



Do PBDEs impact maternal thyroid hormones?

Preliminary results from the Chemicals, Health and Pregnancy study (CHirP) in Vancouver, Canada.

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Flame retardant dilemma workshop,
Berkeley, Feb 12 2010.

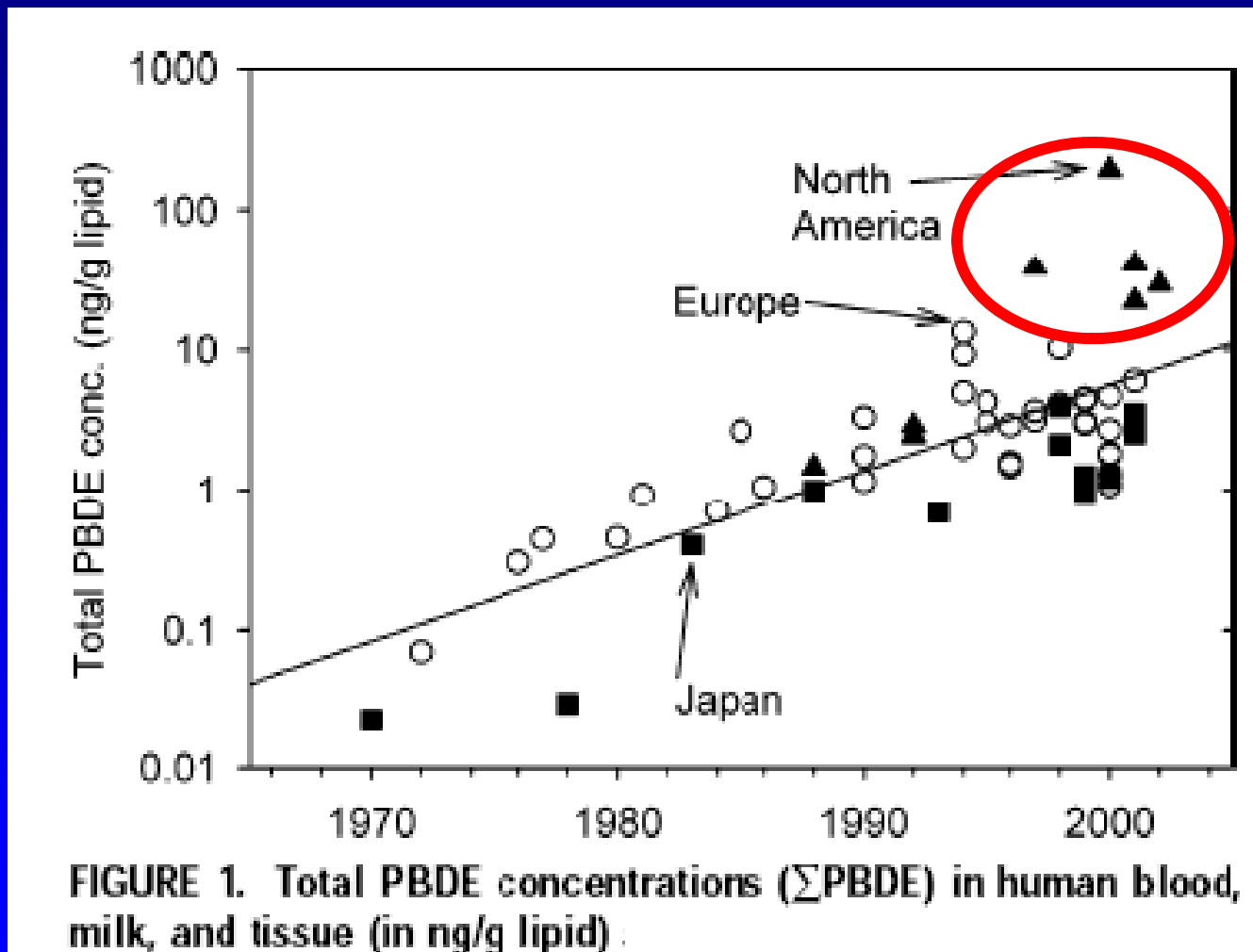


California flame retardant standard TB117

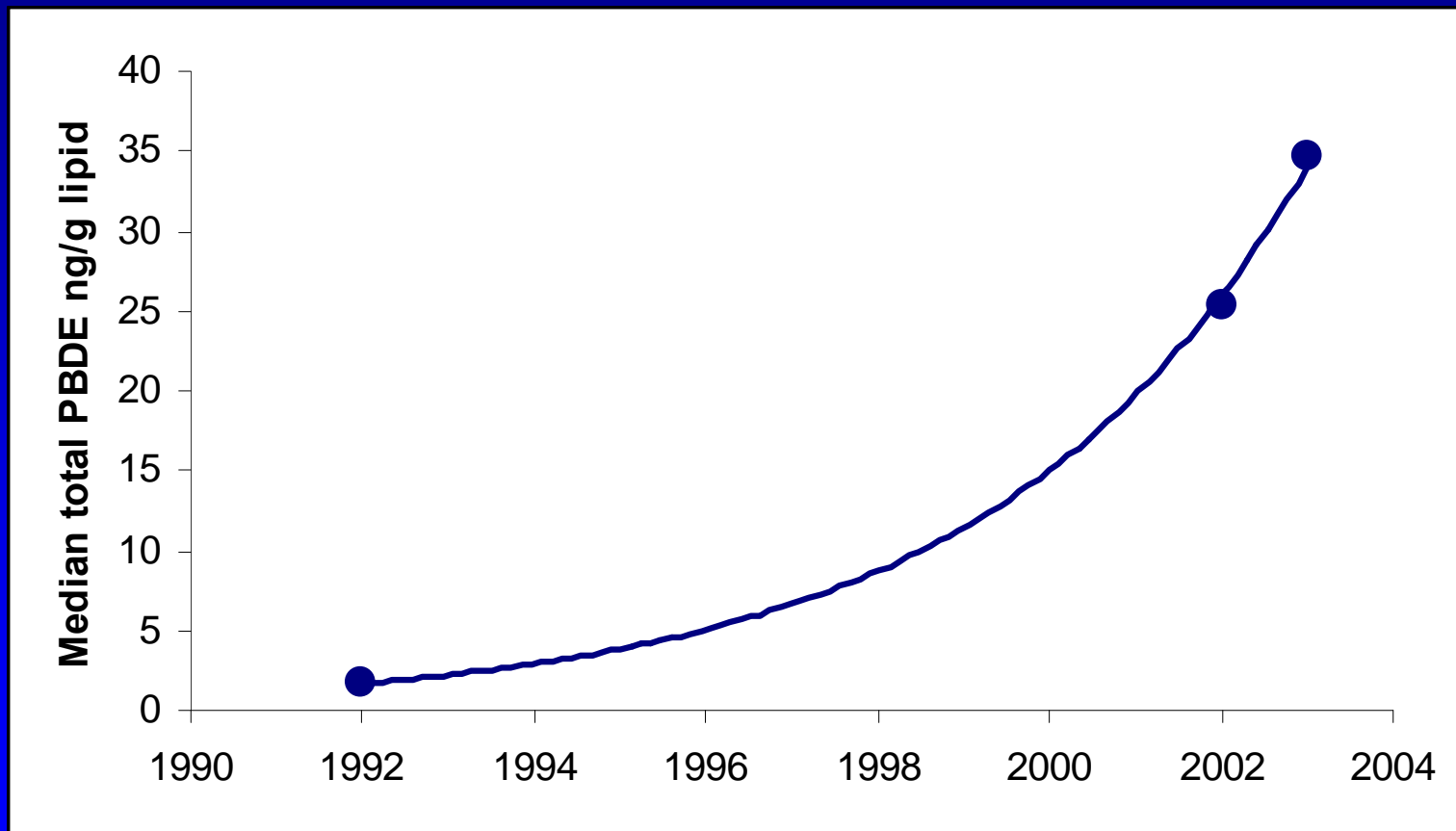
- TB117 products shipped to
 - California
 - Oregon
 - Washington
 - Alaska
 - British Columbia



