Food packaging and chemical safety today

Overview of scientific challenges for tomorrow

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Food packaging and chemical safety today:

Food packaging market

Source: MarketsandMarkets Analysis
### Food packaging and chemical safety today: Public awareness

| JRC, EC (2007): Consumer perception studies on the safety of food packaging, 700 participants | Friends of Glass (2014): Exploring consumer attitudes to packaging and food and drink safety, 8135 participants |
| «Food packaging contamination» | «Worry about food contamination of harmful chemicals from the packaging» |
| Serious concern | >50% | A lot of worry | 27% |
| Some concern | >30% | To some extent | 39% |
| No concern | ≈10% | A little bit | 28% |
| No opinion | ≈5% | Not at all | 6% |
Food packaging and chemical safety today:
The dose makes the poison

exposure \times \text{hazard} = \text{risk} \, ?

Paracelsus’ birth place
1493
Scientific challenges for tomorrow:
Number of substances

Intentionally added substances

- **900-1000** entries on the Union list
- **6475** entries in the FACET database
- **7201** direct or indirect food additives (PEW list)
- **>5000** substances for packaging inks

Non-intentionally added substances (NIAS)

- Side products
- Impurities
- Break-down products
- Contaminations from recycling processes
  - **95-98%** of the migrate from can coatings
  - **60-90%** for polypropylene (PP)

Sources:

Neltner T et al. 2013 Reprod Toxicol
Oldring P et al. 2014 Food Addit Contam A
Ordinance of the FDHA on Materials and Articles 2005 Annex 6
Grob K 2014 Food Control
Scientific challenges for tomorrow:

A simple equation...

exposure x hazard = risk

Data availability?

- < 2000 starting substances: authorized toxicological evaluation
- NIAS may be
  - known & tested/evaluated
  - known, but not tested
  - detected, but not identified
  - not detected

Source:
Grob K 2014 Food Control
Scientific challenges for tomorrow: Exposure
Migration from FCMs
Scientific challenges for tomorrow: Exposure

Cumulative exposure

oral exposure

oral, dermal and respiratory exposure

Fotos courtesy of Kim Seng, LukedaDuke, UGA College of Ag & Environmental Sciences – OCCS; flickr
Scientific challenges for tomorrow: Novel concepts in toxicology

Mixture toxicity

triclosan (TCS) and ethinyl estradiol (EE)

Source: Louis GW et al. 2013 Reproductive Toxicology
Scientific challenges for tomorrow: Novel concepts in toxicology

Non-monotonic dose responses

Sources:
- Vandenberg L et al. 2012 Endocrine Reviews
- Vom Saal F et al. 1997 PNAS
- Takano H et al. 2006 EHP
- McMahon TA et al. 2011 EHP
- El Touny LH et al. 2009 Cancer Research
Scientific challenges for tomorrow: Novel concepts in toxicology

Sensitive windows of development

Time of exposure

- gestation, infancy, early childhood
- childhood
- puberty
- reproductive life
- middle life
- later life

Sources:
Heindel J NIEHS; adapted
Alonso-Magdalena P et al. 2015 Endocrinology

Fotos courtesy of Peter Dahlgren, Rafal Zych, Rod Waddington, Leon Lopez Cuervo, Artform Canada, Ben Smith; flickr
Scientific challenges for tomorrow:

A simple equation...

exposure \times \text{hazard} = \text{risk}
Scientific challenges for tomorrow:

Who?

FCM manufacturers

Food industry

Regulatory authorities

Materials scientists

Analytical chemists

Toxicologists

Epidemiologists

Enforcement labs

Aim: Safe FCMs*

FPF provides information & enables communication

*based on most current scientific understanding
Conclusions

• Data availability not sufficient to guarantee safety.
• New scientific understanding questions the classical chemical risk assessment approach.
• Testing methods for e.g. hormonal activity exist and go beyond the present legal requirements.
• Strategies and open-minded discussions needed to integrate current knowledge and to further increase the safety of FCMs.
Thank you!

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