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3028.0 Building a National Biomonitoring System

Epidemiological Considerations for Biomonitoring

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The views expressed in this presentation are my own and do not reflect the official positions of the State of California

Presenter Disclosures

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has


No relationships to disclose

Biomonitoring Benefits Public Health




Photo: www.parenthood.com/2010/03/25/hyperic-acidosis-heroin.html; www.wikiwand.com/wiki/Heroin

California Environmental Contaminant Biomonitoring Program



- Determine levels of chemicals in Californians
- Establish trends in the levels over time
- Assess effectiveness of public health efforts and regulatory programs

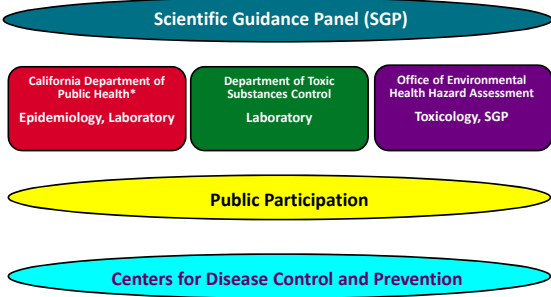


CA Health and Safety Code, Article 8, Section 105440 et seq., 2006

http://www.cdph.ca.gov/multimedia/biomonitoring/pdf/bi_1379_bill_20060929.pdf

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Biomonitoring California Structure



Scientific Guidance Panel (SGP)

- California Department of Public Health*
Epidemiology, Laboratory
- Department of Toxic Substances Control
Laboratory
- Office of Environmental Health Hazard Assessment
Toxicology, SGP

Public Participation

Centers for Disease Control and Prevention

*Lead Agency

www.biomonitoring.ca.gov


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Priority Chemical Categories

Recommended by the Scientific Guidance Panel

- Brominated and chlorinated compounds used as flame retardants
- Polybrominated diphenyl ethers (PBDE)
- Cyclosiloxanes
- Diesel Exhaust
- Environmental Phenols
 - BPA
 - Triclosan
 - Parabens
- Metals
- Perchlorate
- Perfluorochemicals
- Pesticides
 - Herbicides
 - Organochlorine Pesticides
 - Organophosphate Insecticides
 - Pyrethroid Pesticides
- Phthalates
- Polychlorinated biphenyls (PCB)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Tobacco Smoke

<http://oehha.ca.gov/multimedia/biomonitoring/pdf/PriorityChemCurrent.pdf>



Biomonitoring California: Unique Requirements

- Scientifically-based surveys
 - Community-based
 - Representative of California population
- Participants must receive results that are meaningful
- Public involvement



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Why A State Biomonitoring Program?

- NHANES is not representative of states
- California has distinctive:
 - Demographics—12% Asian, 26% foreign born
 - Exposures—diet, furniture standards
 - Exposure reduction efforts—air pollution control
- Part of a National Biomonitoring System*

* Association Of Public Health Laboratories
http://www.aphl.org/policy/Documents/2010/Policy_2010March_BiomonitoringPositionStatement.pdf

Epidemiological Components of All Biomonitoring Projects and Programs

- **Planning**
- **Implementing**
- **Communicating**
- **Use data to inform public health action**



Planning a Biomonitoring Project

- Establish goals and objectives
- Select target population
- Select chemical analytes
- Develop protocols
- Additional exposure assessment
- Ethics, privacy, consent
- Interpret results
- Return results to participant
- Identify stakeholders, partners, community

Planning: General Considerations

- Legislative mandates
- Funding
- Collaboration/Partners



These factors are determined by state/local conditions

Goals and Objectives Guide the Sampling Plan

- **Broad**
 - **Population surveillance**
 - National Health and Nutrition Examination Survey (NHANES)
- **Narrow**
 - **Targeted community investigations**
 - "East Metro PFC Biomonitoring Study"
 - Minnesota Department of Public Health
 - **Rapid incident response**
 - **Research support**
 - Hypothesis-based
 - Validation of laboratory methods

Target Population

Factors to consider

- Purpose of project or program
- Population at risk of exposure and potential adverse health effects
- Eligibility criteria
- Ethical factors
 - Age, ability to consent
- Resources required to access population