Human PBDE levels over time

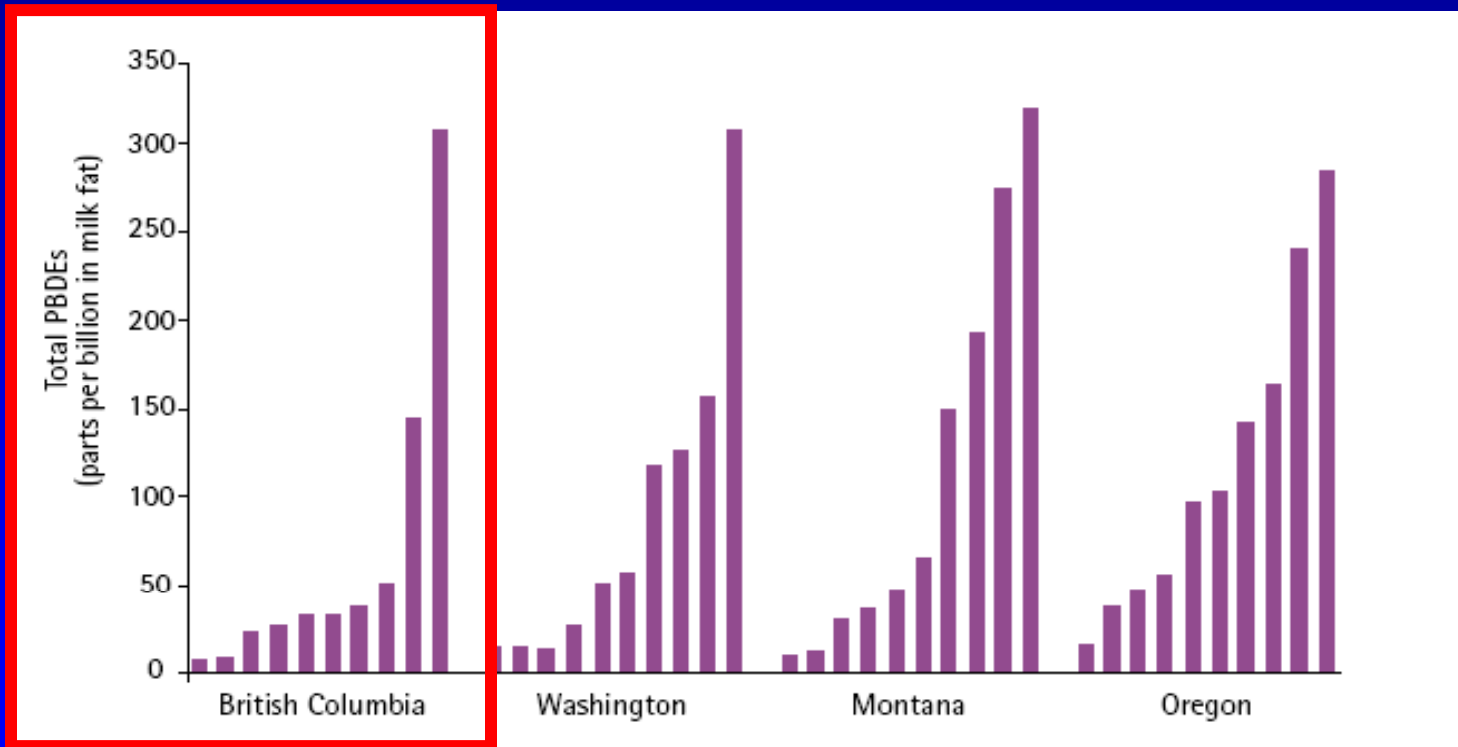


Median PBDEs in Vancouver Breast Milk

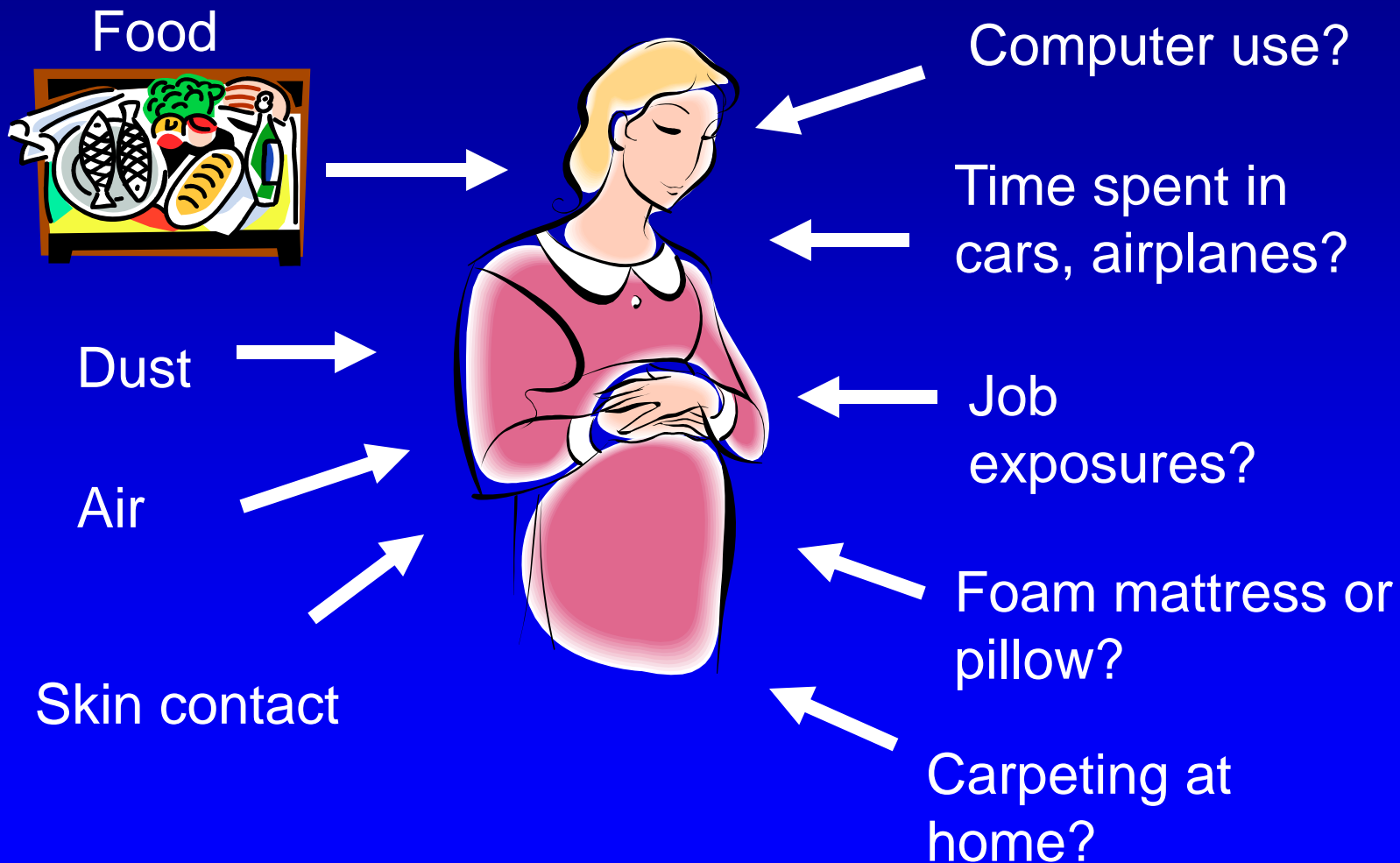


Data from: Ryan 2002, Northwest Watch 2004

