

A photograph of a modern, curved building with a facade made of reflective, triangular panels in shades of blue, white, and gold. The building is set against a clear blue sky. In the foreground, there are bare tree branches and a construction crane. A semi-transparent dark grey horizontal bar is overlaid across the middle of the image, containing the title and authors.

Assessment of chemical mixtures

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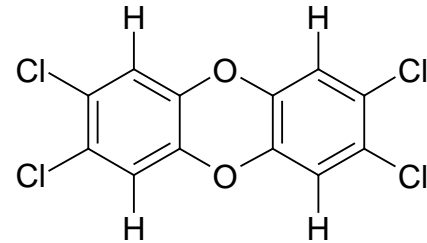
- Development of training in health risk assessment
- Research on risk assessment methodology
- Course leader and teacher in the Master's programme in toxicology

Exposure to many different chemicals - mixtures



Risk assessment of single chemicals

- Risk of one chemical
- Set safe level (based on toxicity data)
- Compare with exposure
- Exposure < safe level

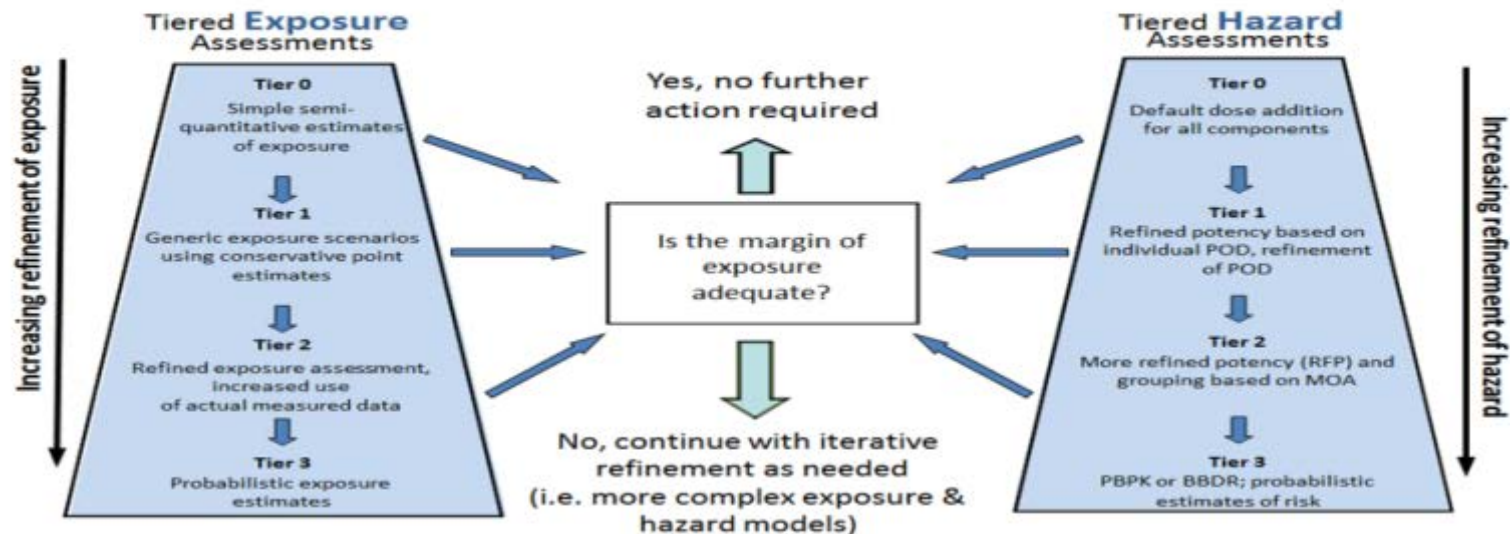


Risk assessment of mixtures of chemicals

- European legislation stipulates that mixtures should be considered
- Lack of methodology and guidelines



