

Introductory Discussion of Biomonitoring Reference Levels

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Goals of this agenda item

- ▶ Describe “biomonitoring reference levels” and give examples
- ▶ Preview March workshop
- ▶ Obtain initial SGP input

Biomonitoring California context

- ▶ Program is required to return individual results upon request
 - Results will be returned regardless of whether comparison values exist
 - Questions on the meaning of the results are very likely
- ▶ Program is also directed to assess the efficacy of public health actions to reduce chemical exposures

“Biomonitoring reference levels”

Concentrations in biological media useful for comparing to biomonitoring results, such as:

- ▶ Measured levels in relevant populations
 - E.g., levels in US population (NHANES)
- ▶ Levels in biological media used to derive environmental guidance values or standards
 - E.g., blood lead level used to derive a drinking water guidance value

Biomonitoring reference levels (cont.)

- ▶ Existing guidance values converted to levels in biological media
 - E.g., Biomonitoring Equivalents (BEs) (Hays et al., 2008)
- ▶ Clinical action levels
 - Levels that trigger particular follow-up actions for the clinical setting
 - E.g., CDPH Management Guidelines on Childhood Lead Poisoning

Biomonitoring reference levels (cont.)

- ▶ Levels for assessing biomonitoring results in workers; may also trigger follow up actions
 - E.g., American Conference of Governmental Industrial Hygienists (ACGIH) Biological Exposure Indices (BEIs)

Availability of reference levels for CECBP priority chemicals

- ▶ Measured values in US population (NHANES) available for ~80% of priority chemicals
- ▶ Examples of other types (rough estimate):
 - Biomonitoring Equivalents (~10%)
 - Biological Exposure Indices (~5%)

Human data example: Cadmium

- ▶ Public Health Goal in drinking water (OEHHA)
 - 1 $\mu\text{g/g}$ creatinine in urine \Rightarrow 0.04 $\mu\text{g/L}$ in water
 - Based on preventing proteinuria and therefore renal toxicity
- ▶ Biomonitoring Equivalents of US EPA reference dose, based on NOAEL in humans of 200 $\mu\text{g/g}$ in renal cortex (Hays et al., 2008):
 - \Rightarrow 2.0 $\mu\text{g/g}$ creatinine in urine
 - \Rightarrow 1.7 $\mu\text{g/L}$ blood

Cadmium (cont.)

▶ Occupational Safety & Health Administration

➤ Exposure above the action level ($2.5 \mu\text{g}/\text{m}^3$, 8 hr time-weighted average) for ≥ 30 days per year triggers medical surveillance

➤ Biological monitoring results of:

- $> 3 \mu\text{g}/\text{g}$ creatinine in urine or
- $> 5 \mu\text{g}/\text{L}$ blood

trigger additional requirements for medical monitoring, exposure review, and possible removal from exposure

Animal data example: Dibutyl phthalate

- ▶ Biomonitoring Equivalents (BEs) for di-n-butyl phthalate (DBP), as mono-butyl phthalate (MBP) (Aylward et al., 2009)
- ▶ BEs calculated for:
 - Health Canada (HC, 1994) tolerable daily intake (TDI)
 - European Food Safety Authority (EFSA, 2005) TDI
 - US Environmental Protection Agency (US EPA, 1990) reference dose (RfD)

Basis for DBP guidance values

- ▶ Health Canada TDI:
 - ↓ in live offspring and ↑ in external defects & skeletal anomalies in offspring of mice exposed throughout gestation (NOAEL)
- ▶ European Food Safety Authority TDI:
 - Loss of germ cell development & mammary gland changes in rats exposed via diet during gestation through lactation (LOAEL)
- ▶ US EPA RfD:
 - Increased mortality in rats exposed in diet for one year (NOAEL)

BEs for dibutyl phthalate (as MBP) (Aylward et al., 2009)

Type of guidance value	Point of departure (POD) (mg/kg-d)	UFs Duration, severity, inter-species	Human equivalent POD (mg/kg-d)	BE _{POD} urine (mg/L)	UF Intra-species	BE urine (mg/L)
TDI _{HC}	62.5	100	0.625	14	10	1.4
TDI _{EFSA}	2	20	0.1	2	10	0.2
RfD	125	100	1.25	27	10	2.7

Workshop on biomonitoring reference levels

- ▶ Date: March 17, 2011
(following March 16 SGP meeting)
- ▶ Location: Oakland
- ▶ Format: Presentations, panel discussions and public participation
- ▶ Purpose:
 - Explore the topic of biomonitoring reference levels with the Panel, invited speakers and the public
 - Obtain guidance on next steps for the Program

Possible workshop topics

- ▶ Purposes and applications of biomonitoring reference levels
- ▶ Meaning of exceedances & how to communicate
- ▶ Implications when underlying basis for the reference levels varies
- ▶ Accounting for cumulative exposures and effects
- ▶ Approaches for data-sparse chemicals

Panel discussion

- ▶ Panel's general comments on use of reference levels for Biomonitoring California
- ▶ Suggestions on topics for March workshop