contamination remains a primary cause of concern within the food industry and it is wrong to suppose that all cases of glass contamination are attributable to acts of deliberate tamper or fraud.
An analysis of our own investigations leads us to propose that up to 70 per cent of all foreign body incidents involving glass may arise simply from domestic accidents. This figure is derived from the observation that only in 30 per cent of the cases investigated can the source be traced back to the factory environment or packaging failure. Of the remainder, many glass contaminants can be identified as originating from domestic articles.

Nonetheless, there have been some high profile recalls in recent years where glass packaging has been identified as being at fault. In 1993, Heineken had to recall thousands of litres of lager after glass slivers were reported in bottles. Heineken’s lead was quickly followed by brewers of other brands including Mousel, Royal Dutch Post Horn, Bavaria and Oranjeboom lagers, all of whom were using potentially flawed bottles from the same source. In October of the same year, SmithKline Beecham withdrew 12 million bottles of Lucozade after fears that the necks could break when opened. Similar problems affected Croix Doree Lager in 1994, Stella Artois and Grolsch lagers in 1996, Sharwood’s sauces and Tesco sparkling wine in 1999.

The emphasis placed thus far on glass from a historical perspective distorts the picture somewhat with respect to current trends. At RSSL, it is increasingly apparent that clients are sending us more complicated problems to solve. Without relegating the relative predominance of glass, plastic and metal analysis, it is interesting to note that cases of precipitates, hazes, sludges and other debris are increasingly common. There are even cases of pills and capsules turning up in products and these can be very difficult to identify accurately.

It is frequently necessary to use chemical analysis and microbiology techniques alongside microscopical observation to find out the exact nature and source of these foreign bodies. These complementary techniques may also be required when the foreign body problem is accompanied by an off-flavour or off-odour, or when the contamination is threatened as part of an extortion attempt. However, in most foreign body incidents, the microscopy laboratory is the starting point for the investigations.

**Investigate before acting**

The necessity for thorough scientific investigation of a foreign body incident may not be immediately apparent, especially if the foreign body can be readily identified and the problem is “easily” resolved by offering a customer some form of recompense.

However, it should be noted that such investigation is required by the “due diligence” element of the Food Safety Act, which also obliges the manufacturer to make every effort to prevent a recurrence of the incident. It is hard to see how the manufacturer can prevent a recurrence if the incident is not investigated and hence not well understood.

From a purely commercial viewpoint, it is generally unwise for a retailer or manufacturer to ignore what may appear at first to be isolated customer complaints, only to find subsequently that they are the precursors to a much bigger problem. It is also dangerous to assume that the foreign body is obvious. For example, crystallised ingredients can resemble glass. Hazes in drinks, though harmless in themselves, may occur as a result of some fundamental production or formulation fault which needs to be addressed.

Of course, not all of the foreign body investigations carried out in RSSL’s laboratories require companies to launch full product recalls. Indeed, the result of the analysis can often indicate that a recall would be entirely the wrong course of action. Foreign body contamination may well be isolated to one or two items, in which case a recall would be a gross over-reaction.

On other occasions it may be spotted by the manufacturer’s own quality control/inspection procedures. Where the manufacturer also has a rigorous traceability system in place, it is often possible to limit the recall to a well defined production run, or even to prevent the affected products from reaching the shelves.

In all cases then, timely investigation of a foreign body incident will help companies to decide the best course of action in order to protect their customers and the reputation of their brands. Just as important, it will help to prevent the recurrence of specific problems.

**Microscopy first**

The first stage of any investigation is close examination of the foreign body by stereo or
compound light microscopy. The techniques used are generally non-destructive and are applicable to very small samples. In some cases, microscopy will be sufficient on its own to identify the contaminant. In other cases it will suggest the most appropriate course for subsequent chemical or microbiological analysis to take. The most commonly-encountered foreign bodies and techniques for their analysis, are outlined below.

**Glass fragments**
Microscopy of any original surfaces of a glass fragment can provide important information on its mode of manufacture, whether, for example, the original glass article was moulded or spun manufactured. Surface interferometry gives information on the curvature of a fragment, distinguishing between flat glass (e.g. window) or curved glass (e.g. tumbler, light bulb). Using this technique it is possible to estimate the radius of curvature of a minute glass fragment and thus form a conclusion about the diameter of the item from which it originated.

