

# **Human Biomonitoring in Israel: Recent Results and Developments**

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# Israel Human Biomonitoring Study (2011): Objectives

- Measure urinary levels of several environmental contaminants in the Israeli population, compared with other international populations



Cotinine



Organophosphate Pesticides



Polycyclic Aromatic Hydrocarbons



Bisphenol A



Phthalates

- Identify demographic, behavioral, and dietary predictors of exposure to these contaminants

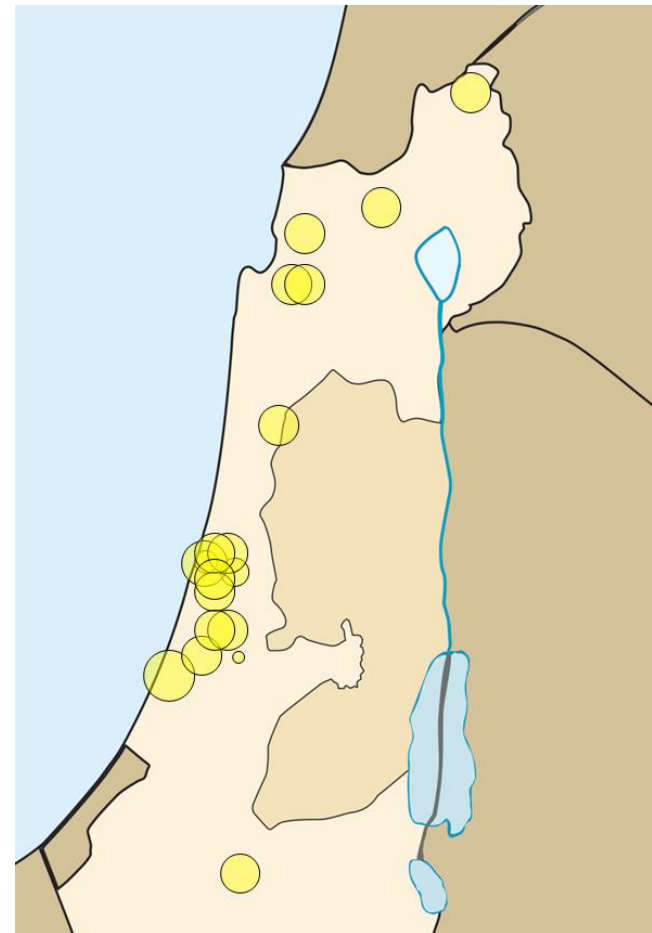
# Israel Human Biomonitoring Study (2011)

## Methods and Study Population

### Methods:

- Participants recruited in February – June 2011
- 248 participants from 5 regions in Israel, ages 20 – 73, various ethnic populations
- Spot urine sample and in depth interview (health and nutrition)
- Urine samples analyzed at University of Erlangen – Nuremberg in Germany

*Recruitment Location of Participants*



# Israel Human Biomonitoring Study (2011)

## Summary of Major Findings

- Socioeconomic status (education, income) predictor of increased exposure to OP pesticides and BPA, and of decreased exposure to cotinine
- Dietary predictors identified for BPA, OP pesticides, and PAH metabolites (in future, need for targeted questions to identify dietary predictors)

### *Selected References:*

*Berman T, Goldsmith R, Göen T, Spungen J, Novack L, Levine H, Amitai Y, Shohat T, Grotto I. Int J Hyg Environ Health. 2014*  
*Levine H, Berman T, Goldsmith R, Göen T, Spungen J, Novack L, Amitai Y, Shohat T, Grotto I. Int J Hyg Environ Health. 2015*