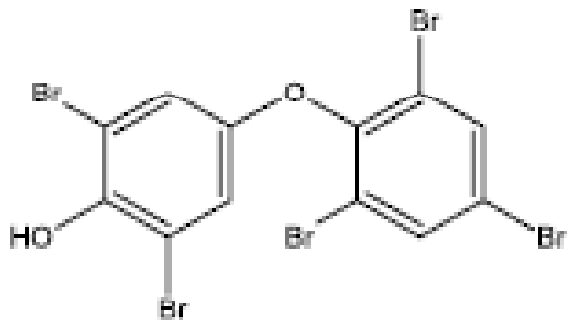
PBDEs in Individual Breast Milk samples



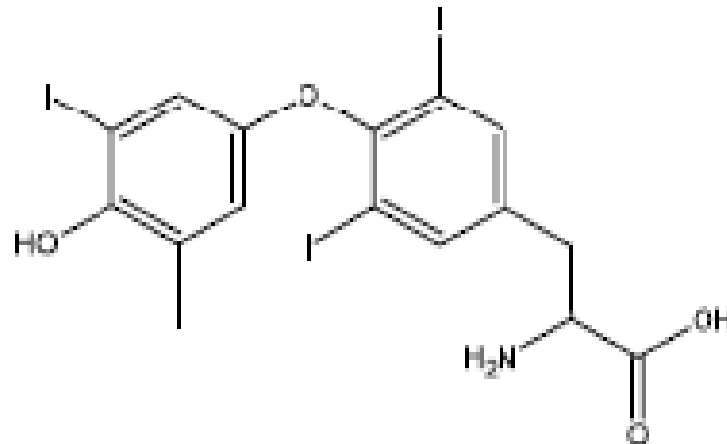
Routes of Exposure to PBDEs



PBDE metabolites resemble thyroid hormone (T4)



