How safe is our packaging?

Understanding Potential Food Safety Hazards in Packaging

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- Worked in the food industry since 1987, from the meat processing floor, to Australian Govt departments, private consulting & as a Food Safety auditor & trainer.
- Completed the EQUIPT trainers course (Evaluators Qualification in Packaging Technology).
- Clare has audited in 14 countries including packaging manufacturers (plastic, cardboard, glass & cans) against the following stds: SQF, BRCGS & ISO 9001 in Australia, UK, Ireland, USA & Canada.
- Consults & trains against BRCGS Packaging standard.

How **safe** is our packaging?

Issues concerning Canned beverages				
Date	Notified By	Issue	Country of Origin	Company
17/Dec/2021	France	Recall of Coca Cola Classic due to the presence of Bisphenol A which cannot be marketed in France	Unknown origin	METRO France, Z.A. du Petit Nanterre, 5, rue des Grands Prés, F-92024 Nanterre Cedex

BPA (Bisphenol A) in 1998 discovered to leach out from rodent environs in a laboratory with 40% egg defects.

First synthesised in 1891, BPA combined with phosgene during WW1 as a toxic gas, yielded the clear polycarbonate plastic of shatter-resistant headlights, eye glasses, DVDs and baby bottles.

The jury is still out.

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Issues concerning Canned foods - vegetables				
Date	Notified By	Issue	Country of Origin	Company
01/May/2020	United Kingdom	Canned sweetcorn from the United Kingdom with defective packaging (faulty seams)	United Kingdom	Company not yet stated
Issues concerning Melamine articles				
Date	Notified By	Issue	Country of Origin	Company
20/Dec/2021	Poland	Unauthorised use of bamboo in melamine mugs, bowls and pitchers from China	China	Company not yet stated
Issues concerning Meat, minced, ground - bovine (beef, veal, cow)				
Date	Notified By	Issue	Country of Origin	Company
05/May/2020	New Zealand	Recall of NZ beef premium mince and NZ beef prime mince due to foreign matter (plastic)	New Zealand	New World Thorndon, Thorndon, Wellington, New Zealand

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How **safe** is our packaging?

Date	Notified By	Issue	Country of Origin	Company
18/Jun/2021	Germany	Recall of Adria brand canned tomato pulp due to peeling paint inside the cans	Unknown origin	Paul M. Müller GmbH, Raiffeisenallee 5, 82041 Oberhaching, Germany

Issues concerning Melamine articles

Date	Notified By	Issue	Country of Origin	Company
21/Jun/2021	Belgium	Melamine products with bamboo fibers on French web shop	France	Company not yet stated
21/Jun/2021	Belgium	Melamine products with plant fibers (bambou/cotton) on French web shop	France	Company not yet stated
21/Jun/2021	Belgium	Melamine products with bamboo fibers on UK web shop	United Kingdom	Company not yet stated
21/Jun/2021	France	Recall of Mucci gourmet ice-cream sticks due to pesticide residues	Unknown origin	Aldi, France

Issues concerning Other articles

Date	Notified By	Issue	Country of Origin	Company
21/Jun/2021	Luxembourg	unauthorised use of wheat straw in polypropylene tableware	Unknown origin	Company not yet stated

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Packaging hazards that have caused recalls of tuna products: 2020- 2019:

- **Plastic** fragments in canned tuna in olive oil from Italy.
- Foreign body (piece of **plastic**) in canned tuna from Spain.
- Foreign body (**paper**) in canned tuna in oil from Spain.
- **Metal** strips in canned tuna from Spain.
- **Damaged** packaging of pouched tuna from Ecuador.

Canned tuna due to presence of botulinum toxin: this is often caused by a **failure in the actual can manufacturing** such as:

- ✓ minute seam break.
- ✓ can damage.
- ✓ weld fail.
- ✓ corroded can.

