

Biomonitoring for Contaminants in Breast Milk in Alaska Native Women of the Arctic

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Samarys Seguinot-Medina
Environmental Health Researcher
samarys@akaction.org

Sarah B. Petras, MPH
Environmental Health Coordinator
sarah@akaction.org



Environmental Health and Justice in Alaska

Our mission:

To assure justice by advocating for environmental and community health. We believe everyone has a right to clean air, clean water and toxic-free food.

Core Values:

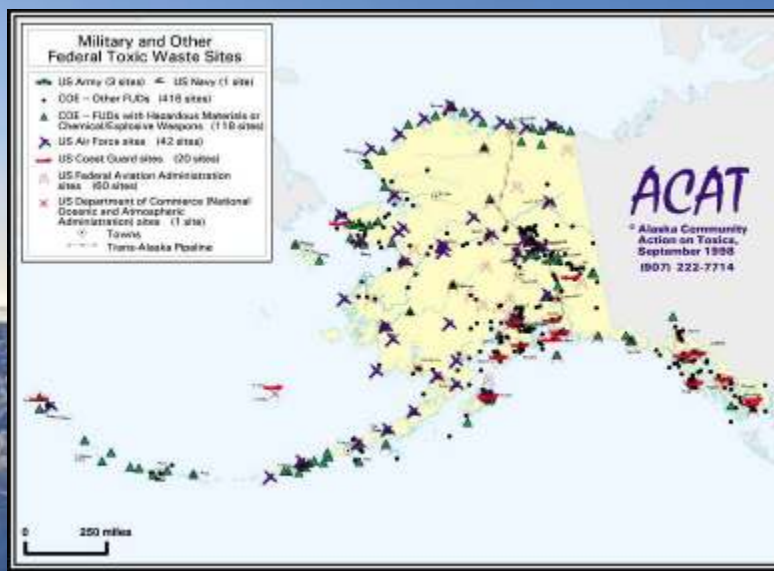
- Community right-to-know
- Environmental justice
- Precautionary principle
- Elimination of the production and release of toxics
- Rights and sovereignty of Indigenous peoples
- Culture of caring and wellness

Addressing Environmental Health Issues in Alaska

- Respond to community calls for assistance
- Conduct community-based participatory research (CBPR)
- Ensure community right-to-know
- Advocate for health and justice through prompting of protective, precautionary local, state, national and international policy changes
- Field and community health investigations
- GIS computer mapping



Military and Other Federal Toxic Waste Sites



Northern Contaminants



- Industrial & agricultural chemicals originating in more southerly latitudes of the Northern Hemisphere end up in the Arctic
- The Arctic serves as a hemispheric sink for persistent organic pollutants (POPs) that volatilize in heat and travel northward via air and ocean currents
- For example, a pesticide used in Mexico may make a series of airborne jumps and arrive in the Arctic in as few as 3 days
- Pesticides and other POPs accrue in the North through global distillation, as the cold conditions and fat-based food web favor retention of pollutants

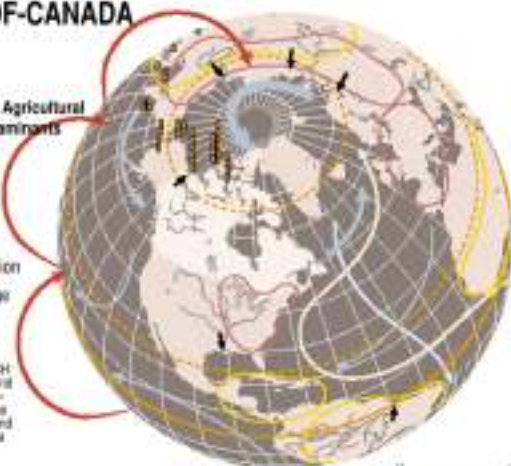


Global Transport of Persistent Chemicals into the Arctic

THE GRASSHOPPER EFFECT AND OUT-OF-CANADA SOURCES

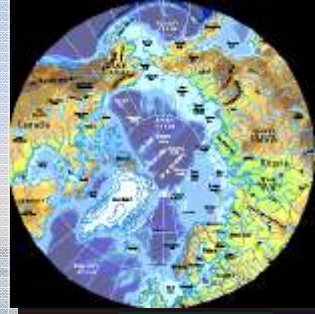
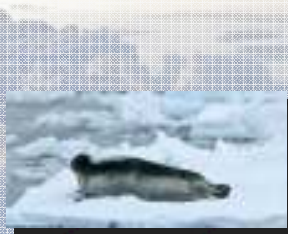
- Source Regions for Agricultural and Industrial Contaminants
- Agricultural
 - Industrial
 - Dominant Air Currents
 - Atlantic Water Circulation
 - River discharge