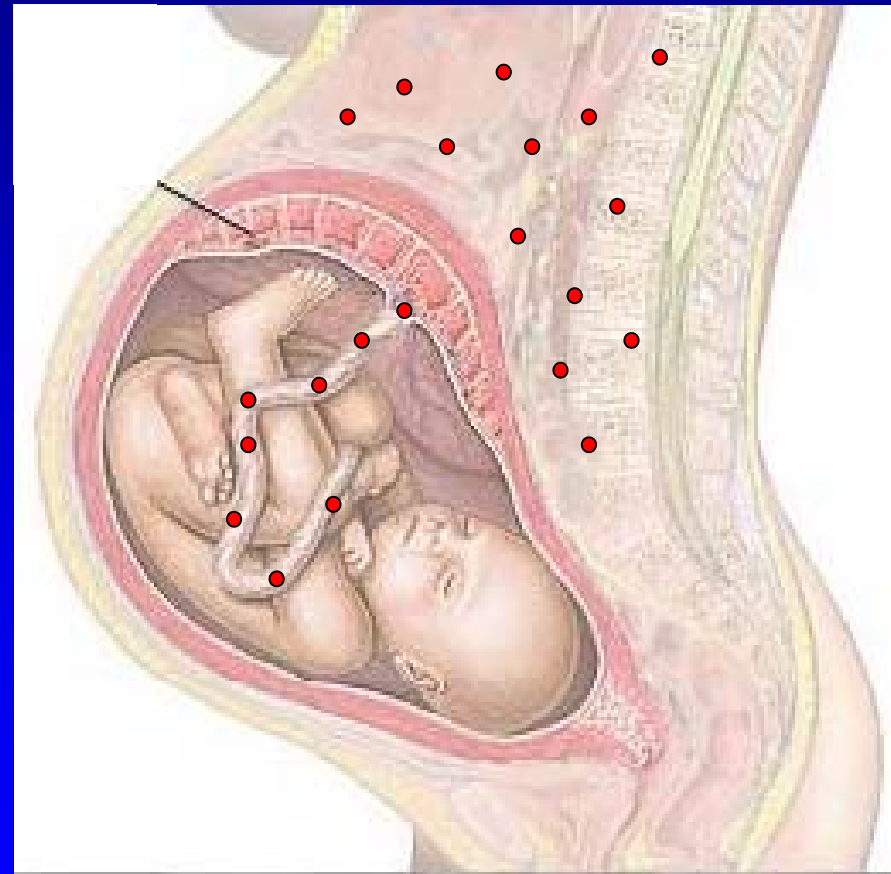
An OH-BDE



Thyroid hormone
(T4)

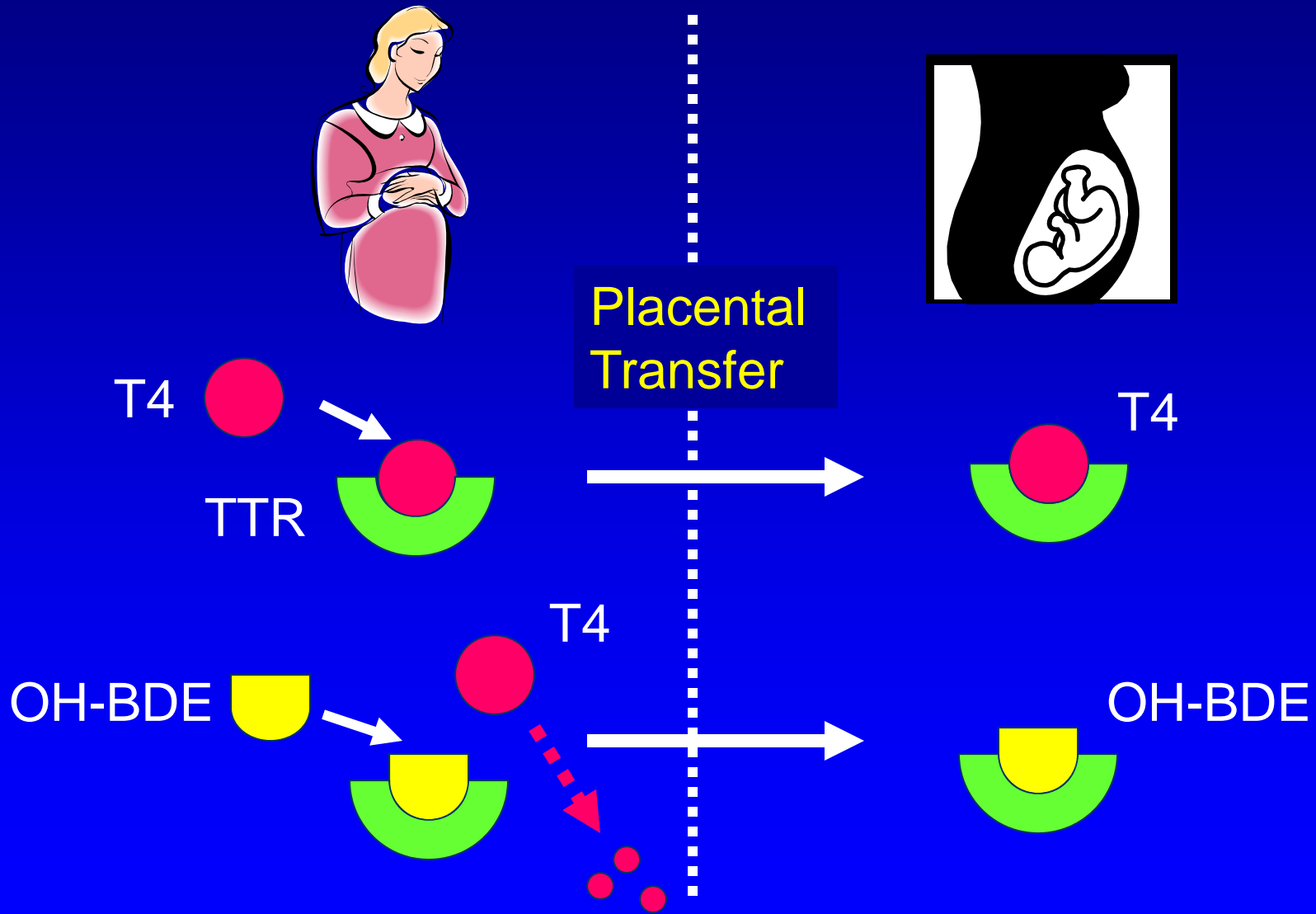
Thyroid hormones (THs) are critical for fetal brain development

- <20 wks, fetus receives all TH across the placenta
- Small changes in THs during fetal life can affect brain development
- Need to study TH disruption in early pregnancy



Adapted from: www.robysnest.com/images/placenta.jpg

OH-BDES may alter T4 transport & metabolism



Thyroid Hormones play critical roles in health

- Metabolism and body temperature regulation
- Normal growth and development
- Brain development
- Cardiovascular system
- Hearing
- Skeletal growth
- Hair and skin

7 months
T₄ treatment



Boy with Hashimoto's
disease

Public health implications of thyroid disruption

Many conditions are *hypothesized* to be linked to thyroid disruption *in utero*

- ADHD
- Autism
- Poor motor skills
- Learning disorders
- Reduced IQ, reading ability, language development

The Issue

PBDEs

- Used in many consumer products
- Leach out & accumulate in human tissues
- Found in ~100% of the general population
- Known thyroid toxicants (animal studies)
- Potential to affect fetal brain development
- Few human health studies

