Expanding the Capability and Capacity for Biomonitoring

at the
Wadsworth Center,
NYS Department of Health

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Biomonitoring California

Scientific Guidance Panel Meeting, November 10, 2011

Wadsworth Center
New York State Department of Health

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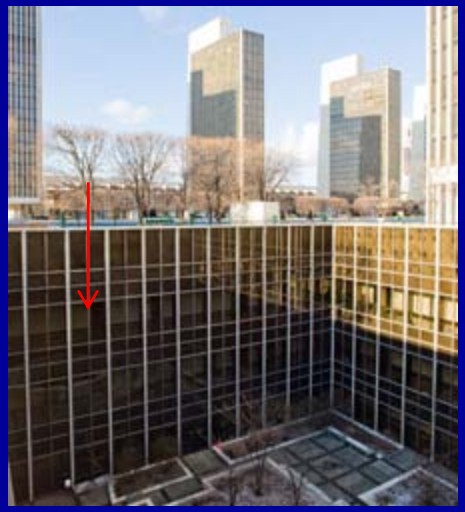


Bigg's Laboratory ESP

David Axelrod Institute

NYS DOH
WADSWORTH CENTER

1,100 staff, including more than 175 doctoral level scientists

900,000 square feet of state-of-the-art facilities in New York state's Capital Region

200 graduate students, postdoctoral fellows and visiting scientists

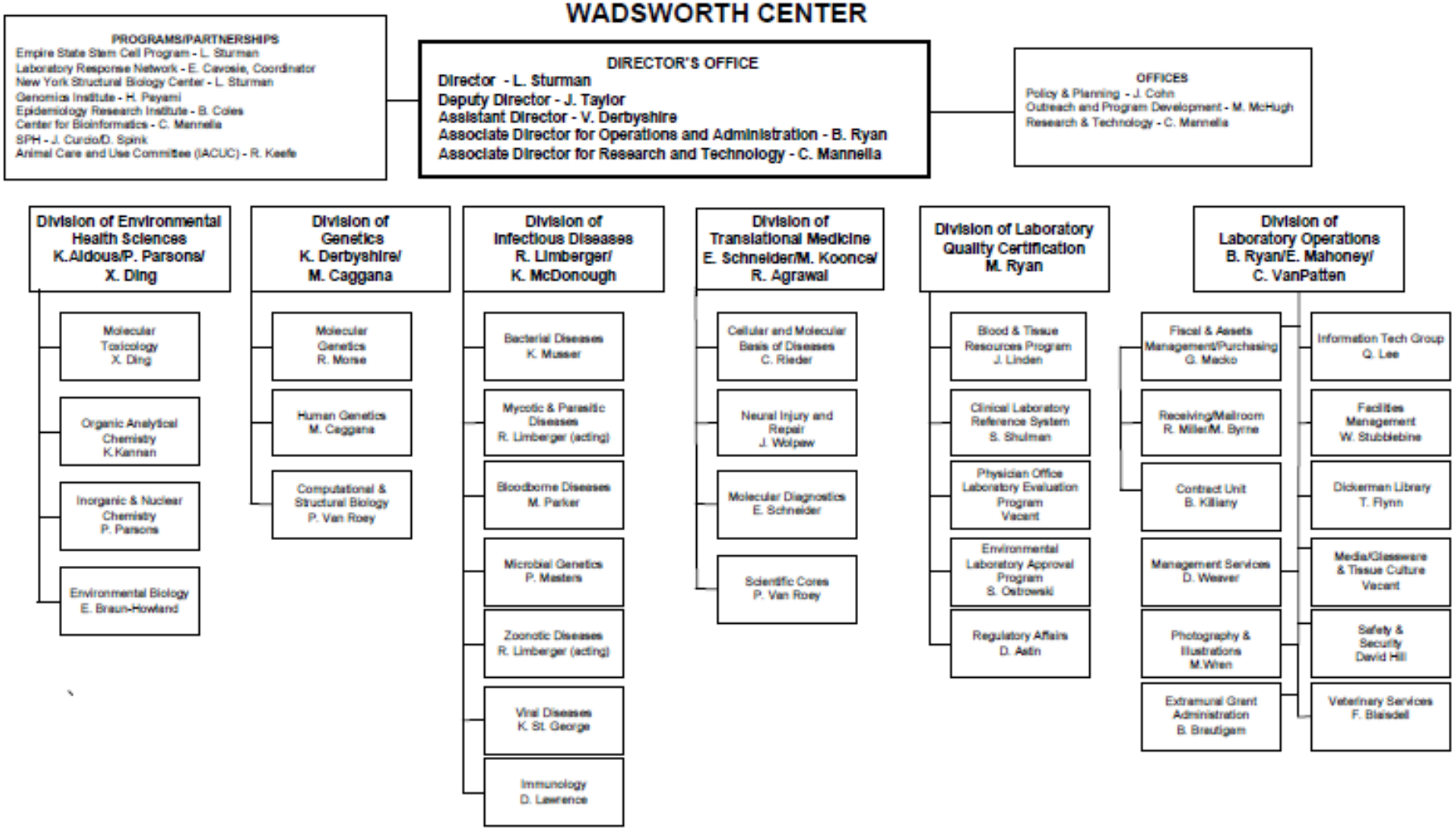
20 laboratories in four scientific divisions:

Griffin Laboratory

Center for Medical Sciences

Wadsworth Center
New York State Department of Health

WADSWORTH CENTER



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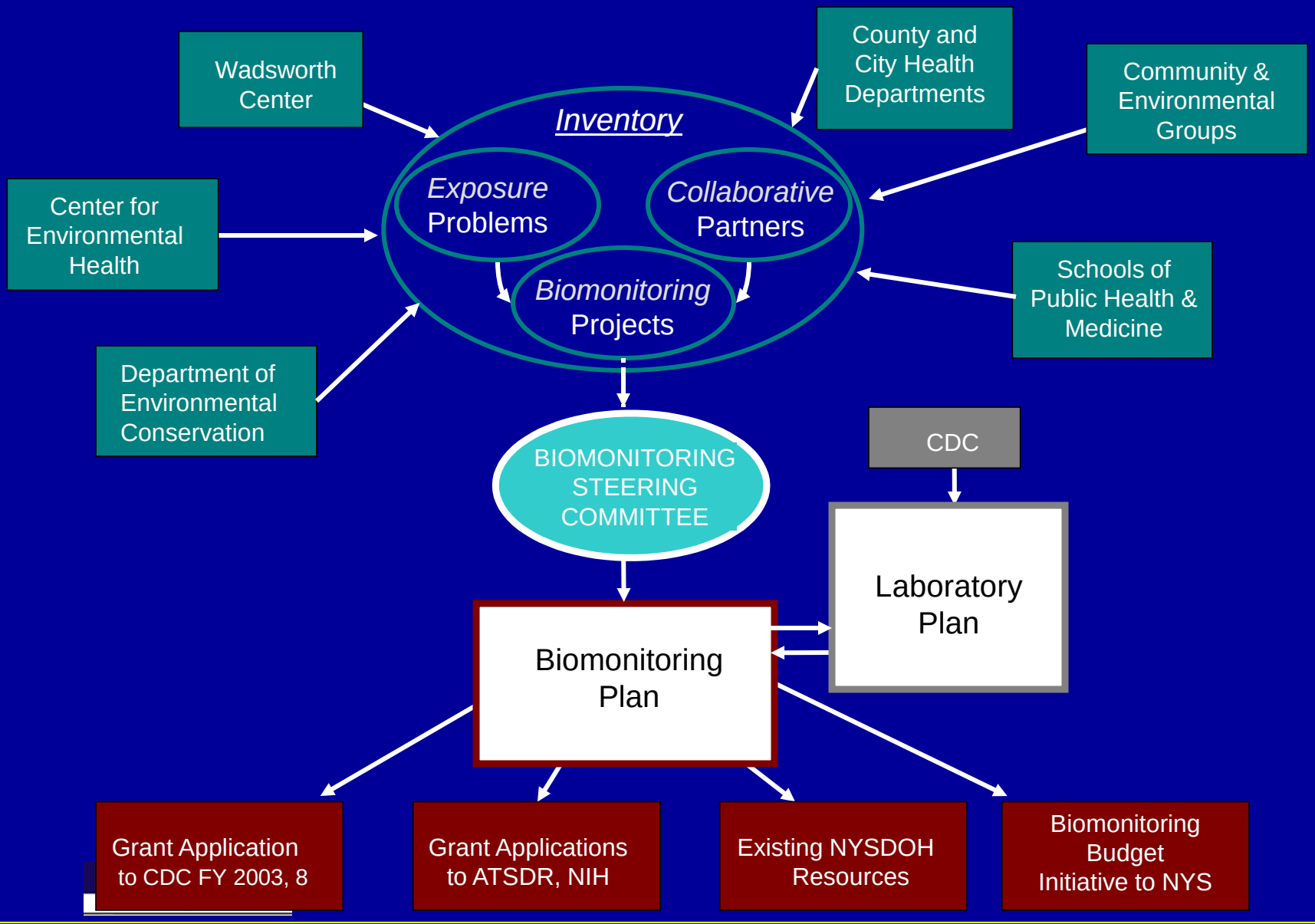
Biomonitoring History at Wadsworth