Concentrations of one HCH isomer have been found to increase from south to north along a line from the Java Sea (off Indonesia and China) to the Beaufort Sea (AMAP, 1987).



Current Use Chemicals in the Arctic

- PBDEs doubling every 7 years in Arctic species (Gabrielsen & Wolkers, 2004; AMAP, 2001)
- Endosulfan, trifluralin, and triallate in snow pack within Arctic national parks
- Fluorinated compounds
- Chlorpyrifos in snow
- Dacthal (herbicide)



Endosulfan

- Organochlorine pesticide (OC) used in agriculture since the 1950s
- Most abundant OC pesticide in global atmosphere
- Used against insects and mites and applied to many crops including cotton, cereals, fruit trees, tea, and coffee.
- According to a 2009 report by the Arctic Monitoring and Assessment Programme, endosulfan (and its degradates) is acutely toxic and occurs ubiquitously in the environment
- Human health effects:
 - estrogenic activity; potential human endocrine disruptor
 - disruption of hormonally mediated processes
 - potential reproductive toxicant in humans
 - some evidence of carcinogenicity
 - some evidence of autism and developmental delays



Polychlorinated biphenyls (PCBs)

- Man-made organic chemical
- Banned in 1979 but still accumulating in Arctic
- Used in hundreds of industrial and commercial applications:
 - electrical
 - heat transfer
 - hydraulic equipment
 - plasticizer in paints
 - plastics
 - rubber products
 - pigments, dyes and carbonless copy paper
 - other industrial applications



PCBs are still among us

- Today PCBs can still be released into the environment from:
 - poorly maintained hazardous waste sites
 - illegal or improper dumping of PCB wastes
 - leaks or releases from electrical transformers containing PCBs
 - disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste
- PCBs may also be released into the environment by burning of some wastes in municipal and industrial incinerators



PCBs Exposure and Health Effects

Exposure:

- Manufacture and use in the US
- Once in the environment, PCBs do not break down easily and therefore may remain for long periods of time cycling between air, water, and soil
- Accumulate in leaves and above-ground parts of plants and food crops
- Absorbed into the bodies of small organisms and fish
- People who ingest fish may be exposed to PCBs that have bioaccumulated in fish

Health Effects in Humans:

- Cancer
- Increase in blood pressure, serum triglyceride, and serum cholesterol

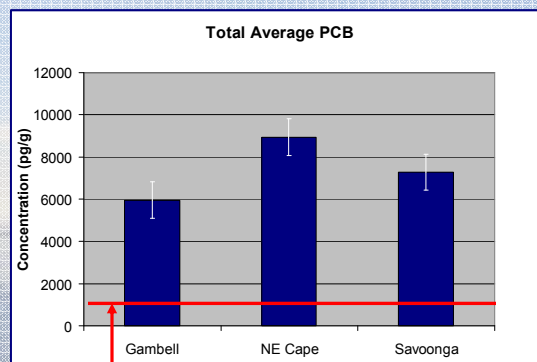
Health Effects in Animals:

- Immune system
- Reproductive system
- Nervous system
- Endocrine system
- Neurological effects

PCBs in Blood Serum of St. Lawrence Island People

- Levels of PCBs in the blood of St. Lawrence Island Yupik people **6-9 times higher** than average in lower-48 populations
- Evidence of PCBs accumulating in the Arctic via global transport
- Military contamination also a significant source

Published in the *International Journal of Circumpolar Health* (Carpenter et al., 2005)



Average for populations in the Lower 48

Polybrominated Diphenyl Ethers (PBDEs)



Photo: Washington Toxics Coalition

What are PBDEs?