Chemicals, Health and Pregnancy (CHirP) study

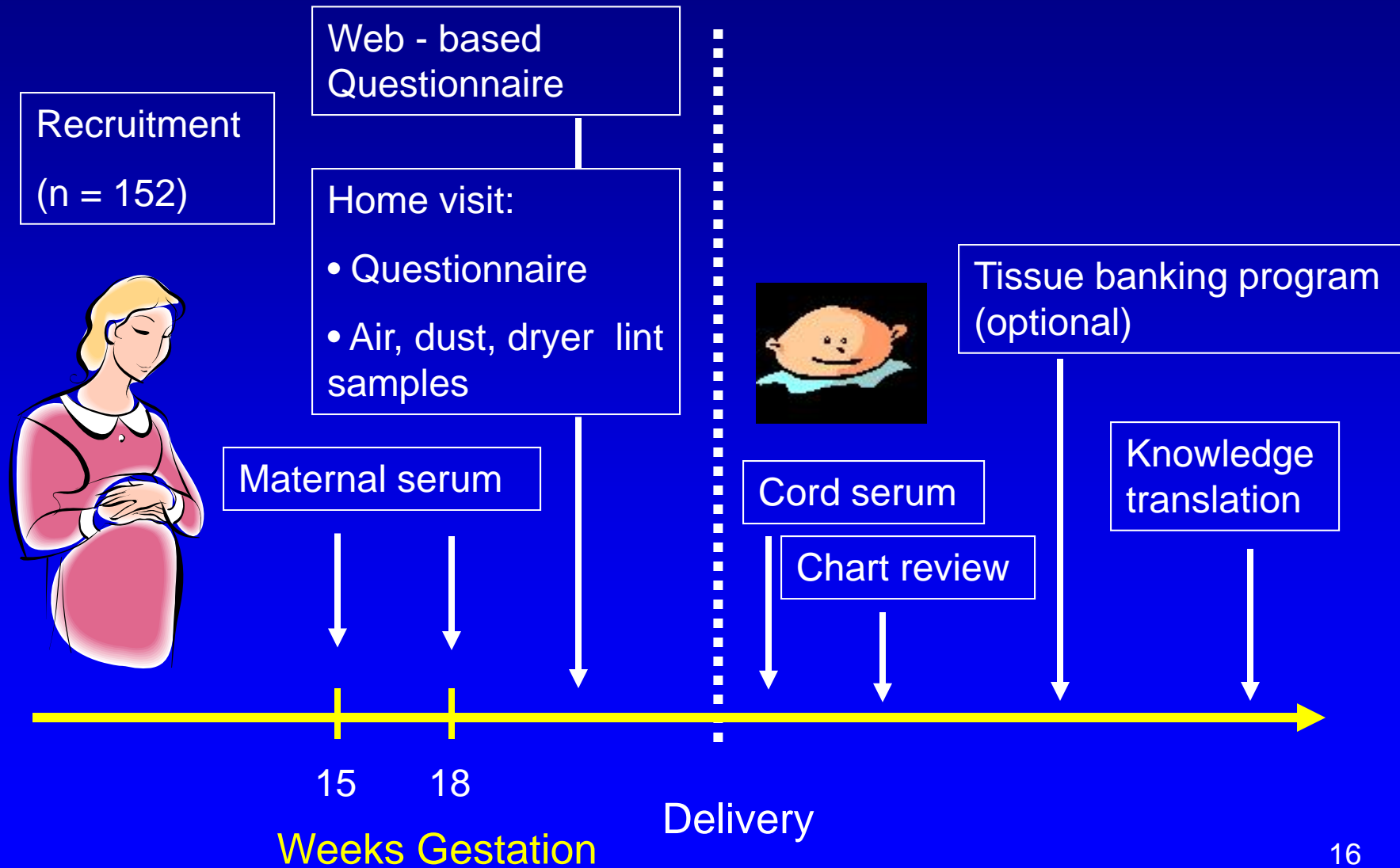


www.cher.ubc.ca/chirp

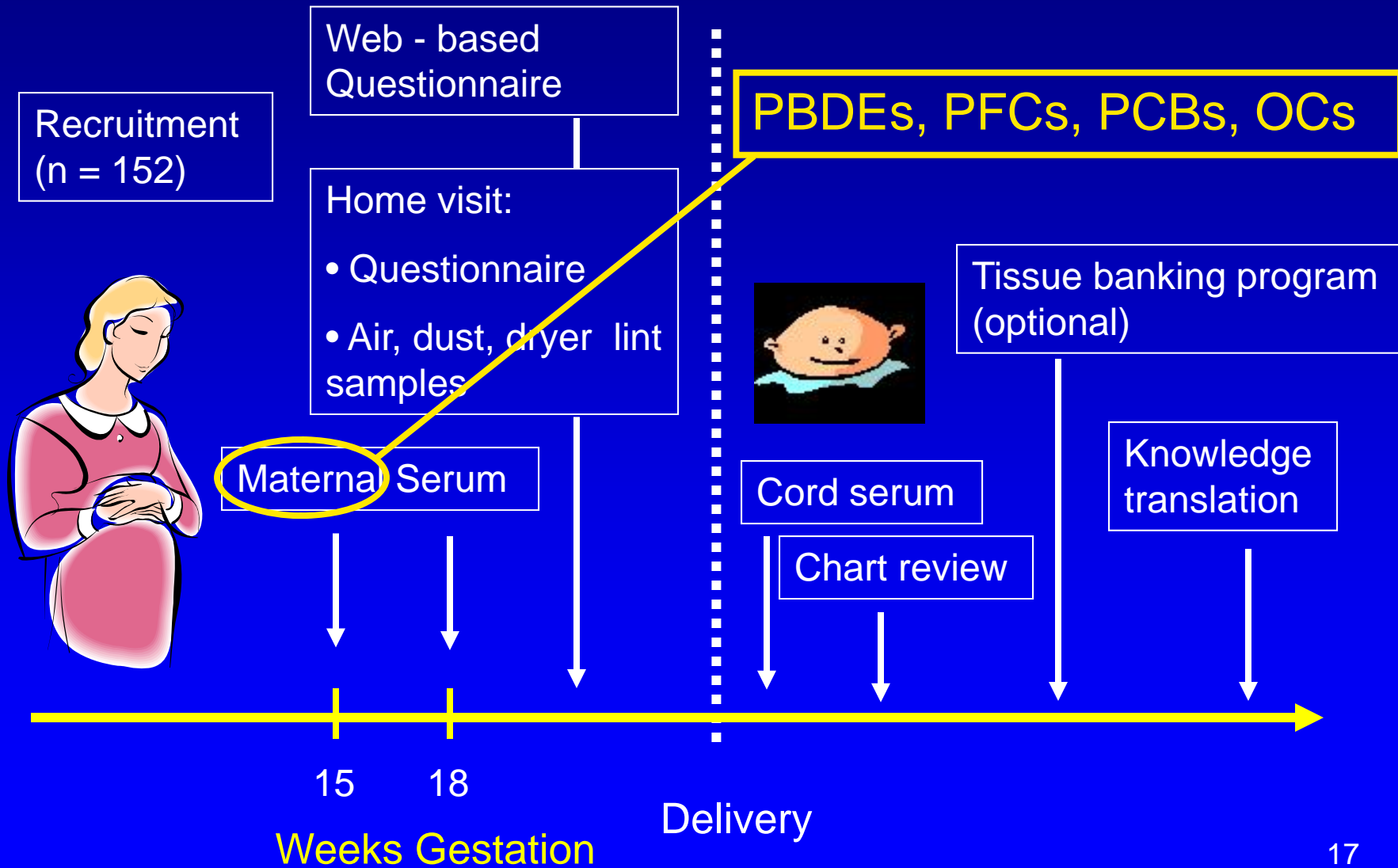
Study Questions

1. Are maternal PBDE levels associated with maternal thyroid hormone levels during early pregnancy?
2. What are the determinants of PBDE levels in pregnant women?