- 2001 Biomonitoring Planning Grant (2 years)
- 25 states and state consortia funded by CDC
  - development, expansion & implementation of state-based human biomonitoring
- 2003 Biomonitoring Implementation Award
  - 3 Awards (NH, Rocky Mt. Consortium, NY)
- 2003-2008 Biomonitoring Implementation Funding
  - Purchase of GC/HRMS + funded one analytical staff
  - NYS Tobacco Control Program – State Legislation
  - NYC HANES Study (Trace elements, cotinine, pesticides)
  - Pilot Projects (PFC, PBDE, OH-PAHs, Perchlorate, trace element speciation, etc)
- 2009-2014 Expanding NY PHL Capability & Capacity

NEW YORK STATE
BIOMONITORING PLANNING PROGRAM

Wadsworth Center
New York State Department of Health



Biomonitoring Staff

- John Arnason, Ph.D. (trace elements)
- Pam Kruger, Ph.D.
- Michelle Morrissette
- Ying Guo, Ph.D. (organic analytes)
- Li Zhang, M.D.
- Sehun Yun

- Patrick Parsons, Ph.D. (trace elements)
- K. Kannan, Ph.D. (organic analytes)
- Robert Jansing, Ph.D.

- School of Public Health Students

NYS Biomonitoring Program

- Major Projects:
  - Impact of NYS Legislation Banning Smoking in Public Places
    - Working with NYSDOH Center for Community Health Tobacco Program
    - Saliva Cotinine (1,800 self administered sample collection)
  - NYC Health and Nutrition Examination Survey (CHANES)
    - Analysis of 1,811 Whole Blood (Pb, Cd, and Hg)
    - Analysis of 1,820 Urine Hg
    - Analysis of 1,500 Serum Cotinine
  - NYS Anglers Study (Archived samples collected 1996)
    - Collaboration with Dr. John Vena (U. South Carolina) Dr. Michael Bloom (SUNY –Albany)
    - Measurement of PolyBrominated Diphenyl Ethers (PBDEs) in Serum[1].
  - Use of NBS Blood Spots
    - Tracking Perfluorinated Compound (PFCs) levels over last 10 years[2].

1. Exploratory assessment of sport fish consumption and polybrominated diphenyl ether exposure in New York State anglers. H.M. Spliethoff, M.S. Bloom, J. Vena, J. Sorce, K.M. Aldous and G. Eadon. Environ. Res. (2008)
2. Use of Newborn Screening Program Blood Spots for Exposure Assessment: Declining Levels of Perfluorinated Compounds in New York State Infants H.M. Spliethoff, L. Tai, S. Shaver, K.M. Aldous, K. Pass, K. Kannan and G. Eadon. Environ. Sci. Technol (2008) 42, 5361-5367.