Biomonitoring California

Legislation Incorporates Epidemiology

- “Individuals selected to participate in the biomonitoring program shall reflect the age, economic, racial, and ethnic composition of the state. Other selection criteria may be applied, as appropriate, for studies of specific populations.”

http://www.oehha.ca.gov/multimedia/biomon/pdf/sb_1379_bill_20060929.pdf

Biomonitoring California

Legislation Incorporates Epidemiology

- “Individuals selected to participate in the biomonitoring program shall reflect the age, economic, racial, and ethnic composition of the state. Other selection criteria may be applied, as appropriate, for studies of specific populations.”
- Population
 - Representative sample of Californians
 - Geographically or non-geographically based community
- Methods
 - Scientifically-based surveys

http://www.oehha.ca.gov/multimedia/biomon/pdf/sb_1379_bill_20060929.pdf

Strategies for Biomonitoring

“Representative Sample of Californians”

N-HANES Model

Contracted with CDC National Center for Health Statistics to develop statewide representative survey

- Pros:
 - Scalable operations plans
 - Develop California database of chemical results
 - Infrastructure to maintain program
- Cons:
 - Cost of program: estimated \$9-10 million per year
 - Cost of IT systems to support this program: one-time costs of approximately \$18 million; \$3 million annual operation

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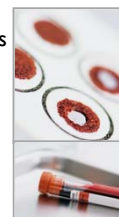
Alternative Approaches to Statewide Representative Sampling

- Utilize existing statewide samples
- Targeted community studies
- Regional sampling



Existing Statewide Samples

- Dried blood spots
 - Pro: collected from over 99% of infants born in CA
 - Con: group (pooled) analyses
- Maternal alpha-fetoprotein in serum
 - Pro: collected from 70-80% of pregnant women
 - Con: group (pooled) analyses



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Targeted Population Studies



Maternal and Infant Environmental Exposure Project (MIEEP)*

- Convenience sample of <100 pregnant women who received prenatal care at a county hospital
 - Blood, urine from mothers; cord blood at delivery
 - Extensive questionnaires

*Collaboration with University of California San Francisco and Berkeley

Targeted Population Studies

Firefighter Occupational Exposures Project (FOX)*

- Convenience sample of 101 firefighters undergoing wellness and fitness exams
- Blood and urine
- Brief questionnaire
- Dust sampling at selected firehouses



*Collaboration with UC Irvine and Orange County Fire Authority

Regional Sampling

Biomonitoring Exposures Study (BEST)*

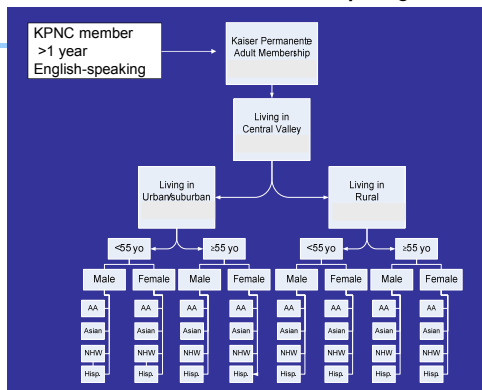
- Stratified random sample of Kaiser clients in Central Valley:
 - Urbanicity, age, gender, ethnicity
- Blood, urine from 100 participants
- Questionnaire



*Collaboration with Kaiser Permanente Northern California (KPNC) Research Program on Genes, Environment, and Health

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BEST Stratified Sampling



Additional Exposure Assessment

• Surveys: self- or interviewer-administered

- Demographics, diet, occupation, household, personal product use
- Targeted to chemicals of interest

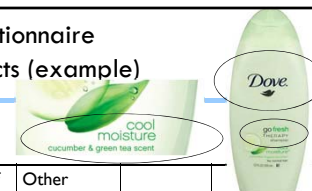
• Administrative records

- Medical or employment records

• Environmental samples

MIEEP At-Home Questionnaire Personal Care Products (example)

Hair Care Products



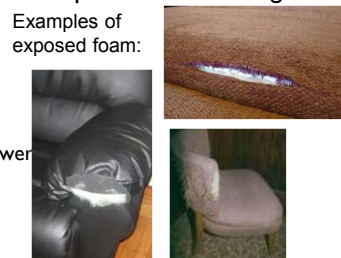
Product	Brand/ Company	Name of Product	Other Information	<input type="checkbox"/> I use this but don't have all the information.	<input type="checkbox"/> I don't use
Shampoo	Dove	Go Fresh Therapy	Cool Moisture Cucumber & green tea scent	<input type="checkbox"/>	<input type="checkbox"/>
Conditioner				<input type="checkbox"/>	<input checked="" type="checkbox"/>

