Chapter 1 Questions, questions and more questions to ask and answer

From the feedback to Activity 1.1 and the points made in chapter 1, it is seen that the “right questions” should interrogate the problem presented, particularly for those details associated with: ‘Safety’, ‘Traceability’, ‘Labelling (including Content)’ and ‘Integrity of the source material’ (bulk and sample). Each problem scenario will have its own specific details but consideration of the above four headings is important. As stated before, you ask as many ‘right’ questions as needed to identify the problem and requirements for its solution in full.

Feedback to Question 1

The line of questioning could follow the below list but to note that handling of the contaminant should be avoided by anyone except experienced personnel:

Where was the loaf of bread purchased / receipt

When was the loaf of bread purchased / receipt

Who supplied the loaf of bread

When was the loaf of bread opened

Who opened the loaf of bread

When was the “contaminant” discovered

Who discovered the contaminant

Was the contaminant removed / handled

Where was the loaf of bread stored before opening / Where was it kept

Where was the loaf of bread stored after opening / Where was it kept

Who had access to the loaf i) before and ii) after, the packaging was opened?

Is this the original packaging?

Please present the packaging and labelling supplied by the manufacturer

Has anything been added to the loaf since it has been purchased / opened

Is this the only contaminant found or are there other pieces present

(is further examination of the loaf / contents of the package required to answer the above)

-: Remember that manufacturers and suppliers and possibly consumers will need to be alerted.

Feedback to Question 2

The line of questioning could follow the below list but to note that handling of the “samples” should be avoided by anyone except experienced personnel:

Please present the packaging and labelling from the supplier

Please present the packaging and labelling supplied by the manufacturer (which will also identify country of origin)

When was the present batch of painted toys delivered

Who signed for the delivered goods

Can you supply the import license for the delivered goods

How long has this product been supplied using this route

Have there been any changes to the “product” supplied in that time

Does this include changes to product identification numbers

What alerted you to the possible problem with the toy(s) / paint

What evidence is there of the toy(s) complying with the ‘materials regulations’ for public / consumer purchase in the UK including safety for children – see: https://www.gov.uk/guidance/toy-manufacturers-and-their-responsibilities

-: Remember that manufacturers and suppliers (and possibly consumers) will need to be alerted.

Feedback to Question 3

The line of questioning could follow the below list but to note that handling of the “samples” should be avoided by anyone except experienced personnel:

Please present the packaging and labelling from the original supplier

Please present the packaging and labelling supplied by the manufacturer

When was the present batch of sunflower oil delivered

Who delivered the present batch of sunflower oil

Was the present batch of sunflower oil inspected upon delivery

Was it transported / delivered in accordance with the requirements of the manufacturer (temp and light)

Where was the present batch of sunflower oil stored

Is this storage in accordance with the requirements of the manufacturer (temp and light)

Has this problem ever happened before (at this store) or other stores

What evidence is there for the problem being present (visual assessment)

Can you present an example of a 'suitable' batch of sunflower oil for comparison

Tackling this problem will be based upon the evidence supplied. Visually, **is it** considered "off" because of i) colour, ii) opacity (cloudiness), iii) particulates, iv) separation of liquid layers, v) gassing, etc? But also is there any, vi) Odour, vii)….etc.

-: Remember that manufacturers and suppliers and possibly consumers will need to be alerted.

Feedback to Question 4

Here, health and safety and risk must be a priority; you must know what you are being asked to handle and how it should be handled, in order to be safe. Hence, the first question should be:

Can you please supply the "forms" which identify the components present in the vial and the risks associated with them from the process they have undergone.

[All chemicals used in manufacture will have a safety data sheet (SDS) or a materials safety data sheet (MSDS) or a chemical safety data sheet (CSDS) or a product safety data sheet (PSDS). These should accompany any materials used in a production process. Each is a technical document that provides detailed and comprehensive information on a 'controlled' product regarding health effects from exposure to the product, a hazard evaluation related to the product's handling, its storage and use. These are then used to complete a risk assessment, specific to the process they undergo (manufacturing or otherwise) and this risk document is referred to as a COSHH (control of substances hazardous to health) form].

If the manufacturing process is following Health and Safety guidelines, then the important required identification / safety in handling / risk assessment, information is immediately available and reduces the questions that need to be asked. In particular, "do I have sufficient information to safely accept this sample?"

If the answer to this is "yes" then a systematic Q and A session with the line manager should follow, detailing the whole process, step by step, leading up to the sample being taken from the production line, which is now in front of you.

Feedback to Question 5

Where legislation and food are concerned, a good starting point is the European Food Safety Authority (EFSA). A simple on-line search using key words such as "regulations"; "Tuna" and "Mercury" will immediately provide helpful links such as:

https://ec.europa.eu/food/safety/chemical_safety/contaminants/catalogue/mercury_en

and further selected links within this site provide:

https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2012.2985

For the FDA, a useful link is:

https://www.fda.gov/food/foodborneillnesscontaminants/metals/ucm115644.htm

This allows the below list to be constructed.

It is noted that there are a range of approaches to limits and recommendations. Often they are based upon the type of mercury present, the amount of a certain type of tuna you can consume in a week, and the amount of a type of mercury you can consume in a week based upon your body weight.

i) Total mercury (independent of chemical type or 'speciation')
ii) Inorganic mercury (Hg^{2+})
iii) Methylmercury (organo-mercury)

In the United States, the FDA has an action level for **methylmercury** in commercial marine and freshwater fish that is 1.0 mg/kg. In Canada, the limit for the **total mercury content** is 0.5 mg/kg.