NYS Current Biomonitoring Program Specific Aims

1. Expand number of NYC HANES analytes for Persistent Organic Contaminants
2. Expand number of NYC HANES analytes for Inorganic Compounds
3. Assess Exposure to Depleted Uranium (DU) in NY state residents impacted by industrial site
4. Methyl Mercury exposure of Asian populations in NYC and Albany
5. Pilot studies to develop methods for emerging contaminants in human specimens (Wadsworth/SUNY SPH)

New York City Community HANES (2004)

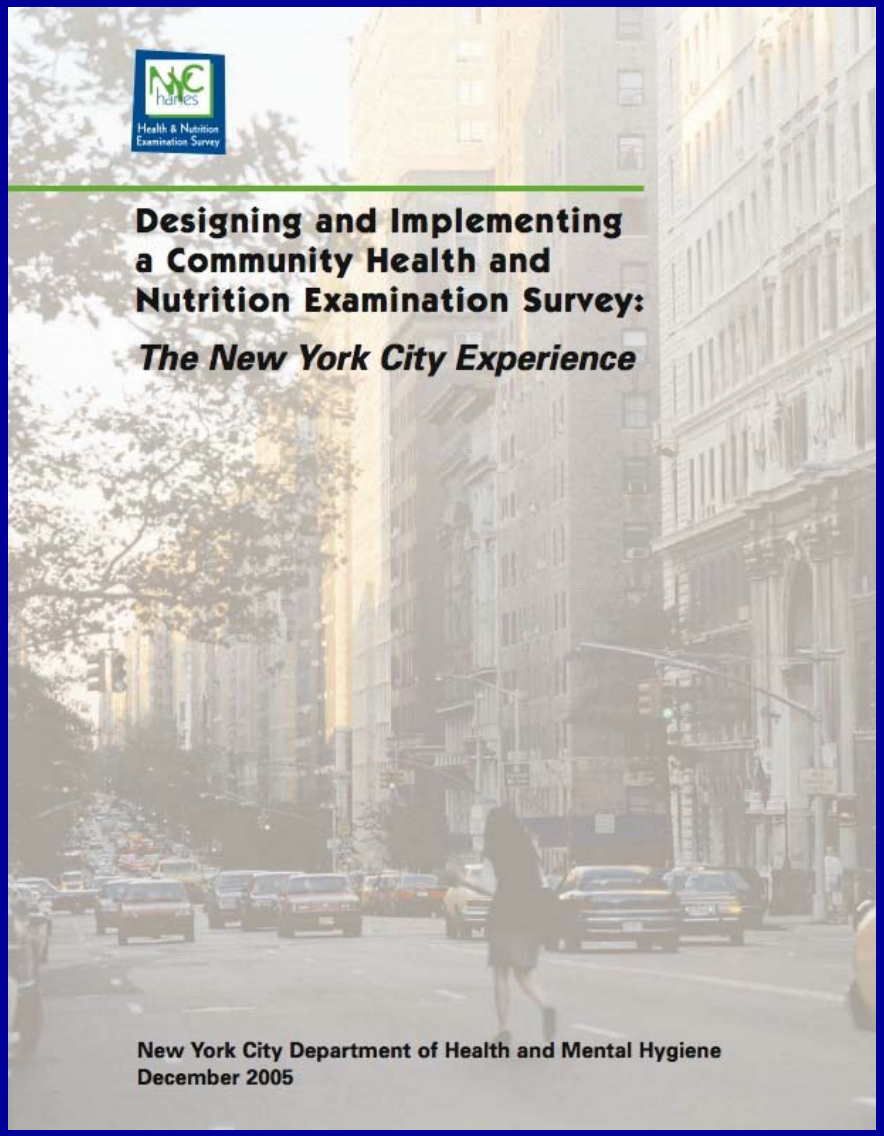
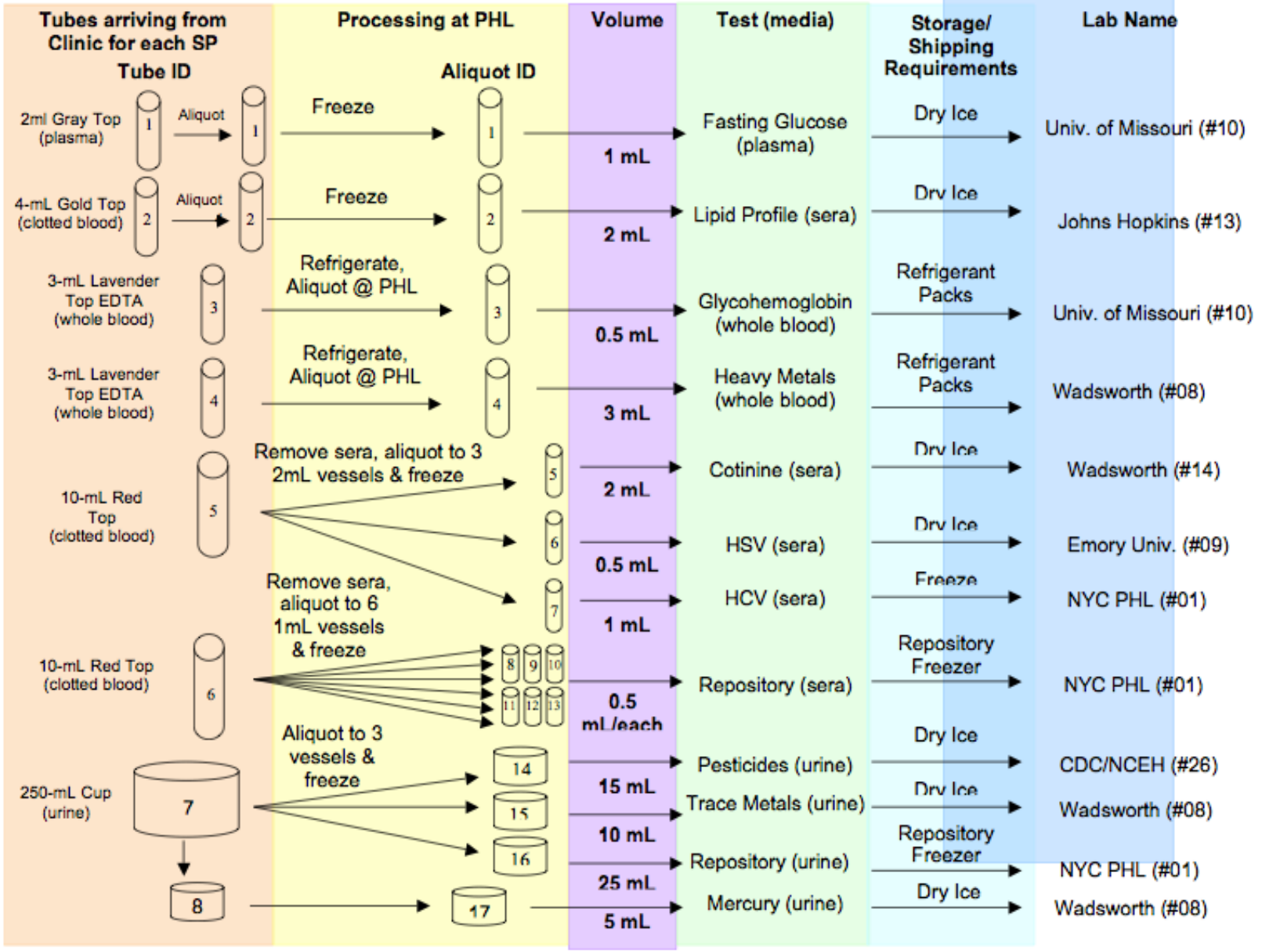


