

Water Contaminants

Detection, Quantitation, Identification, Evaluation


- Established Contaminant – Instrumental Analysis – Bioanalytical Analysis (Immunoassays)
- Predicted Contaminant – Instrumental Analysis – Bioanalytical Analysis (Immunoassays)
- Unknown Contaminant(s) – Application of Mechanism-Based Screening Bioassays

Bioanalytical Approaches for Chemical Detection/Toxicity Assessment.

	Endpoint	Test Organism/Cells
Acute Toxicity	Toxicity	Vibrio fisheri (bacteria)
	Lethality	Ceriodaphnia dubia (invertebrate)
	Growth Inhibition	Selenastrum capricornutum (algae)
	Lethality	Mammalian Cell lines
	Lethality	Medaka/Zebrafish
Endocrine Activity	Estrogenic Response	Human Ovarian Carcinoma (BG1)
	Androgenic Response	Human Breast Carcinoma (T47D)
	Glucocorticoid Response	Rat Hepatoma (H4IIE)
	Progesterone Response	Rat Hepatoma (H4IIE)
	Ah Receptor Response	Mouse Hepatoma (H1L6.1c2)
	Estrogenic, Thyroidogenic & Progesterone Responses	Medaka/Zebrafish
Gene Expression	Gene Induction (Metals)	Mammalian/Bacterial Cells
	Xenobiotics	Mammalian Cells (Gene Expression Arrays)
Genotoxicity	Ames Bioassay	Salmonella
	Comet Bioassay	U937 Human Monocytes
	Carcinogenicity	Medaka
Chemical-Biological Databases	ACToR, Tox21, ToxRefDB, ToxCastDB, ExpoCastDB, PubChem, EDSP	

- High Throughput Analysis
- Evaluation of Mixtures
(chemical interaction effects)
- Evaluation of Transformation
Products (i.e. metabolites)
- Provides Avenue for Chemical ID

Toxicant Identification Evaluation (bioassay-directed fractionation)



**hplc fractionation - bioassay –
instrumental analysis – identify
chemicals – effect confirmation**

Bioassay Approaches for Emerging Contaminants

Advantages

- Mechanism-based initial screening approach to identify positive samples (w/o knowledge of chemical(s)).
- Wide range of available biological endpoints and possible future bioassays.
- Relatively rapid and provides a measure of the activity of a complex mixture.
- “Low” cost for many bioassay approaches.
- Potential to identify interactions with other chemicals in the mixture.
- Provides a screening approach to assess effect of removal/remediation processes.
- Provides an avenue in which to isolate and identify the responsible chemical(s) which then allows determination of its potential health effects. (TIE)

Limitations

- What endpoint assays need to be included to provide a “comprehensive” screen?
- Has complete assay validation been accomplished (false negatives/positives)?
- What are costs for comprehensive screening?
- Provides little or no information as to the identity of the positive chemical(s).
- In vivo relevance of positive results for human health (EAC versus EDC)?