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Food Safety hazards from canned product:

A food manufacturer is recalling its pizza due to the tomato product used: the varnish had come off in some cans & so contaminated the sauce:

- Paint peeling in cans of tomatoes: Heating could lead to thermal reactions.
- Because a health risk from the dissolved & heated paint components cannot be safely ruled out, the remaining cans have been withdrawn from sale according to the manufacturer.
- Specifically, it is about the ADRIA pizza tomatoes (Polpa di Pomodoro) with a content of 4250 milliliters, which specified August 31, 2022 as the best before date.
- The individual paint peeling was determined in the batch SI LJ 240 MHD / BBE: 31/08/2022 with the EAN (GTIN) 4 003735 770367 - the corresponding batch number can be found on the lid or bottom of the can.

https://newsrnd.com/life/2021-06-23-recall-of-tomato-sauce--paint-peeling-off-inside-the-can.rkdfJnx2O.html

Chemical hazards & regulatory issues:

- Scientists have identified **more than 3,000 potentially harmful chemicals** that can be found in food packaging & other food-related materials, 75% of which were not previously known to be in contact with food.
- An international group of scientists **analyzed more than 1,200 scientific studies** where chemicals had been measured in food packaging, processing equipment, tableware & reusable food containers.
- A report released by the Food Packaging Forum, a Switzerland-based non-profit, noted **little is known about many of the 3,240 chemicals** examined in these studies or their effects on people.
- Nearly 75% of the studies analyzed in the new report looked at **chemicals in plastic**. Packaging manufacturers often add chemicals without knowing the long-term ramifications, said Jessica Heiges, a UC Berkeley doctoral candidate who studies disposable food items such as plasticware & packaging. The chemicals "are terrifying because we don't know what their impacts are", Heiges said. "What's most alarming is this cocktail of chemicals, how they're interacting with each other. Some of them are persisting in the environment & in our bodies as we're consuming them." More than 3,000 potentially harmful chemicals found in food packaging | Food safety | The Guardian

Chemical hazards & regulatory issues:

- The Food & Drug Administration (FDA) said Thursday that it **will not impose a total ban** on a set of dangerous chemicals commonly found in fast-food packaging, angering scientists & environmental groups who have long pressed for their removal.
- The **FDA did institute a ban on the use of 23 phthalates** for food contact applications, but it noted that those particular compounds had already "been abandoned" by manufacturers anyway. In taking its action, the FDA agreed to a July 2018 petition submitted by an industry group known as the Flexible Vinyl Alliance.
- "These chemicals are approved for their use, they have the ability to leach out of these products into the food, they're ending up in our food in our bodies & are leading to serious & irreversible health effects," said Ami Zota, an associate professor at the George Washington University's Milken Institute School of Public Health who is a member of Project TENDR.

FDA sparks anger with decision on 'phthalates' — a chemical in fast-food packaging | The Hill

FDA Takes Another Look at BPA (plasticstoday.com)

Chemical hazards & regulatory issues:

27/Apr/2022	Switzerland	Migration of ESBO, DBS, Polyadipat and ATBC from glass jar lid olives in oil	Greece	Company not yet stated
26/Apr/2022	Austria	Migration of primary aromatic amines from spatula	Unknown origin	Company not yet stated
26/Apr/2022	Italy	Recall of Borella branded 'Lazise' coffee cups with plate and hanger due to migration of lead	China	Shenzhen Master international Trade co Ltd, China
27/Apr/2022	Italy	Migration of Melamine in kitchen dishes from China	China	Company not yet stated

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Chemical hazards & regulatory issues:

- The **European Food Safety Authority** (EFSA) has re-evaluated the risks of bisphenol A (BPA) in food & proposes to considerably lower the tolerable daily intake (TDI) compared to its previous assessment in 2015. EFSA's conclusions on BPA are explained in a draft scientific opinion that is open for public consultation until **8 February 2022.**

- **California law "Proposition 65"** requires businesses to provide warnings to Californians about significant exposures to chemicals that cause cancer, birth defects or other reproductive harm. These chemicals can be in the products that Californians purchase, in their homes or workplaces, or that are released into the environment including in packaging.

- Watch for new "candidate list of substances" or "chemicals of high concern". EFSA issues statement on 4-methylbenzophenone in some breakfast cereals | EFSA (europa.eu)

- Migration of mineral oil aromatic hydrocarbons (MOAH) **from cardboard containers to dry foods**. Often considered as a 'chemical of interest".

Chemical hazards & regulatory issues:

- **2010 Kellogg's Recalls 28 Million Boxes of Cereal:** "an uncharacteristic off-flavor & smell coming from the liner in the package" of the recalled cereals. Kellogg's Recalls 28 Million Boxes of Cereal | Food Safety News

- **2010 Kellogg's Blames Elevated Hydrocarbons for Recall:** An aromatic hydrocarbon called methylnaphthalene is present the substance giving off the unpleasant smell in the packaging of some recalled Kellogg's cereals. Kelloggs recalled some 28 million boxes of Froot Loops, Honey Smacks, Apple Jacks & Corn Pops on June 28 for an "off flavor & smell" from the packaging. Kellogg's Blames Elevated Hydrocarbons for Recall | Food Safety News

- 2014 **Methylnaphthalene** in Food Packaging & **Cadmium** in Food Packaging & Household Items: Overview of Exposure, Toxicology, Regulatory Aspects, & Research Needs: by **Suzanne M. Snedeker** DOI 10.1007/978-1-4471-6500-2_10 in book: Toxicants in Food Packaging and Household Plastics (pp.245-263)

Handling packaging: onsite, in the supply chain & by the consumer.