- Industrial chemicals used as a flame retardant in consumer electronic plastics, furniture foams, and textiles
- Three common mixtures: penta, octa, and deca
- Belong to chemical class: polyhalogenated aromatic hydrocarbons
- Stable and lipophilic

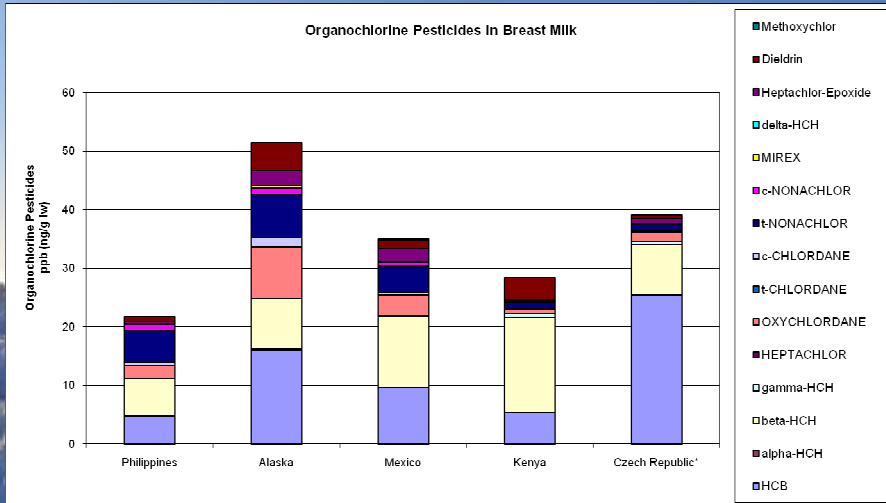
Health Effects:

- Reproductive effects
- In utero exposure associated with increased risk of testicular cancer
- Deca-BDE is listed as possible human carcinogen
- Decreased circulating concentrations of thyroid hormone
- Decrease in thyroid weight

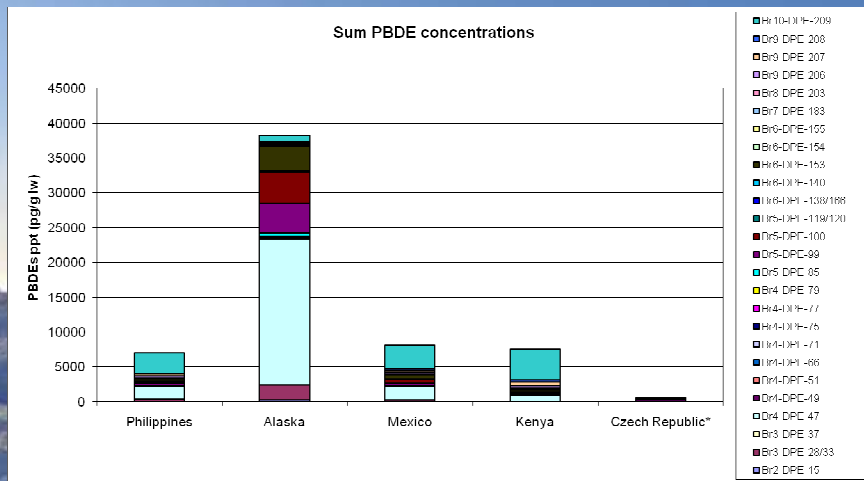
Biomonitoring and Research Efforts to Identify Contaminants in Breast Milk



Mother Earth; Mothers' Milk; Mothers' Stories



Mother Earth; Mothers' Milk; Mothers' Stories



Conclusions of the Mother Earth; Mothers' Milk; Mothers' Stories Project

With care and sensitivity,
communicating results about POPs in
breastmilk can:

1. Help women learn to avoid further exposures through personal choice
2. Create a community of those who have given samples who offer support for breastfeeding and policy change
3. Support a forum where women's voices can be heard, demanding toxic chemical policy reform



Conclusions of the Mother Earth; Mothers' Milk; Mothers' Stories Project



- Power of biomonitoring is based on both the biomonitoring results and the personal stories of those tested.
- By communicating biomonitoring results, an informed and engaged community is created
- When results are not communicated, a tremendous opportunity is lost, and basic human right to know is violated.

