

# Ecotoxicological characterization of waste

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## Background

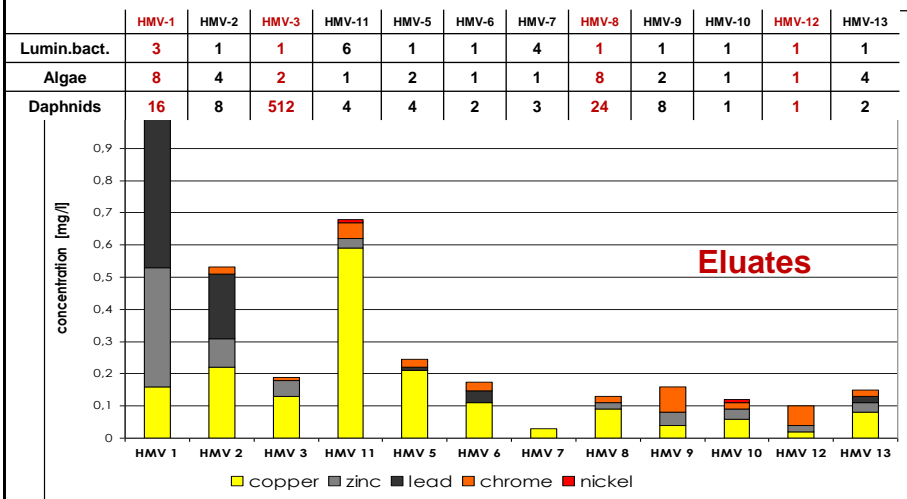
- **September 2005: Workshop UBA and Joint Research Centre, Ispra**  
 Problems around Soil and Waste III - The H-14 Criterion and (Bio)analytical Approaches for Ecotoxicological Waste Characterization  
 40 Experts from Europe to decide on a test battery for evaluation
  
- **2006 - 2007: European Ringtest**  
 Demonstration workshop with participants from 12 Member States  
 67 participants from 15 Countries (Private and Public labs, Universities)  
 3 Waste materials with different pollutants  
 Basic test battery and additional voluntary biotests  
 More than 950 accepted data sets  
 Additional investigations on reproducibility and repeatability  
**All results and raw data** → <http://ecotoxwasteringtest.uba.de/h14/index.jsp>
  
- **Since then**  
 Assessment of Municipal waste incineration ashes (different eluates, biotests and analytics)  
 Development of Technical Guidance Document for Federal State Waste Authorities  
 Ecotoxicological characterization of 25 different wastes in mirror entries  
 Input to support the further development of waste sampling

## Waste ecotoxicity tests: Why and How?

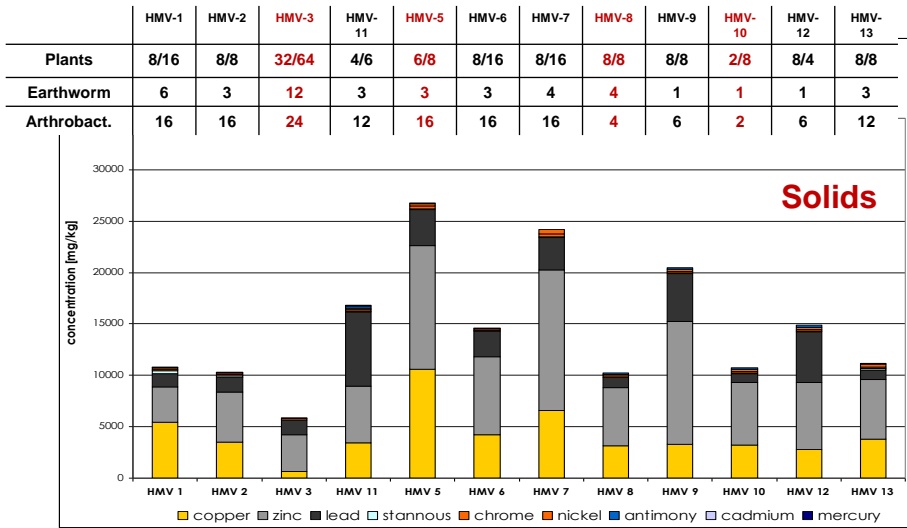
- Detection of acute or chronic **effects** of substances / chemicals on aquatic or terrestrial organisms, including persistence and accumulation potential
- Determination of the bioavailability of harmful substances and their **interactions** in heterogeneous materials
- Assessment of **environmental risks** without the necessity of having analytical data of the material
- Biological test systems, in which test organisms like plants or microorganisms indicate pollutants by a change in their vital functions.