- Gerber Products Company is recalling 2 organic baby foods because a packaging defect may make them susceptible to spoilage during transport & handling.
- There have been 3 consumer reports of temporary gastrointestinal symptoms, but the FDA said it has been unable to confirm that they are related to the product.

Gerber recalls two organic baby food pouch products - CNN

Handling packaging: onsite, in the supply chain & by the consumer.

- Supermarket chain Woolworths NZ is recalling a range of squeezable baby food pouches from its stores nationwide after holes were found in about 30 individual packets in its Auckland & Napier supermarkets.
- The recall follows the discovery of a mice infestation at 2 of Woolworth NZ's Auckland distribution centres, says New Zealand Food Safety director of compliance Gary Orr.
- "It now looks likely that the damage was caused by these mice infestations. However, we continue to work to rule out any other possible issues in the supply chain.

Squeezable baby food pouches recalled from Woolworths NZ supermarkets | NZ Government (mpi.govt.nz)

Packaging failures: in manufacturing & for the consumer.

11/May/2022	The Netherlands	Glass splinters in a bottle of beer	Belgium	Company not yet stated
27/Apr/2022	France	Recall of Karma Kefruit brand elderflower kefir due to a packaging defect	Unknown origin	Biogroupe SA, 11 rue Robert Surcouf, 22430 Erquy, FRANCE
29/Apr/2022	United Kingdom	Recall of IRN-BRU regular and IRN-BRU 1901 glass bottles due to manufacturing fault which may cause bottle caps to pop off unexpectedly	Unknown origin	AG Barr

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Packaging technology e.g. vacuum packing.

- **Components:** colour printed, clear flexible laminates with high oxygen barrier properties that is heat sealed & often with lacquer coated metallized inserts.
- **Vacuum forming:** thermoforming method has a softening plastic sheet pulled with a mold by a vacuum.
- **Vacuum packaging**: where the air is withdrawn from the primary pack, to remove oxygen to reduce product degradation & kill off some bacteria but not all i.e. Listeria monocytogenes.
- **Hazards:** chemical migration, seal failure leading to oxygen permeability & microbial growth with possibly toxin formation.

Packaging technology e.g. MAP.

- Sandwiches of PE or PP ?
- EVOH film 5µm
- LDPE (0.910-0.925g/cm3) or HDPE (0.940g/cm3)?
- **Passive or active**?
- Micro perforated films & changing atmospheres.
- Respiration rates.
- Film **permeability** or not ?
- **Permeability Coefficient of Common Polymers**: The transport of gases & liquids through polymer membranes (plastic films) is caused by either a pressure or temperature gradient, or by an external force field &/or a concentration gradient. The **permeability coefficient**, P, is defined as the volume of gas or vapor passing per unit time through unit area of **polymer** film of unit thickness.
- What about CAP ?: **controlled atmosphere packaging**: storage method not a packaging method.