The FDA provides recommendations for young children, pregnant women, and women of child-bearing age, for the consumption of Tuna; these being:

No more than 12 ounces total from up to three servings (3 x 113 g) per week of light Tuna

No more than 4 ounces total from one meal (1 x 113 g) per week of Albacore (white) Tuna

In Europe the most recent regulations are based upon tolerable weekly intake (TWI), the type of mercury present and your body weight (b.w.). These are:

TWI for inorganic mercury = 4 µg Hg per kg b.w.

TWI for methyl mercury = 1.3 µg **Hg** per kg b.w. ‡

The use of body weight allows tolerable levels of a potentially toxic element to be adjusted for the variation of body mass with age (e.g. children vs adults).

Based upon a 70 kg adult the above quantities therefore become:

TWI for inorganic mercury = 280 µg Hg (= 0.28 mg)

TWI for methyl mercury = 91 µg Hg (= 0.091 mg)

‡ To note that while the speciation of the mercury present is determined, this value is expressed as the mercury (Hg) content of the 'methyl mercury' measured.

Feedback to Question 6

This erroneous rumour comes up occasionally and as 'you are a chemist' who has in their line of work, determined the calcium content of these milk products and published this information, you know it to be readily available. You could start with the publication from The Dairy Council itself:

https://www.milk.co.uk/hcp/wp-content/uploads/sites/2/woocommerce_uploads/2016/12/Milk-Consumer-2018.pdf

and the table within this document; "**Nutritional comparison of milk and alternatives**".

Other surveys of milk and milk products are also available but information from independent, validated, peer-reviewed published sources should be considered.

Feedback on Question 7

While there are a number of routes that offer the potential for health and safety issues from recycled plastics, when it comes down to certain elements contained within these polymer materials (as identified in the question) then recycled processed materials that involve contact with our food, our water and direct contact with our (human) body systems must be considered. Plastics can contain a range of metals, metalloids and non-metals (other than the above elements stated in the question) dependent upon the type of plastic and its original usage. Elemental examples in plastics are: e.g. Ca, Mg, Cd, Pb, Sb, Hg, Sn, Ba, Ti, Zn, Co, Cr, Ni….; As, Ge, Se….; Si, F, Cl, Br….; Whether these elements are present because they are fillers, stabilisers, property modifiers and enhancers or are part of the polymer back-bone (as some halogens are), one major characteristic of importance is the element's ability to 'leach-out' from the 'plastic goods' usage and contaminate our food, our water or directly, ourselves. This effect of 'leaching-out' can also be referred to as "migration" in certain documents and will obviously be dependent upon: the type of plastic, the temperature, the extractant (e.g. water, vinegar – 3% acetic acid -, vegetable oil, saliva, the foodstuff itself, etc.), the period of contact (time-scale or duration of exposure) between the plastic and the extractant, its usage that may abrade and expose a 'fresh' surface….etc.

Questions should encapsulate these points and the relevant government / EU sources should be interrogated.

For example: Regulation (EU) No. 10/2011 (including amendment 1282/2011) is a European regulation which brings all European Union legislation on food contact plastics under one heading. For some metals (shown below) the following can be identified:

Specific migration of metals shall not exceed the following limits as detailed in Regulation (EU) No. 10/2011.

- barium: 1mg/kg food or food simulant
- cobalt: 0.05mg/kg food or food simulant
- copper: 5mg/kg food or food simulant
- iron: 48mg/kg food or food simulant
- lithium: 0.6mg/kg food or food simulant
- manganese: 0.6mg/kg food or food simulant

- zinc: 25mg/kg food or food simulant.

It may be of interest to see the official report by COWI and the DTI at:

https://www2.mst.dk/Udgiv/publications/2014/12/978-87-93283-31-2.pdf

There is an updated amendment (EU) 2017 / 752 which supersedes the earlier document: Regulation (EU) No. 10/2011 (including amendment 1282/2011) with regards to certain procedures. Please see:

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0752&rid=6

Feedback on Question 8

i) The more commonly encountered cannabinoids together with their reported pharmacological properties include*
1. cannabidiol (CBD), an anticonvulsant drug tested in treatments of epileptic patients, in addition to being anxiolytic, anti-inflammatory, antipsychotic, antispasmodic and analgesic;
2. cannabinol (CBN), a sedative and anticonvulsant that is anti-inflammatory;
3. Δ9-tetrahydrocannabinol (Δ9-THC), the main psychoactive compound of the *Cannabis* plant.
4. cannabigerol (CBG), which has antiproliferative and antiglaucoma activities as well as antibiotic, anti-inflammatory, antifungal and analgesic activities;
5. cannabichromene (CBC), which is anti-inflammatory,antifungal and analgesic;

ii) Δ9-tetrahydrocannabinol (Δ9-THC), the main psychoactive compound of the *Cannabis* plant.

iii) There needs to be an approved and defined commercial end use for the cultivar and the Home Office only issues licences for cultivation of plants from approved seed types with a THC content not exceeding 0.2%. The '0.2%' reference is used solely to identify varieties which may potentially be cultivated. See:
https://www.gov.uk/guidance/controlled-drugs-licences-fees-and-returns
and the fact sheet contained therein:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757786/factsheet-cannabis-cbd-and-cannabinoids-v1-3-2018.pdf
***** For example; Analysis of Isomeric Cannabinoid Standards and *Cannabis* Products; *Valdemar Lacerda Jr et al.; J. Braz. Chem. Soc.*, Vol. 30, No. 1, 60-70, 2019. But there are many peer-reviewed scientific sources available including those from 'Forensic Science International' and 'Journal of Forensic Science' etc.