FIGURE 1. NYC HANES SPECIMEN PROCESSING FLOWCHART (3.4.04)



New York City CHANES

- Population-based, cross-sectional survey of ~2000 civilian, non-institutionalized adults.
- Conducted Jun 2004 – Dec 2004
- Serum Cotinine measured in ~1,800 people
- Analyses by LC/MS/MS
- Blood metals (Pb, Cd and Hg) and Urine Hg were measured in ~1,800 people.
- Analyses performed by ICP-MS

Rogers, HS, Jeffery, N., Kieszak, S., Fritz, P., Spliethoff, H., Palmer, CD., Parsons, PJ, Kass, DE, Caldwell, K., Eadon, G., Rubin, C. 2008. Mercury exposure in young children living in New York City. J Urban Health: Bulletin of the New York Academy of Medicine. 2008 Jan;85 (1):39-51.

W. McKelvey, R.C. Gwynn, N. Jeffery, D. Kass, L.E. Thorpe, R.K. Garg, C.D. Palmer, P.J. Parsons, A biomonitoring study of lead, cadmium, and mercury in the blood of New York city adults, Environmental Health Perspectives 115 (2007) 1435-1441.

Ellis, J.A., Gwynn, C., Garg, R. K., Philburn, R., Aldous, K.M., Perl, S. B., Thorpe, L. and Frieden, T. R. Secondhand Smoke exposure among nonsmokers nationally and in New York City, (2009) Nicotine and Tobacco Research (online April 7, 2009)

Objectives for the CHANES Archived Samples

- Organic Analytes
  - Complete analysis of 1,000 sera for PCBs, OC, PBDEs
  - Complete analysis of 1,000 urines for OH-PAHs
  - Method development/validation for phthalate metabolites, Bisphenol A and Perchlorate.
- Inorganic Analytes
  - Complete analysis of 1,876 urines for 17 trace elements (NHANES + As, Cr,Zn, Cu, and Mn) Q- ICP-MS
  - Method development and analysis of 1,847 whole blood for Se and Mn using SF –ICP-MS
  - Develop blood Hg speciation method using GC- ID ICP-MS and analyze 438 blood samples >5 ug/L total Hg
  - Develop urine As speciation method using LC- ICP-MS and analyze ~500 urine sample >40 ug/L total As

Requirements for Reaching Goals

- Maintain trained staff, Hire additional staff (funding)
- Access to sensitive instrumentation (funding)
- Clean Laboratory, biohoods
- Develop and Validate Biomonitoring methods
- Access to Standards and Reference Materials
- Enhance sample throughput through automation
- Ongoing staff training at CDC
- Project development with collaborators (EPHT)
- Pilot studies

Challenges of Biomonitoring

- Develop study, obtain IRB approval and funding
- Cost of sample and data collection
- Samples are complex
- Low concentration of Target compound(s)
- Sample treatment and preparation for analysis (contamination)
- Standards and reference material
- Instrumentation expensive to operate and maintain
- Skilled experience staff

Current Resources for Biomonitoring

- Trained Staff – (investment)
- Facilities – Biosafety Hoods, Clean Rooms
- Instrumentation (dual-use)
  - detection
  - sample preparation
  - automation – high throughput
- Network(s)
  - for collaboration, support and expertise