*Consider what would happen if any of these **components fail**?*

*Or have been **substituted** with a cheaper raw material ?*

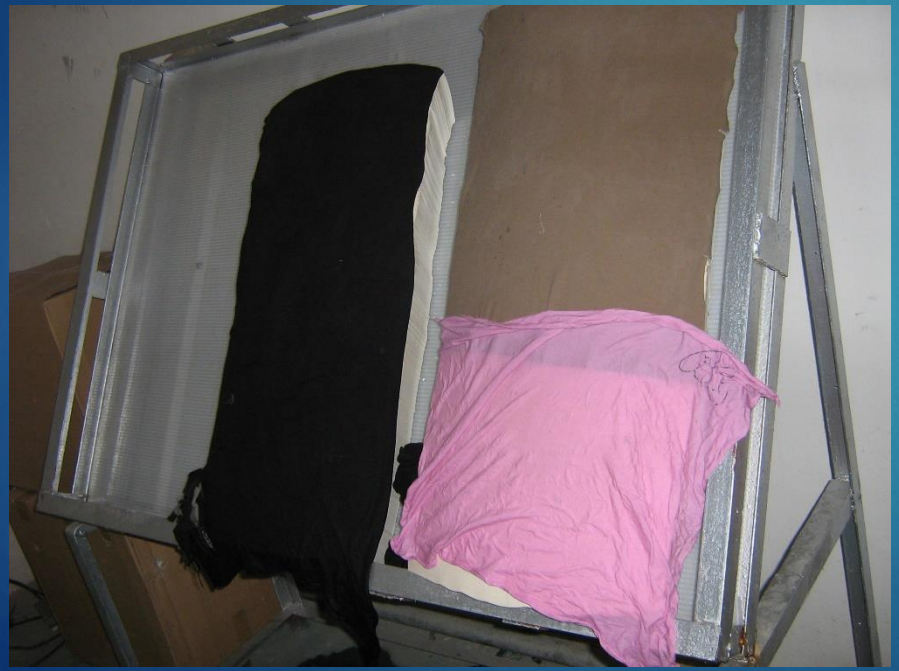
Ref: Intelligent & Active Packaging for Fruits & Vegetables edited by Charles. L.Wilson. ISBN 10: 0-8493-9166-0

Hazards at the packaging manufacturers: coffee cup case study.

- cardboard shreds in most stored inner cups in the warehouse.
- visible set off migration from the printed surface of the non-food contact to the food contact surface.
- water applied to raw paper prior to production, with an old rag, used to soften the rim.
- motor bike driving in warehouse.
- finished products sighted with 'ink ring' from inserted cups external printed wall i.e. printed ink inside the cups.
- grease sighted on temporary repairs on production machines using sticky tape & 'glad' bags that are used to hold the bags that the final cups are packed in prior to final despatch.
- maintenance chemicals are left in soft drink bottles throughout the plant.
- blended paints/inks are stored in open unlabelled containers in the print room.

Hazards at the packaging manufacturers: coffee cup case study.

Wet rags on coffee cup rims & uncovered paper rolls.



Hazards at the packaging manufacturers: coffee cup case study.

Bucket of water for use directly onto cup rims & foreign objects on paper rolls.

Hazards at the packaging manufacturers: coffee cup case study.

Unsealed plumbing in factory, cigarette butts & stick in glue pot for direct contact.

Recycled material packaging.

- **Recyclable packaging** is made from previously used materials, including paper & plastic. The recycled packaging is processed at a recycling facility & made into something new to continue its circle of life.
- **Allergen controls**: recycled cardboard gets "cooked" over 200C to kill pathogens but does that "kill" allergens ?
- PET can be approved by EFSA & US FDA for **mechanically recycled** PET.
- Other plastics can be sourced from **chemically recycled** products. Advanced recycling – Ending Plastic Waste (csiro.au)
- Post Consumer Recycled (PCR) materials will need: **sustainability declaration** or delivery documentation to verify chain of custody **AND** a Declaration of Compliance **or Statement of Compliance** that calls out the EU or FDA approval.
- The FDA have some specific guidelines under which the use of recycled plastics in direct food contact can be acceptable: http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/IngredientsAdditivesGRASPackaging/ucm120762.htm

Plant based & Organic packaging.

- Wheat starch (= gluten) is used in corrugated cardboard.
- Cutting corrugated cardboard makes dust which is likely to have gluten in it: "**unexpected allergens**".
- Recalls of "plant based" packaging with melamine in it.
- Bioplastic sourced from rapidly-renewable plant resources, like **corn.** Ingeo™ PLA (polylactic acid) requires 52% less energy to produce & has a carbon footprint 71.8% lower compared to regular plastic.
- Takeaway containers, napkins, cutlery, straws made from reclaimed & rapidly renewable **sugarcane** pulp.
- Most **organic** products are not packed in organic packaging.
- Usually the requirement is that the packaging does not have any chemicals that will leach out. Even paper based compostable packaging will have traces of non-intentionally added chemicals so won't be organic. Most manufacturers will comply with Article 3 in EU 1935: 2004.

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27/Apr/2022	**Spain**	**Plastic materials and bamboo in tableware products from China**	**China**	**Company not yet stated**
25/Apr/2022	**Ireland**	**Unapproved Use of Rice Husk in Huski Lunchboxes and Cups**	**Unknown origin**	**Company not yet stated**

Plant based packaging options:

- Active packaging that be a non toxic insect repellent.
- Active packaging that has antibacterial compounds in the headspace- which can lead to **taint** in the food.
- These active packaging options can be made of: citrus peel, cinnamon, neem, turmeric or pyrethrum extracts, essential oils or oleoresins.
- Many of the listed plant sources are susceptible to **food fraud** i.e. cinnamon, neem & turmeric.