# Israel Human Biomonitoring Study (2011)

## Summary of Major Findings

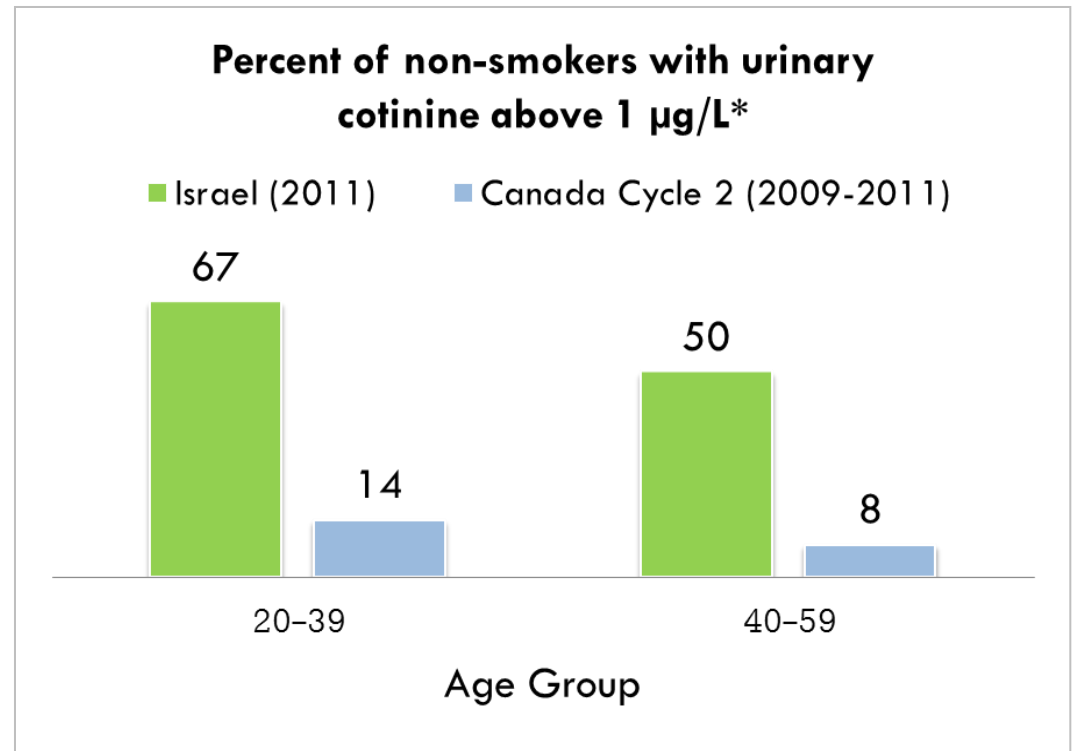
- Contaminants as potential public health cause for concern and priority for public health policy intervention based on:

|                 | <b>Comparison to international populations</b> | <b>Comparison to health based threshold values*</b> |
|-----------------|--|---|
| Cotinine        | ↑  | NA  |
| OP pesticides   | ↑  | NA  |
| BPA             | ↔  | ↓   |
| Phthalates      | ↑  | ↓   |
| PAH metabolites | ↔  | NA  |

\* HBM-1 and Biomonitoring Equivalent values

# Exposure to Environmental Tobacco Smoke

- First data on urinary cotinine concentrations collected in Israel
- Findings indicated widespread exposure to environmental tobacco smoke



\* Canadian level of detection

Reference: Levine H, Berman T, Goldsmith R, Göen T, Spungen J, Novack L, Amitai Y, Shohat T, Grotto I. *Int J Hyg Environ Health*. 2015

Data in Figure from Health Canada (2013)

