

# The Superfund Basic Research Program: Consulting Community Perspective on Research Needs

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SBRP External Advisory Committee Meeting  
Durham, NC

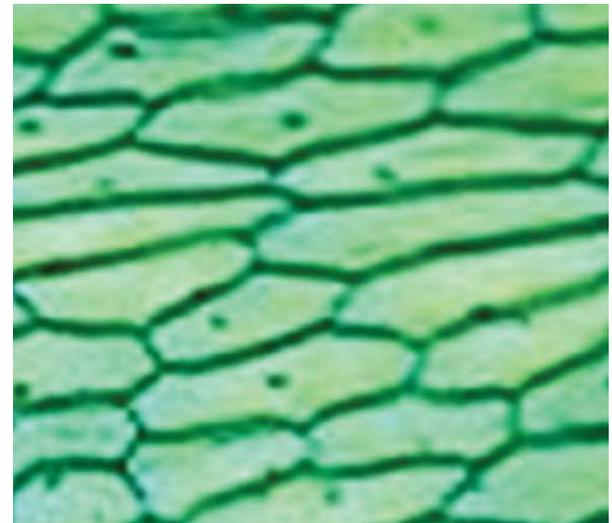
January 19, 2009

## Overview

- Improve precision of dermal exposure assessment
- Refine bioavailability of chemicals in soil and sediment
- Refine methods to model/measure concentrations of chemicals in indoor air
- Conduct research on practicality of increased use of epidemiologic (human) data in toxicity assessment
- Conduct research concerning pharmaceuticals and personal care products in the water supply
- Refine statistical and sampling methods for determining exposure point concentrations

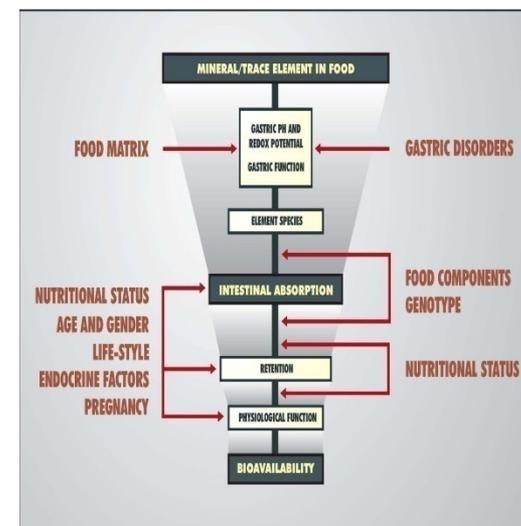
## Improve the precision of dermal exposure assessment

- Problems with current procedures
  - Complex pathway
  - Different EPA programs assess exposure differently (see EPA (2007))
  - Limited understanding of dermal penetration, transfer efficiency, skin loading, time/location/activity info
- Research needs
  - For chemicals in water:  $K_p$  estimates for lipophilic compounds (e.g., PCBs, dioxins); re-examine Flynn data base
  - For chemicals in soil: effect of soil composition (e.g., carbon, moisture, particle size) on skin loading
  - Dermal exposure assessment for contaminated surfaces: types of contaminants, transfer rates, time-activity patterns
  - Effects of clothing



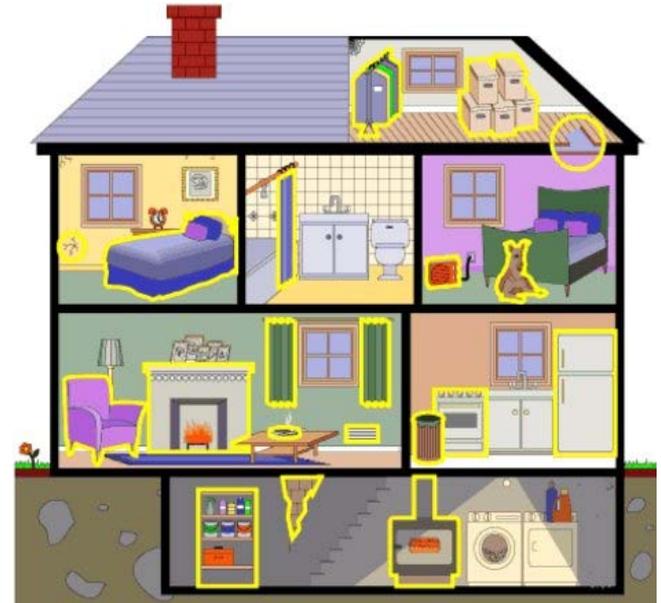
## Refine bioavailability of chemicals in soil and sediment