More information is available from X-ray microanalysis, a technique used in conjunction with scanning electron microscopy. This technique relies on the fact that different elements emit X-rays of characteristic wavelengths when irradiated with an electron beam. Detection of the emitted X-rays reveals the elemental composition of the glass fragment and allows it to be compared with reference samples, either from the factory, or from our own database of over 500 samples. Using this technique, it is possible to differentiate between sheet glass, lighting glass, containers (bottles and jars), lead glass, borosilicate and domestic glass (tumblers, dishes, etc).

**Metal**
Like glass, metal fragments and objects may arise from a variety of sources such as factory machinery, packaging, even dental fillings. Most factories do have metal detection facilities online which helps limit the problem of foreign bodies reaching the consumer but none of this equipment guarantees an end to the issue. Metal fragments were the reason for Asda withdrawing its polony sausage product in April 1999, and for Crookes Healthcare recalling Dequadin lozenges in 1998.

The origin of a tiny metal fragment or dust can only be determined once its elemental composition is known. This is achieved by X-ray microanalysis, which allows distinctions to be made between different base metals, steels and other alloys. The same analysis can be used to determine any match between samples and reference materials supplied from the factory.

**Plastics**
Polymers and plastics have replaced metals and glass in many applications. As a result, plastics present an increasingly common foreign body problem. Faults with a plastic screw cap prompted Wells Soft Drinks to recall some products in 1998, revealing that it is not just lager bottles that are vulnerable to packaging problems.

A combination of microscopic and spectroscopic techniques can be used to identify these materials. Microscopy and X-ray microanalysis will confirm that the material has a high organic content and Fourier transform infra-red (FT-IR) spectroscopy or microspectroscopy can be used to characterise the chemical structure of the sample.

The spectrum obtained by FT-IR can be compared with reference spectra from RSSL’s own plastics database, or an extensive polymer library. A second technique, known as differential scanning calorimetry, can also be used to characterise plastics in terms of their melting point, degree of crystallinity and glass transition temperature. In some cases this will differentiate between different forms of the same polymer.

**Others**
There are many other potential foreign bodies, such as hairs and fibres, insect parts, animal droppings, hazes and precipitates all of which can be investigated using a combination of microscopical, microbiological and chemical techniques. Deposits and hazes, for example, often arise from natural deposition or settling out of ingredients, breakdown of filtration systems, or by chemical contamination causing precipitation of ingredients. Occasionally they develop post-manufacture as a result of microbiological or enzymic activity.

Hence an obvious foreign body problem may have a very obscure origin and considerable detective work may be needed to
identify its cause. In the case of insect infestation etc., this can occur at any point in the supply chain and is especially distressing for consumers. RSSL is experienced in insect identification and can usually determine the species or family of insect, its country of origin and association with specific raw materials. From the manufacturer’s point of view, it is worth knowing whether the infestation occurred in the raw materials, during processing, or after processing, and it is sometimes possible to use a phosphatase test to give answers to these questions.

**Further action**

Aside from what the investigation reveals about a specific incident, it may also reveal a weakness within the manufacturer’s procedures or processes, or with staff training, and it is important to learn the lessons of any foreign body incident. Hazard analysis critical control point (HACCP) has been widely accepted by the food industry as an important system for identifying potential hazards, and more importantly for preventing them. The remit of HACCP extends well beyond prevention of foreign body contamination, but it certainly includes it.

Training of staff in HACCP procedures and the implementation of an effective HACCP system should form the basis of every food manufacturer’s approach to food safety and the prevention of production related problems.

**Conclusion**

Any consumers finding a foreign body in food are bound to be suspicious of the quality and hygiene standards of the manufacturer and, possibly, with every justification.

RSSL’s own experience is that consumers expect an explanation from the manufacturer as to the cause of a foreign body, and are not satisfied merely with a refund of the purchase price of the affected goods. Moreover, the “due diligence” requirements of the Food Safety Act oblige manufacturers to investigate the cause of foreign body incidents and, in so doing, to make every effort to prevent their recurrence. To this end, every manufacturer should have an effective HACCP system in place to identify possible types and sources of foreign body, and appropriate preventive measures and detection procedures to prevent their occurrence.

It is also clear that manufacturers need to respond quickly to foreign body incidents, both to investigate them and to initiate a recall should this prove necessary. Facilities and procedures to achieve both these aims must be in place before an incident occurs, or else the initiative will be lost, and an irritating problem might rapidly develop into an uncontrollable crisis.