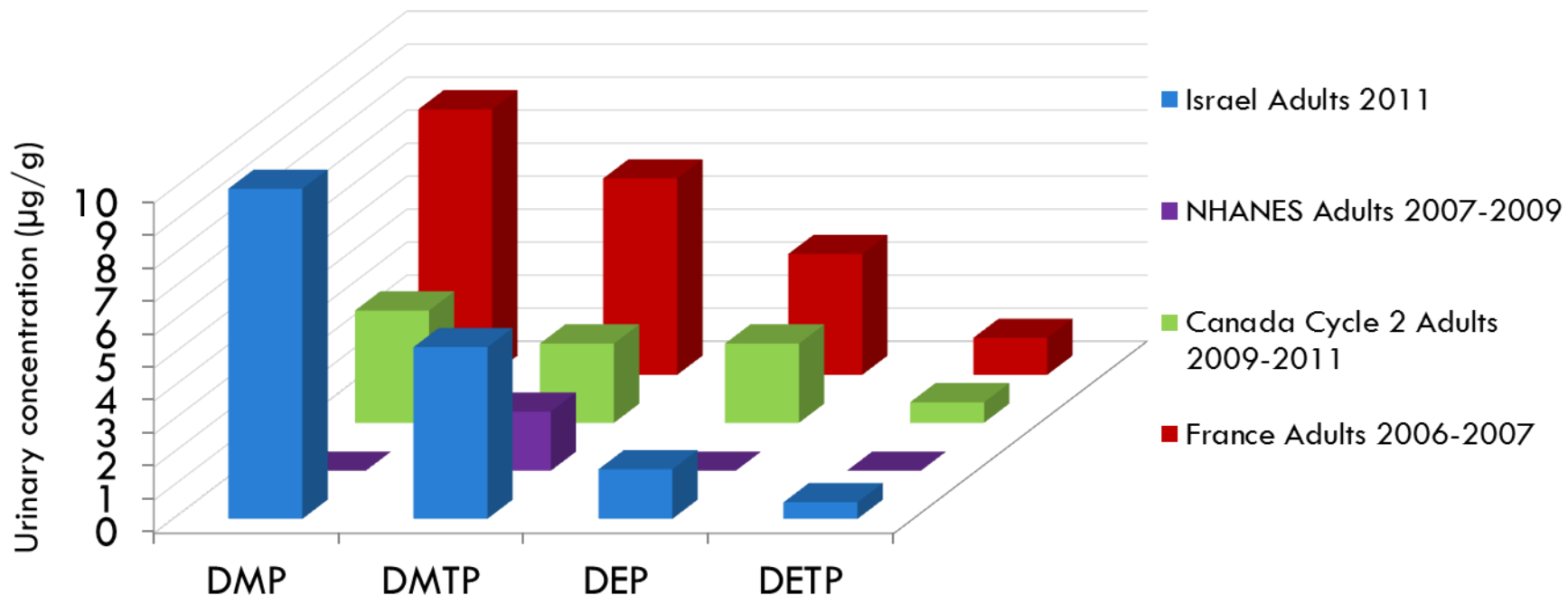
# Policy Implications of Environmental Tobacco Smoke HBM Findings

- Data used to support legislation to expand smoking ban in public places (open spaces such as stadiums, railway platforms)



# Exposure to Organophosphate Pesticides

Median Creatinine Adjusted Urinary Dialkylphosphate Concentrations in Israel and other International Populations



Reference: Berman T, Goldsmith R, Göen T, Spungen J, Novack L, Levine H, Amitai Y, Shohat T, Grotto I. *Environ Int.* 2013

Data in Figure from: CDC (2015), French Institute for Public Health Surveillance (2010), Health Canada (2013)



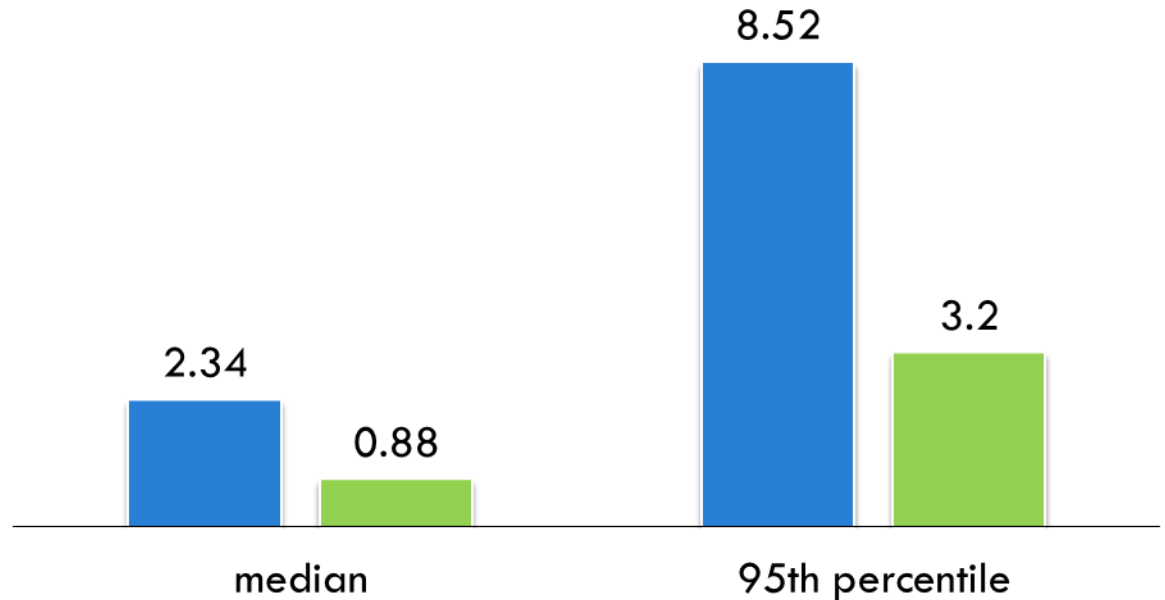
# Exposure to Chlorpyrifos Metabolite TCPy (Organophosphate Pesticide)