Significant Breast Milk Studies

Human biomonitoring has become an integral part of public health research in Europe, where some countries routinely screen citizens for industrial chemicals.

In 1998, studies of Swedish breast milk showed that levels of flame retardants known as PBDEs were **doubling every two to five years**. As a result, Sweden banned PBDEs, and the EU has followed suit beginning this year.

Norén K, Mieronyté D. (1998). Contaminants in Swedish human milk. Decreasing levels of organochlorine and increasing levels of organobromine compounds. *Organohalogen Compounds*. 35:1-4.

Significant Breast Milk Studies

Figure 1. Organohalogen compounds in breast milk in Sweden. Data from Norén and Mieronyté (1) and Guvenius and Norén (2).

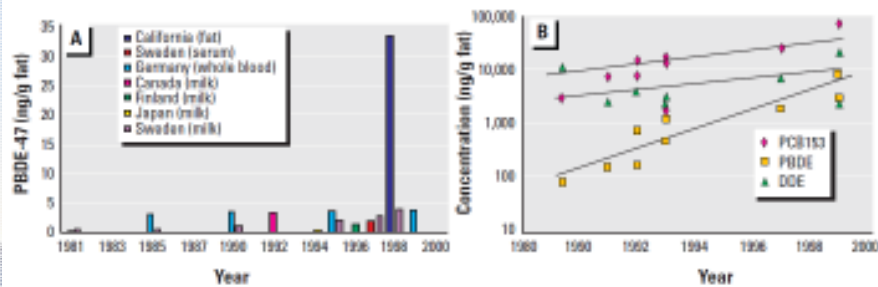
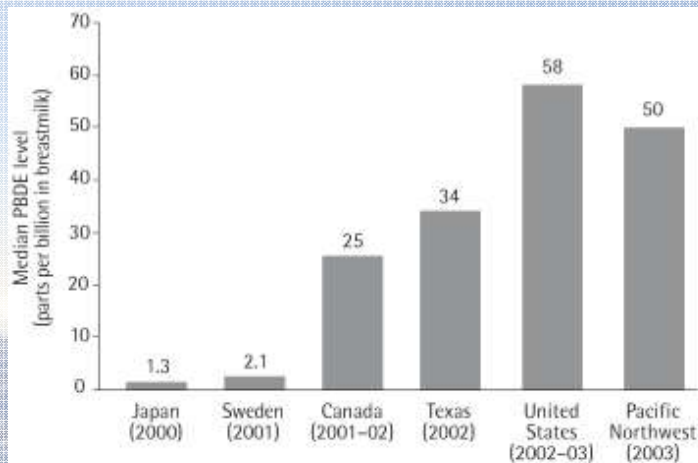


Figure 2. High and increasing levels of PBDEs in California. (A) PBDE levels in humans' regional comparisons. (B) Persistent organic pollutants in harbor seals from San Francisco Bay.

She J, Petreas MX, Winkler J, Visita P, McKinney M, Kopec D. (2002). PBDEs in the San Francisco Bay Area: Measurements in harbor seal blubber and human breast adipose tissue. *Chemosphere*. 46(5):697-707.

Significant Breast Milk Studies



Williams-Derry C, and Abbotts J. *Flame Retardants in the Bodies of Pacific Northwest Residents: A Study on Toxic Body Burden*, Northwest Environment Watch: September 29, 2004.

“When breast milk speaks, people listen!”

“Most important is that breast milk occupies a special place in the public mind: People seem unconsciously to invoke the precautionary principle more readily for chemicals in breast milk than for those in blood, urine, or fat. Because breast milk speaks loudly, catching the public’s attention, body burden data from breast milk can serve as an effective warning system for new chemicals in need of regulatory attention (e.g. PBDEs).”

Hooper K, She J. (2003). Lessons from the Polybrominated Diphenyl Ethers (PBDEs): Precautionary Principle, Primary Prevention, and the Value of Community-Based Body-Burden Monitoring Using Breast Milk. *Environmental Health Perspective*. 111(1):109-114.