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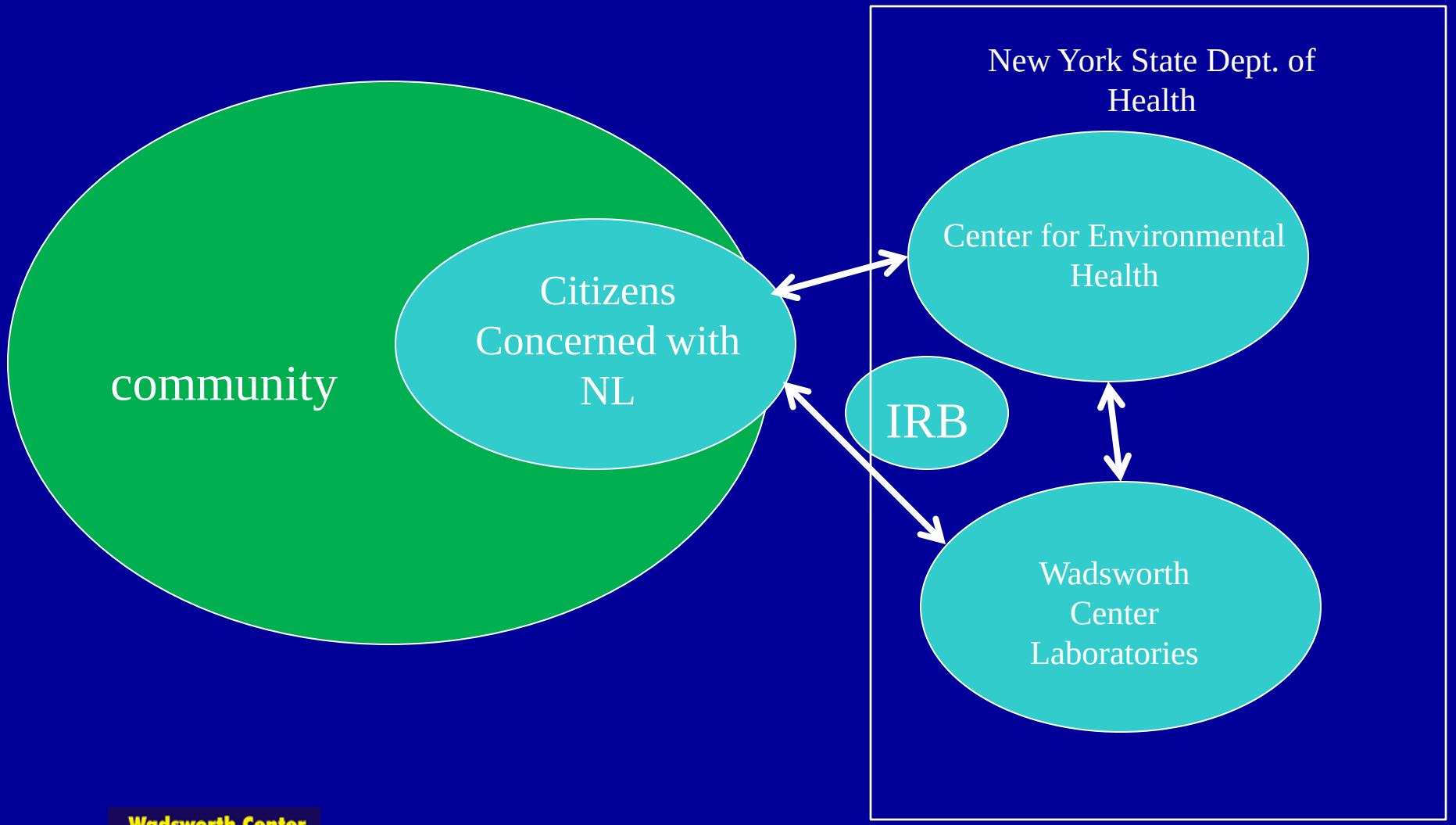
Project Organization



DU Study (National Lead)

- Validation of CDC method for uranium isotopes in urine*
- Development of new method for uranium isotopes in whole blood
- Development of sampling protocol
- Community outreach and IRB approval
- Sample collection expected to begin before end of 2011.

* Pappas et al. 2006

Ongoing Work

- Validation of CDC method for uranium isotopes in urine (Pappas et al. 2006)
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Target Chemicals

- Persistent organic pollutants in serum and other matrices: PCBs, OC pesticides and brominated flame retardants such as polybrominated diphenyl ethers
- Organophosphate pesticide metabolites in urine
- PAH metabolites in urine
- Phthalate esters and their metabolites in urine
- Perfluorinated compounds in serum
- Bisphenol A in serum and urine
- Cotinine in serum and saliva
- Perchlorate, phytoestrogens, thyroid hormones, creatinine, benzophenone/benzotriazole, organotin compounds, musks, new BFRs, emerging environmental chemicals.

Biomonitoring is an essential component of the National Environmental Public Health Tracking Network.

- EPHT must include data on environmental hazards, human exposure, and health effects. The most health-relevant method of determining human exposure to environmental hazards is biomonitoring.

(CDC website 1/26/2011)

Acknowledgements

- Kurunthachalam Kannan, Ph.D.
- Robert Jansing, Ph.D.
- Patrick J. Parsons, Ph.D.

- NYC DOHMH
- NYS Center for Environmental Health
- Funding and assistance from CDC

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