- Findings indicated high levels of exposure to chlorpyrifos in Israel compared to the US



**Median (and 95 percentile) creatinine adjusted urinary concentrations in Israel and US Adults**

■ Israel Adults 2011    ■ NHANES Adults 2009-2010



# Policy Implications of Organophosphate Pesticide HBM Findings

## Phased out or Restricted Pesticides in Plant Protection in Israel, 2012-2014

| Substance          | Phased Out | Limited to Critical Uses |
|--------------------|------------|--------------------------|
| Azinphos methyl    | X          |                          |
| Acephate           | X          |                          |
| Parathion methyl   | X          |                          |
| Fenthion           | X          |                          |
| Oxydimethon methyl | X          |                          |
| Prothiophos        | X          |                          |
| Cadusafos          | X          |                          |
| Diazinon           | X          |                          |
| Dichlorvos         | X          |                          |
| Metamidophos       | X          |                          |
| Methidathion       | X          |                          |
| Fenamiphos         |            | X                        |
| Pirimiphos methyl  |            | X                        |
| Ethephon           |            | X                        |
| Tolclophos methyl  |            | X                        |
| Chlorpyriphos      |            | X                        |
| Dimethoate         |            | X                        |



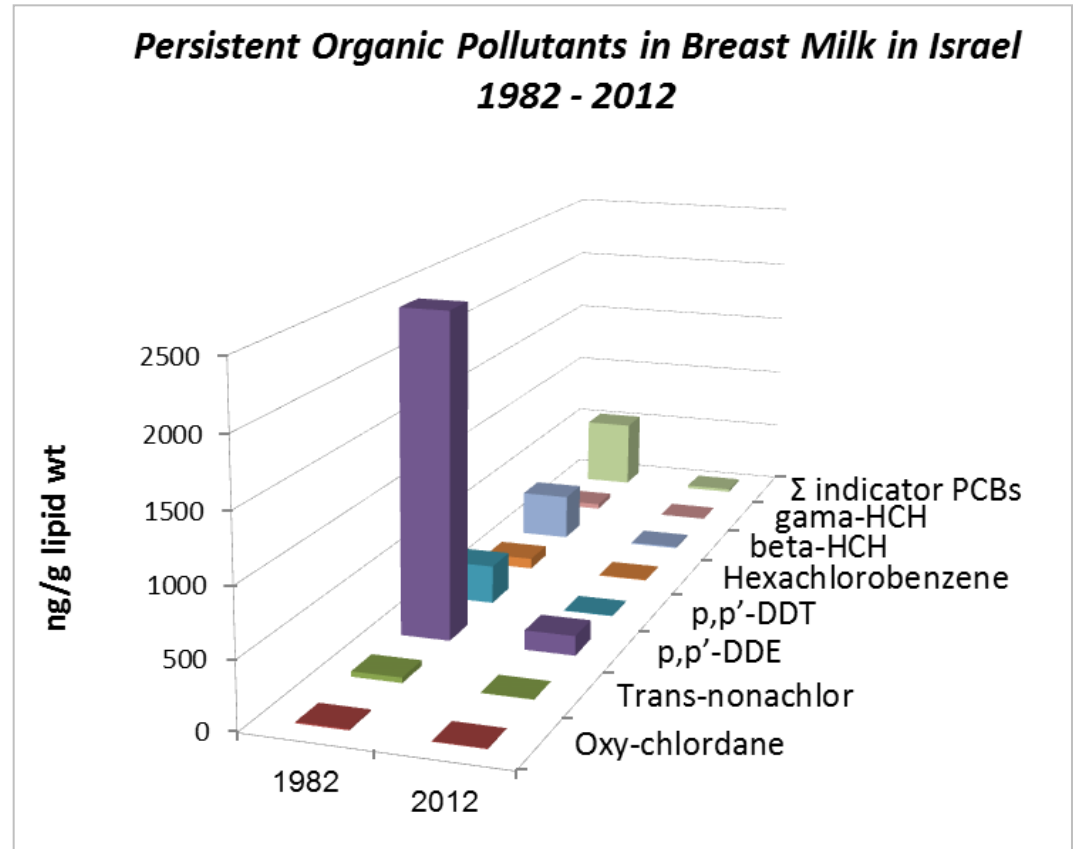
# HBM Studies Underway in Israel: National Health and Nutrition Survey (2014-2016)