Breast Milk Biomonitoring

- Community-based programs to monitor body burdens of POPs using breast milk could be implemented in the US in collaboration with WIC programs
- Such programs emphasize that increasing breast-feeding rates and decreasing POP body burdens are both important ways to improve the health of the infant and child
- Breast milk is invaluable to the infant as a source of nutrition and health, so breast-feeding should be encouraged

Why a Breast Milk Pilot Study in Alaska?

- Currently no published human exposure studies of endosulfan in the Circumpolar Arctic
- No comprehensive breast milk monitoring for POPs in Alaska Native populations
- Alaska Native populations are at risk of higher exposure due to global transport



Breast Milk Pilot Study: Hypothesis

- Women who live in the Alaska Arctic carry a body burden of endosulfan and other organochlorine (OC) pesticides in breast milk at levels that may pose a risk to health
- Endosulfan and other OC pesticides will be found in all breast milk samples

Study Design

- Community-based participatory research
- Alaska Native villages in the Arctic are invited to collaborate
- In collaboration with village health aides, researchers will approach women who are pregnant with their 1st or 2nd child to invite them to participate in the study
- ACAT will conduct training for health aides to assure proper procedures for recruiting potential participants and obtaining informed consent
- Participants (N=40) will provide breast milk samples two to four weeks after the birth of their babies

Study Design

- Samples will be shipped to labs at AXYS Analytical Services in Sidney, British Columbia and University at Albany, NY
- After analysis, Dr. David Carpenter will review results and prepare confidential letters for each participant to inform her about contaminants found
- Summary report for all participating villages will be distributed
- ACAT staff and Dr. David Carpenter will be available to answer questions that participants may have before and after they receive their results

Research Implications

- If this research demonstrates that Alaska Natives have endosulfan in their breast milk despite residing long distances from agricultural sources, the data can be used in efforts to eradicate this deadly pesticide nationally and globally
- There are viable alternatives to endosulfan!
- In the long run, health of people throughout the world will benefit—agricultural laborers, consumers, those who live near production centers, as well as the Indigenous Peoples of the Arctic
- In July 2010, EPA signed a Memorandum of Agreement with the registrants of endosulfan that will result in voluntary cancellation and phase-out of all existing endosulfan uses in the US

Research Implications

- The Stockholm Convention Conference of the Parties will consider the recommendation of its scientific review committee (POPs Review Committee) to add endosulfan for international elimination in April 2011



Research Implications

- Scientific information and policy decisions concerning endosulfan will set a precedent for decisions concerning other currently used pesticides and industrial chemicals
- Many more thousands of chemicals similar to endosulfan should be phased out because they are found in the Arctic environment and adversely affect public health
- Application of science into policy
- **Biomonitoring research creates a sense of urgency to take action to support public health**

What Can We Do?

- Focus on prevention and move beyond early detection and early treatment of disease
- Prevent cancers, reproductive and neurodevelopmental disorders
- Eliminate contribution of toxic chemicals to the development of diseases like diabetes, obesity and cardiovascular disease - growing epidemics
- Reform how chemicals are managed in the US and internationally
- Take immediate action on the most dangerous chemicals (persistent bioaccumulative toxics [PBTs] including endocrine disruptors)
- Hold industry responsible for the safety of its chemicals and products
- Require that chemicals meet safety standards for all people including the most vulnerable (children, pregnant women, and workers)

The Language of the Stockholm Convention

- “Acknowledging that the **Arctic ecosystems and Indigenous communities are particularly at risk** because of the biomagnification of persistent organic pollutants and that contamination of their traditional foods is a public health issue.”
- “Conscious of the need for **global action...**”
- “Acknowledging that **precaution underlies the concerns of all Parties** and is embedded within this Convention.”
- “Determined to **protect human health and the environment** from the harmful impacts of persistent organic pollutants.”





“Our grandmas tell us we're the first environment, that our babies inside of our bodies see through the mother's eyes and hear through the mother's ears. Our bodies as women are the first environment of the baby coming, and the responsibility of that is such that we need to reawaken our women to the power that is inherent in that transformative process that birth should be.”

–Katsi Cook, Traditional Midwife and Healer, Mohawk Nation



Protecting Health, Assuring Justice

info@akaction.net
www.akaction.org
(907) 222-7714 phone
(907) 222-7715 fax