- Aquatic test methods for waste eluate testing
- Terrestrial test methods for solid waste testing

## Ecotoxicity assessment by analytics?



## Ecotoxicity assessment by analytics?



## Recommended test battery – toxicity criteria

	Test organisms	Reference	Endpoint	Toxicity criteria
Eluate testing	Luminescent bacteria	ISO 11348-3(2007)	Luminescence	EC50 (30min) Limit test design: 30%
	Algae	ISO 8692 (2004a)	Growth	EC20 (72h) Limit test design: 25%
	Daphnids	ISO 6341 (1996)	Immobilisation	EC50 (48h) Limit test design: 20%
	<i>Salmonella typhimurium</i>	ISO 13829 (2000)	Gen induction	Dmin ≥ 1,5 (24h)
Solid waste testing	<i>Brassica rapa</i>	ISO 11269-2 (2004b)	Growth	EC50 (14d) Limit test design: 30%
	<i>Eisenia fetida/ andrei</i>	ISO 17512-1 (2007)	Behaviour	EC50 (48h) Limit test design: 40%
	<i>Arthrobacter globiformis</i>	ISO 10871 (2008)	Dehydrogenase	EC50 (6h) Limit test design: 30%



Evaluation of the recommended test battery							
	Luminescent bacteria	Daphnia acute tox.	Algal growth inhibition	Umu genotoxicity	Arthroba-cter contact	Eisenia avoidance	Plant growth
	ISO 11348-3 (2007)	ISO 6341 (1996)	ISO 8692 (2004a)	ISO 13829 (2000)	ISO 10871 (2008)	ISO 17512-1 (2007)	ISO 11269-2 (2004b)
Practicability	++	++	+++	+	+++	+++	++
Level of experience	+++	+++	+++	++	+	++	+++
Reproducibility*	+++	+++	++	++	+++	++	+++
Sensitivity	++	++	+++	+	+++	+++	++
Validity **	+++	+++	++	+++	+++	+++	+++
Duration	1 h	48 h	72 h	24 h	6 h	48 h	14 d
Costs (€)	150 - 200	300 - 400	400 - 600	100 - 200	200 - 300	1400 - 1600	1600 - 1800

\* high within and between labs; \*\* = criteria defined and usually fulfilled

Additional burden in waste management?							
<ul style="list-style-type: none"> <li>▪ Testing costs for biotests               <ul style="list-style-type: none"> <li>→ Tiered test design (first aquatic tests, then solid tests)</li> <li>→ Limit test design</li> </ul> </li> <li>▪ Costs for reliable sampling are the same for analytics as for biotests</li> <li>▪ False classification by chemical analysis of waste material with non-bioavailable compounds (e.g. elementary copper)</li> <li>▪ Laboratory capacity and experience in biotesting of waste is available in EU Member States</li> <li>▪ Information about the potential biological effects as a decision base for the reutilization of waste in the environment</li> </ul>							

## Implementation of Biotests in EWL?

- Ecotoxicological assessment of waste (H14) requires biotests suitable for waste eluates and waste materials.
- Trigger values for effect determination are proven and accepted for the suggested test battery.
- Characterization of waste as hazardous by any other H criterion than H14 → no biotests necessary
- If H 14 is the only relevant criterion → aquatic biotests first, followed by solid biotests
- If H14 will be kept, biotesting of waste should be done based on state of the art with a harmonized test battery.
- Determination of biotest battery and test procedere now, EU wide project to collect data and experiences within the next 5 years → Agreement on harmonized limit values

**Thank you for your attention.**

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