- Includes 1500 children and 4000 adults
- Detailed information on dietary intakes (24 hour recall and food frequency questionnaires); anthropometric data (weight, height, others)
- Questionnaire includes: SES, smoking, physical activity, alcohol, medication use, self reported presence/absence of a wide variety of medical conditions
- Urine samples will be analyzed for pesticides and cotinine in sub-sample of 200 adults and 100 children
- Opportunity to explore associations between HBM and health data

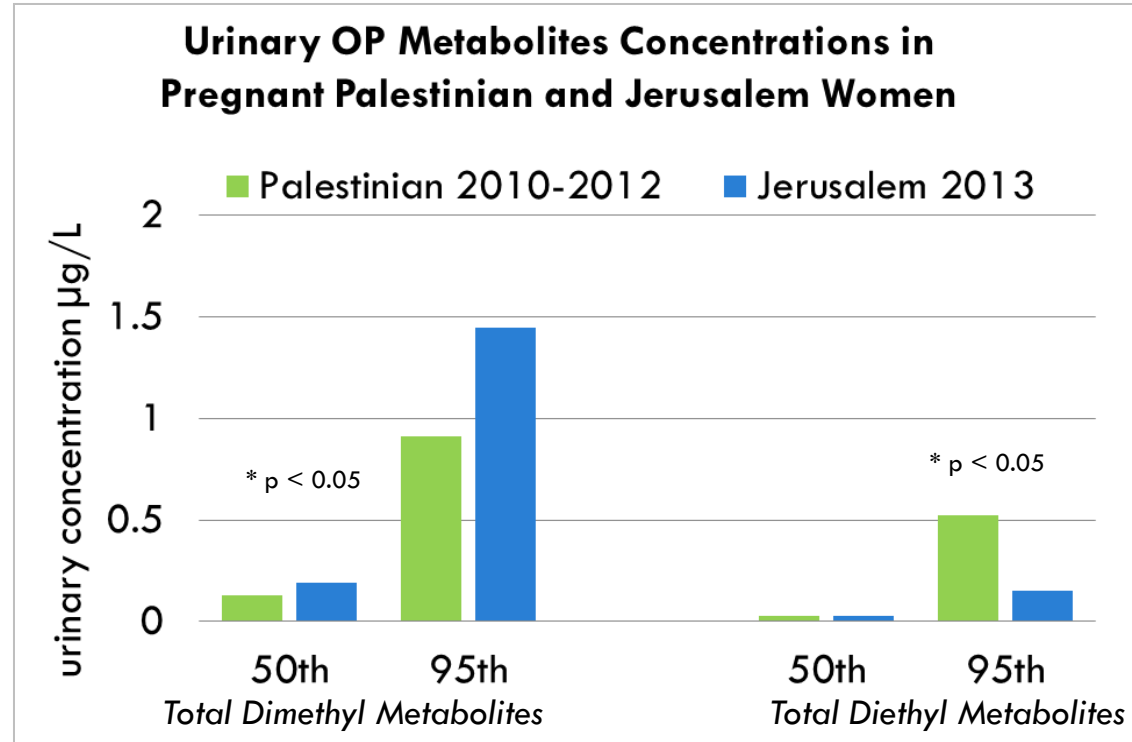
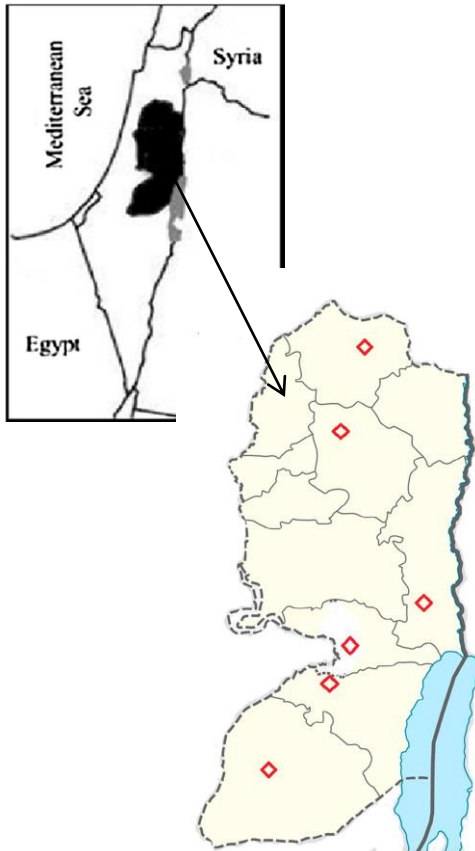