At-Home Questionnaire (example)

- Is any of your furniture treated to be stain or water resistant?
 - Yes
 - No
 - I don't know
 - I don't want to answer

At-Home Questionnaire (example)

- Have you had any furniture in your house like a sofa or chair that had exposed or crumbling foam?
 - Yes
 - No
 - I don't know
 - I don't want to answer



Other considerations

- Ethical issues
 - Informed consent,
 - Including specimen banking
 - Results return
- Data management
 - Protect privacy
 - Keep lab and personal identifiers separate
 - Common database for multiple studies



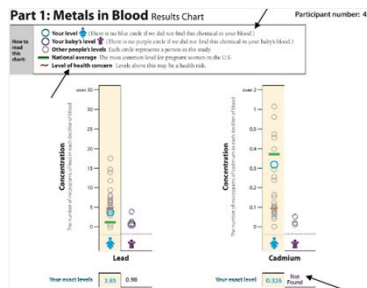
Interpreting Biomonitoring Results

Data Source	Information provided	Limitations
CDC: National Report on Human Exposure to Environmental Chemicals	-Environmental chemicals measured in blood or urine collected from a representative sample of the national population every two years	-Not representative of regions/states -Data may not be available on a biomarker of interest -Time lag -Limited stratification
Occupational Studies	-Biomonitoring studies conducted in workers exposed to a particular chemical or industrial process	-Population, exposures, methods may not be comparable to low-level community exposures
Risk Assessment-based Values or Guidelines	-Information on health-effects observed in toxicological studies -e.g., NOAELs, LOAELs, PELs, MRLs, RIDs, etc. -)	-High degree of uncertainty, may not be based on effects observed in humans
Internal Comparison (for interpreting individual-level data)	-Comparison of an individual's result to the distribution within the study population	-Limited clinical relevance

Returning Biomonitoring Results

- Should we report results when we can't interpret clinical significance?
- Issues to consider:
 - Right to Know
 - Do no harm (fear, worry, stigma caused by results)
 - Empowerment to change behaviors, policy

Results Return: "Best practices"



National Biomonitoring System

- Joint, parallel, multidisciplinary efforts
 - Association of Public Health Laboratories (APHL)
 - Council of State and Territorial Epidemiologists (CSTE)
 - Association of State and Territorial Health Officials (ASTHO)
- CSTE: *Epidemiological guidance for state/local/tribal public health agencies*



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Summary

- Biomonitoring programs are multidisciplinary
- Epidemiology is an integral component
- Develop and share best practices
- Adjust best practices to local needs
- Resources determine project scope, design

Acknowledgments

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> ▪ Biomonitoring California – Josie Alvaran – Frank Barley – Shirley Cao – Sung Choi – Robin Christensen – Dina Dobraca – Ngozi Erondu – Phillip Gonzaga – Tan Guo – Weihong Guo – Suhash Harwani – Sara Hoover – Farfa Kaufman – Gail Krowech – Diana Lee – Michael Lipsett – Nancy Lopez – Amiko Mayeno – Sandy McNeel – Myrso Petreas – Sissy Petropoulou | <ul style="list-style-type: none"> – Jianwen She – Jed Waldman – Berna Watson – Lauren Zeise ▪ SGP members – Asa Bradman – Dwight Culver – Marion Kavanaugh-Lynch – Ulrike Luderer – Thomas McKone – Gina Solomon – Julia Quint – Michael Wilson – (Ed Moreno) • KPNC – Stephen Vandeneeden – Amethyst Leimpeter | <ul style="list-style-type: none"> ▪ UC San Francisco: – Carrie Dickenson – Jackie Schwartz – Naomi Stodand – Tracey Woodruff ▪ UC Berkeley: – Rachel Morello-Frosch – Holly Brown-Williams ▪ UC Irvine – Leslie Israel – Cristy Fan ▪ Orange County – OCFA – Peter Condy – Marty Driscoll – Tom Moon |
|--|---|---|



Questions?