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Dissolvable and edible packaging.

Dissolvable/edible packaging for food has emerged as a possible solution to some of the most challenging issues facing the sector today: reduction of single-use plastics, packaging waste & the use of petroleum based raw materials.

- Water soluble (polyvinyl **alcohol-based) edible film**.
- Dissolvable food packaging include goods made with plant-based ingredients such as **tapioca, seaweed & potato.**

There are **no dedicated legal frameworks for dissolvable food packaging** at present.

- In the US, edible packaging may be considered a food additive & would therefore require a Food Additive Petition (FAP) before it could be legally sold.
- In the EU all food contact materials are covered by the harmonised legal framework Regulation (EC) No. 1935/2004. In accordance with Regulation (EC) No 1169/2011 it's also likely that the components of edible packaging will need to be included on a (food) product's ingredients list.

Ref: Intelligent & Active Packaging for Fruits & Vegetables edited by Charles. L.Wilson. ISBN 10: 0-8493-9166-0

Nano technology packaging: to detect pathogens/track & trace:

- Can change colour to show the presence of specific pathogens.
- Can have anti-microbial properties i.e. as per the plant based packaging.
- **Invisible nanocrystals embedded into a product** which forms an individualized Nanotag, readable by a proprietary smartphone application.
- Invisible to the human eye, scanners can detect a covert tracer & provide instant verification.
- Use scanners to verify your own product's authenticity.
- The EU published a definition of nanomaterials: **2011/696/EU**. Many pigments & silica (common additive) fit the EU definition.
- Other EU regulations include **EU 10/2011: Article 9.2** requires such substances to be listed in Annex I. It is a grey area between substances that have nano sized particles due to natural size distribution vs substances engineered on purpose to perform specific function, as listed above.
- Nanocrystals embedded into a product can **potentially have migration issues** at a molecular level. The EU is reviewing this currently. Carbon black in ink pigments (refer to handout) often comes up. It is permitted based on risk assessment that it is bound or encapsulated by host polymer matrix & negligible potential to migrate. Most large food manufacturers do not permit use of nanotechnology unless explicitly approved by a regulation.

http://www.ypbsystems.com/technology/image_recognition.php

Food Fraud & packaging.

Potential and actual fraud identified in audits:

- Faked food packaging with almost correct details but the wrong-coloured liner i.e. packaging copied from one company & the product inside is not from that company.
- Seafood Sustainability eco label for a specific company used on product in Europe, when the company in question does not export to Europe i.e., fake labelling information.
- Using "recycled" produce cartons as packaging & making claims of GFSI certification i.e. claiming SQF certification that belongs to another business.

Who has control of your artwork at the printers?

Who has control of your "waste" packaging?

- Packaging ingredients substituted with cheaper materials leading to packaging failure or chemical migration.

Do you know what your packaging is really made of?

Halal packaging:

- **No porcine based products** used: will need a statement.
- **No alcohol based products** i.e. inks, adhesives & solvents used.
- BSE/TSE controls: **no bovine based products**.
- **Animal based products to look for**: tallow derivatives(resin formulations), fatty acids, esters & glycol: will need a statement stating "Packaging is free of animal derived ingredients: ADI".
- May need statements for Halal segregation requirements compliance.

Regulatory issues:

- **Positive lists:** list of what chemicals/components can be used i.e. like the Chinese lists of permitted chemicals (that are not consistent with the EU list).
- **Negative lists**: list of what cannot be used- like Californian Proposition 65.
- **Conflicting ever changing regulations**: Different countries within the EU have conflicting requirements, just meeting the EU regulations is not enough. Some countries have more laws for a specific packaging component i.e. Swiss ordinances for inks, German Bfr & US FDA for paper & board. Within the USA different states will have different requirements for PFAS & Californian regulations are very different to the rest of the country. Meeting the FDA regs is not enough.
- **Testing of materials:** Which labs are acceptable for which countries, especially for China & Japan? What labs can actually carry out the test you need ? What labs are 'certified' to carry out the tests you need ?

Any Questions?

For Further Information Contact

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Check out our 4 hour workshop on this topic:

Understanding potential food safety hazards from packaging - Integrity Compliance Solutions