# Persistent Organic Pollutants in Breast Milk

- Levels of organochlorine compounds decreased in 30 years since previous breast milk survey in Israel
- Current levels of indicator PCB and DDT in Israel low compared to many European countries
- Levels of PBDEs higher in Israel compared to Belgium and Ireland but lower than US



# Exposure to Organophosphate Pesticides in Pregnant Palestinian Women



N = 148 for Pregnant Palestinian women

N = 73 for Pregnant Jerusalem Women

# Exposure to BPA and Phthalates in a Vegetarian Community (A Pilot Study)



- 42 participants from a Vegan – Vegetarian Community in Northern Israel (Amirim)
- Very high intake of fruits and vegetables compared to general Israeli population
- High intake of home cooked food, no meat intake (potential source of DEHP)
- Findings
  - ❖  $\sum$  DEHP urinary metabolite concentrations significantly lower in Amirim
  - ❖  $\sum$  DINP urinary metabolite concentrations significantly lower in Amirim
  - ❖  $\sum$  DAPs (OP pesticide metabolites) significantly higher in Amirim
  - ❖ TCPy urinary concentrations significantly higher in Amirim
  - ❖ Consumption of organic produce associated with significantly lower urinary DMP






# HBM Studies Underway in Israel: Birth Cohort Studies Using Exposure Biomarkers



| Birth Cohort                                      | Sample | Relevant Contaminants                               | Biological Media   |
|---|--------|---|--|
| Asaf Harofeh/<br>Ichilov Hospital                 | 500    | Brominated Flame<br>Retardants, PCBs,<br>Phthalates | Maternal blood, urine, cord<br>blood, breast milk, paternal<br>blood and urine; infant<br>meconium |
| Hadassah Hospital                                 | 300    | Organophosphate<br>Pesticides,<br>Phthalates        | Maternal and infant urine  |
| Ben Gurion<br>University – Soroka<br>Hospital     | 140    | Heavy metals  | Maternal urine   |
| <i>In Vitro</i> Fertilization<br>Pregnancy Cohort | 30     | <i>To be determined</i>                             | Maternal blood, urine; cord<br>blood, meconium, colostrum  |

# HBM Studies Underway in Israel:

## Research in Environmental Epidemiology and Biomarker Development

| Topic  | Research Partners   |
|--|---|
| Exposure biomarkers (pesticides) and male reproductive health                      | Hebrew University Center for Excellence in Agriculture and Environmental Health, Tel Hashomer  |
| Exposure biomarkers (cotinine, phthalates) and respiratory function in children    | Hebrew University, Asaf Harofeh Hospital, Mount Sinai Hospital (NY)                            |
| Nano-particles in Exhaled Breath Condensate and Respiratory Function in Children   | Tel Aviv Sourasky Medical Center    |
| Lymphocyte cell proliferation (umbilical cord) as exposure biomarker               | Ben Gurion University    |
| Human Exposure to Pharmaceuticals (Carbamezapine in Urine) from Treated Wastewater | Hebrew University Center for Excellence in Agriculture and Environmental Health              |



# HBM in Israel: Future Goals

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- **Joining Regional HBM Program** (European HBM Initiative)
- **National HBM Laboratory**
- **Long Term National Plan** (including public participation)

# Thank You

- Co – Investigators in Israel: **Rebecca Goldsmith, Judith Spungen, Prof. Itamar Grotto, Prof. Tamy Shohat** (Ministry of Health), **Dr. Hagai Levine**, (Hebrew University – Hadassah) **Dr. Lena Novack** (Ben Gurion University)
- Co – Investigator in Germany: **Prof. Thomas Göen** Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine, University Erlangen-Nuremberg, Erlangen, Germany
- **Environment and Health Fund, Jerusalem**
- **Middle East Regional Cooperation US-AID**
- **Dr. Antonia Calafat** (US Centers for Disease Control), **Dr. Dana Barr** (Emory University)
- **Dr. Marike Kolossa – Gehring, Dr. Kirsten Becker** (Federal Environment Agency)