- Problems with current procedures
  - Use of “neat” or aqueous solutions rather than environmentally relevant matrices (e.g., soil or sediment)
  - Physiologically relevant animal models?
- Research needs
  - Pulmonary bioavailability
  - Estimates from sediment – assume same as soil?
  - Estimates of mixtures
  - Primate studies
  - Use of radiolabels (e.g., Maibach et al. studies with benzene)
  - *In vitro* methods development/refinement



## Refine methods to model/measure concentrations of chemicals in indoor air

- Problems with current procedures
  - Conservatism of J & E model
  - Lack of baseline studies
  - Lack of unobtrusive/ multipurpose personal air sampling gear
  - Lack of health effects data for chemicals at indoor air concentrations
- Research needs (EPA 2005)
  - Baseline studies – more chemicals, additional indoor environments
  - Personal air sampling equipment
  - Dose-response studies
  - Health effects studies for mixtures



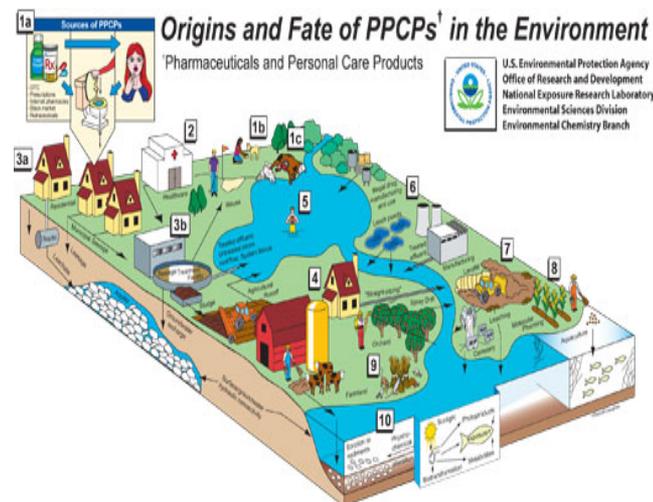
## Conduct research on practicality of increased use of epidemiologic (human) data in toxicity assessment

- Problems with current procedures
  - Preponderance of use of animal data as the basis for RfDs and CSFs
  - Species/low-dose extrapolation
  - Metabolism/toxicokinetics
  - Anatomy/physiology
- Research needs
  - Focus on common Superfund site chemicals: dioxins, PAHs, PCBs
  - Literature review/analysis to assess adequacy of epi data for modified toxicity factor development
  - Meta analysis
  - Epi studies of facilities with robust IH data (e.g., refineries)
  - Simulation studies



## Conduct research concerning pharmaceuticals and personal care products in the water supply

- Problems with current procedures
  - Many sources: prescription and OTC meds, hospital waste, veterinary/agribusiness waste
  - Environmental persistence of PPCPs
  - Ability to detect extremely low concentrations
  - Perception of effects
  
- Research needs
  - Analytical methods for detection
  - Fate and transport
  - Health effects at environmentally relevant concentrations
  - Ecological exposure and effects



## Refine statistical and sampling methods for determining exposure point concentrations

- Problems with current procedures
  - Lots of methods – which is appropriate for Superfund sites?
  - Many methods require extensive (costly) sampling
  - Are the bounds of uncertainty too large with current methods?
- Research needs
  - Advanced statistical methods – e.g., advanced robust kriging
  - Gy sampling methods/theory (Gerlach et al. 2002)
  - Software development to support new/advanced methods – “Scout”



## References

- Gerlach, R.W., D.E. Dobb, and G.A. Raab. 2002. Gy sampling theory in environmental studies 1: Assessing soil splitting protocols. *Journal of Chemometrics* 16(7):321-328.
- Modjtahedi, B.S and H.I. Maibach. 2008. In vivo percutaneous absorption of benzene in man: Forearm and palm. *Food Chem Toxicol.* 46(3):1171-1174.
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