Personalized Exposure Assessment: Promising Approaches for Human Environmental Health Research

Brett Tunno

Environmental Exposure

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Introduction

- Complex interactions between genes and environment
- Environmental factors are a nice target
- Hypothesis: Newer, improved technology will lead to better health research
Exposure Assessment

- Exposure metric – estimate for each individual
  - Biologic sample or environmental monitoring
- Defining markers of genetic variation = important
- Lack reliable, cost-effective approaches
Technology

■ A “toolbox” of methods
  ■ External exposures
    ■ Environmental sensors and GIS
  ■ Internal exposures
    ■ Biologic sensors, toxicogenomics, body burden assays
Environment-sensing devices

- Industrial effluents to household environments
- Personal dosimeters monitor CO
- “Lab-on-a-chip” sensing device
- Personal monitors – global positioning
GIS Technology

- Spatial and temporal data display
- Predict contaminant fate and transport, identify pathways and exposure routes
- Future = spatially integrate behavioral patterns
Biologic sensors

- Measure motion, temperature, heart rate
- Contain biological sensing agent
- Measure continuously, so reduce uncertainty
- Future = global sensing networks
Toxicogenomics

- Genes, mRNA transcripts, and proteins
- Classify exposures to chemicals and drugs
- Challenge = predictive markers
- More realistic view by incorporating multiple exposures at once
Body burden assays

- Heavy metals and phthalates
- Quantify chemicals in blood/urine samples
- Limits: specificity, background data
- Newer = chromatography and mass spectrometry
Why these approaches?

- Identify priority of diseases, environmental factors, and genetic determinants
- Identify target study population
- Genotyping can aid in process
- Targeted exposure assessment is necessary
Future studies

- New methods can:
  - Provide sensitivity areas
  - Develop baseline data on exposure factors
  - Improve exposure-model simulations

- Personal genetic information necessary?
  - Ethical?

- Technology can lead to better health research