Framework for mixtures: Tiered approaches (WHO, Meek et al. 2011)



Risk assessment of mixtures of chemicals

- Whole mixture
 - Too many mixtures
 - Mixtures change composition
- Components
 - Calculate safe levels of individual chemicals
 - Predict toxicity of mixture

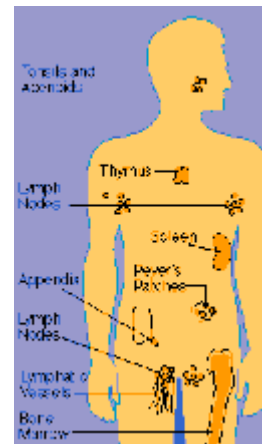
Combine toxicities of chemicals in a mixture

- Do they have similar toxicity? – add up doses
- Do they have dissimilar toxicity? - calculate joint probability of independent events
- Dose addition is recommended, $1 + 1 = 2$

- Do the chemicals interact? – no agreed approach
- Synergistic: $1 + 1 > 2$
- Antagonistic: $1 + 1 < 2$

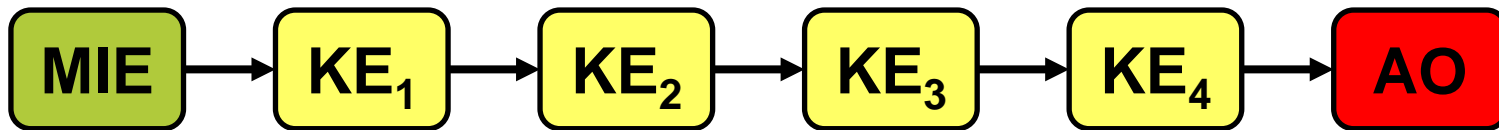
Which chemicals should be assessed together

- European Food Safety Authority EFSA approach
- Grouping of chemicals into Cumulative assessment groups (CAGs)
- Similar toxicological properties in a specific organ or system
 - Liver
 - Nervous system
 - Thyroid
 - Reproductive and development



Which chemicals should be assessed together

- Adverse outcome pathways



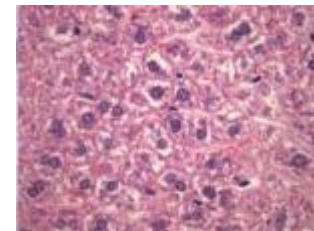
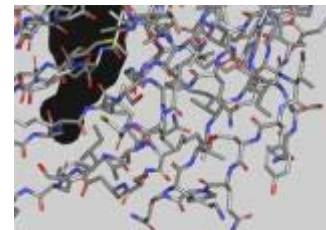
When is a mixture risk assessment needed?

Priority to chemical mixtures

- Potential to co-exposure
- Similar toxicity

Need for further research and development

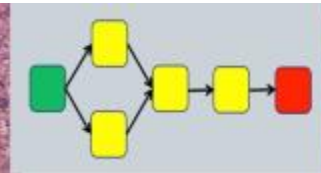
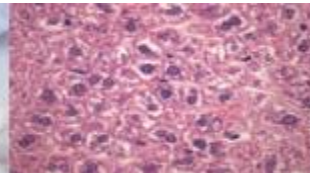
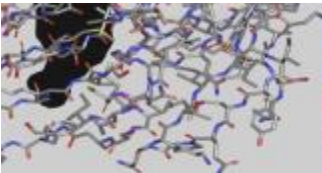
- Approaches for grouping of chemicals with similar toxicity
 - Cumulative assessment groups
 - Adverse outcome pathway
- Testing strategies to identify similar toxicity
 - Use of in vitro and in silico data
- Exposure assessment of mixtures of chemicals
- Tiered frameworks and guidelines





Risk assessment of mixtures in the area of food safety

EU-funded project coordinated by RIVM, Netherlands
22 partners including Karolinska Institutet



Thank you!