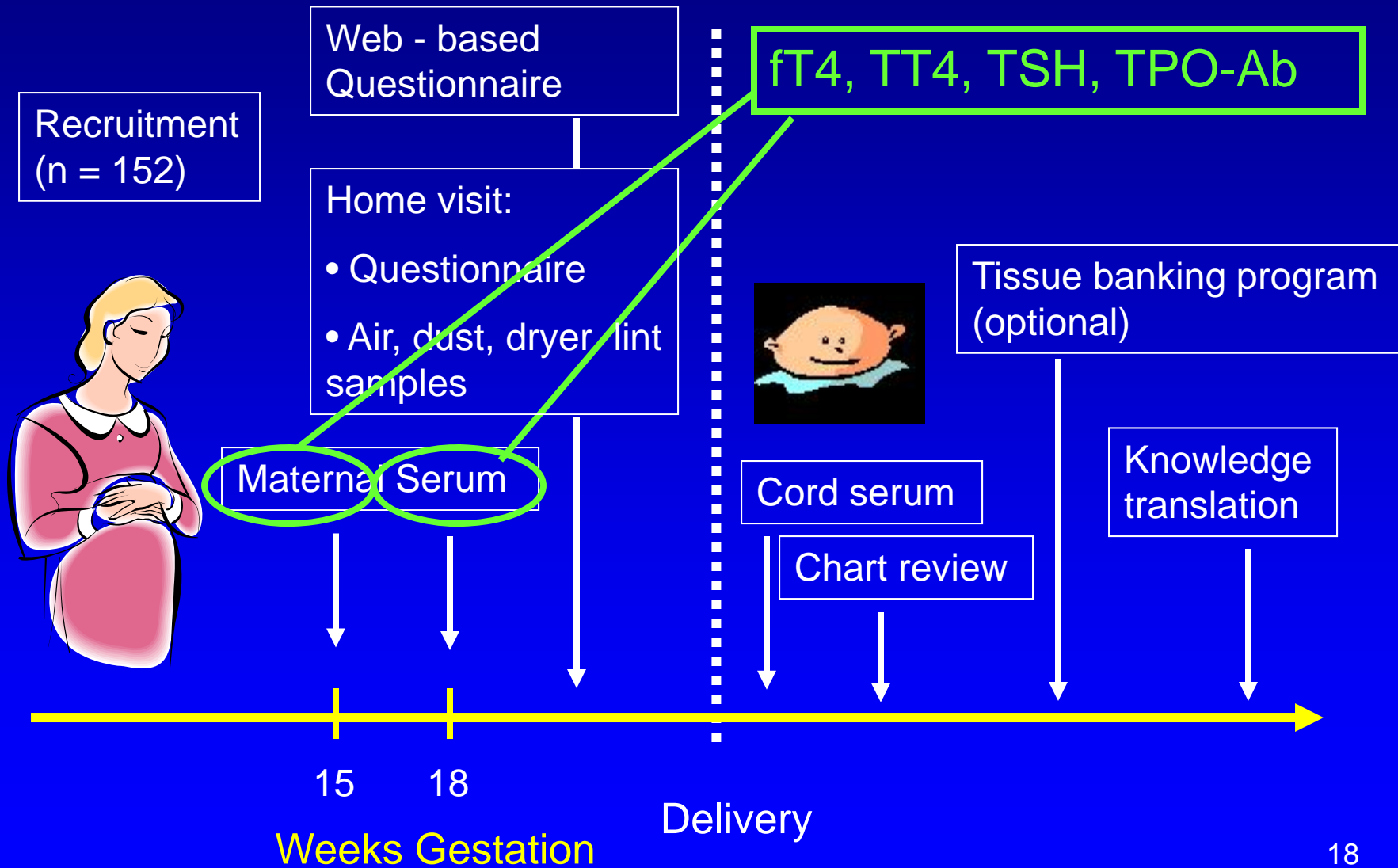
Study design



Study design



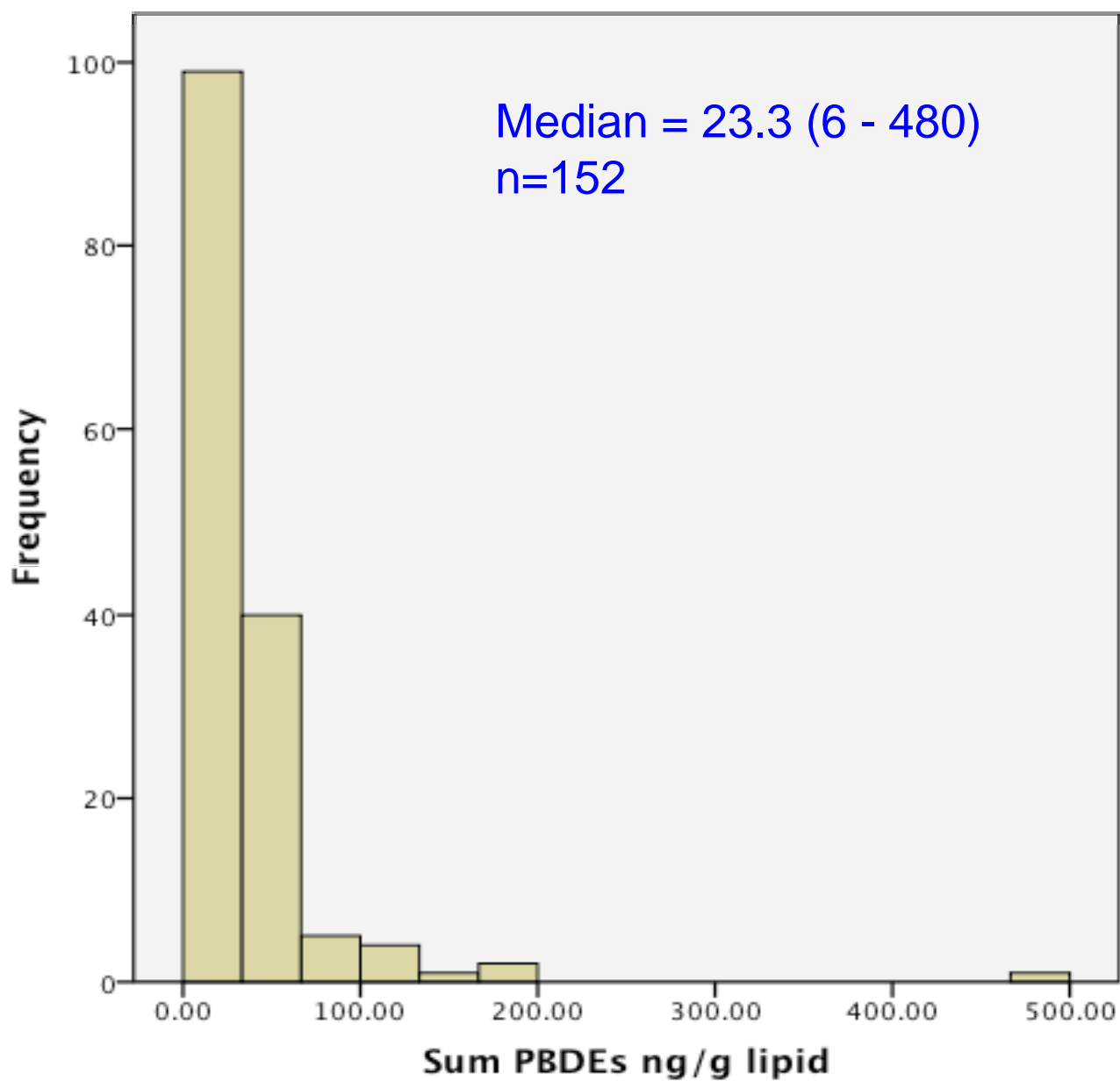
Study design



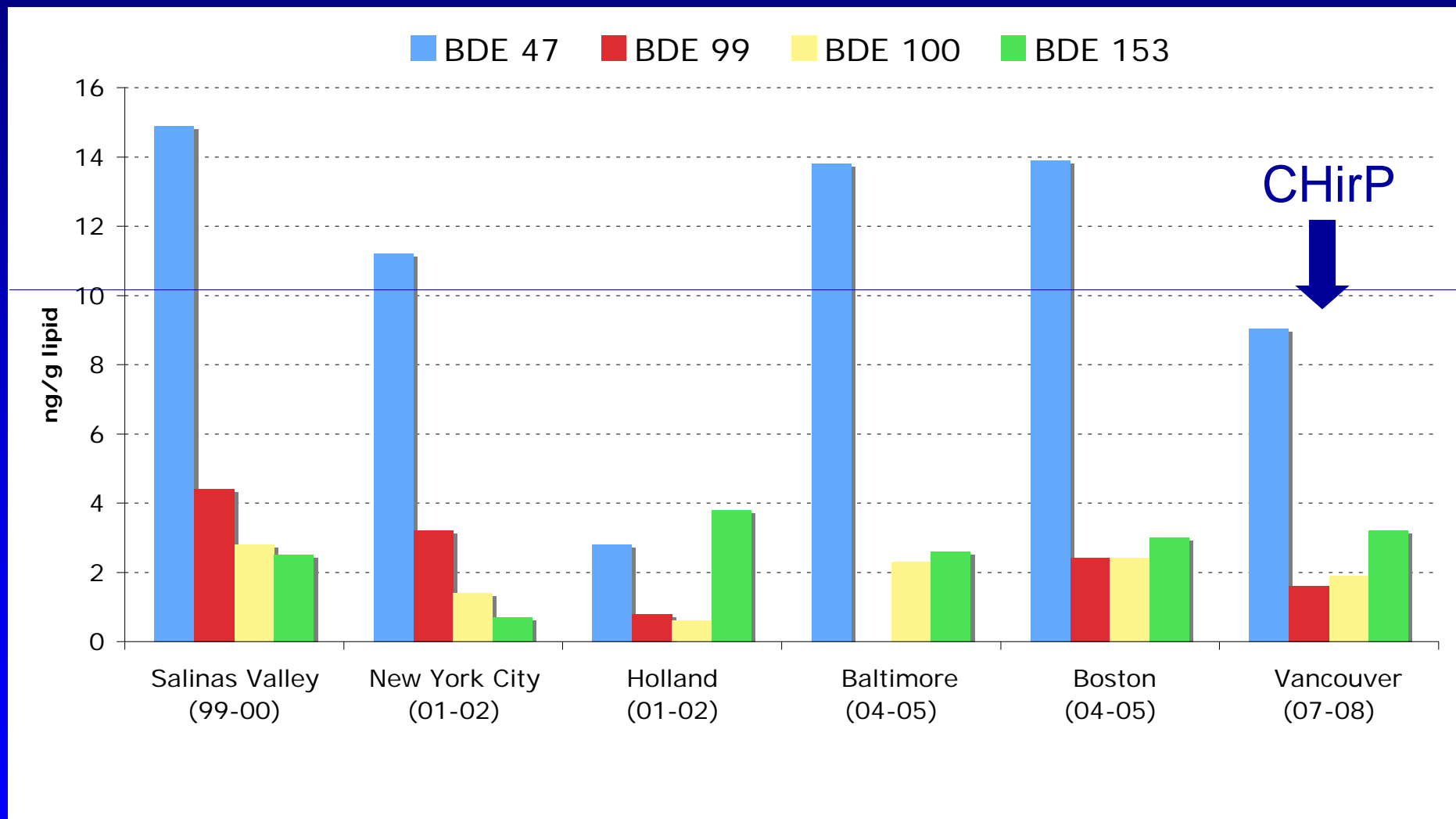
CHirP population

- Average maternal age = 34 (25-43)
- 82% Caucasian
- Median household income: 80-120K
- 81% with university degree or diploma
- 47% under midwifery care
- 21% planned home births

Distribution of Sum PBDEs (ng/g lipid)



Median PBDEs in other pregnancy studies



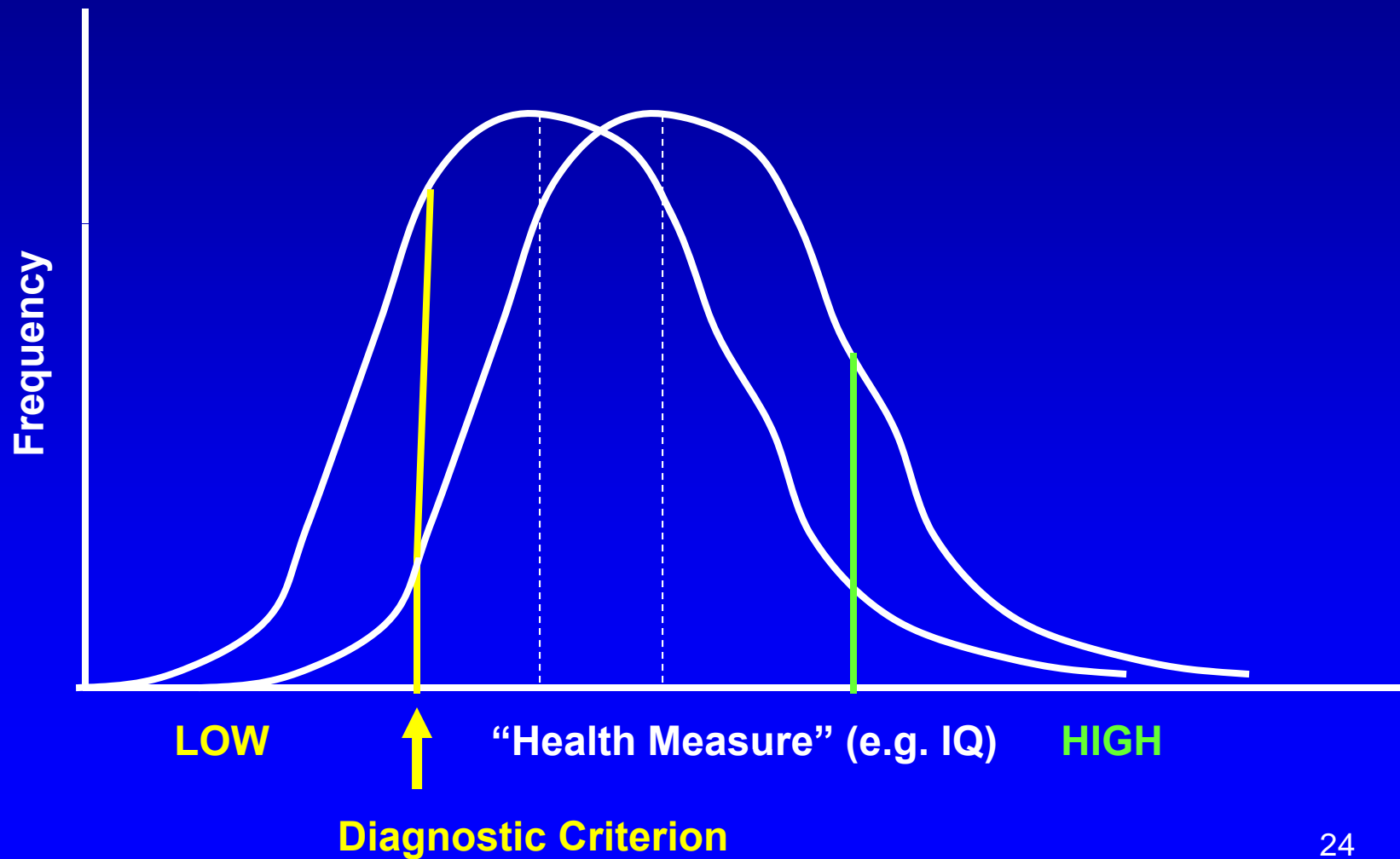
Thyroid Hormones and PBDEs: US Studies + CHirP (Vancouver)

Study	N	Free T4	TSH
Turyk ♂	304	↑	↓
Bloom ♂	36	(↑)	-
Meeker ♂	24	↑	-
Chevrier ♀	287	-	↓
Webster ♀	152	(↑)	(↓)

Summary

- BDE 28, 47, 99, 100, 153 detected in >60% of CHirP participants
- PBDE levels ~similar to other human health studies
- PBDEs: ↑fT4, ↑TT4, ↓TSH (prelim. results)
- Clinical / Public health / policy relevance?

Population 'Risk'



CHirP weaknesses

- Small sample size
 - may limit power for epidemiology questions
- Biased population
 - Limits the generalizability of findings

CHirP strengths

- Study *designed* to answer PBDE vs TH question
- Comprehensive & unique study design
- 2 measures of maternal TH - increased statistical power
- Provide pilot data for larger national studies
- Participant commitment is high, possibility for follow-up studies
- Banked serum and hair samples (no DNA)
- Policy relevant research

Acknowledgements

PhD committee	Kay Teschke, Scott Venners, Patti Janssen, Andre Mattman
Research Assistants	Rebecca Love, Linda Dix-Cooper , Sara Leckie, Noël Patten, Cristina Cotea, Sarah Hilbert-West, Robin Simms
Hospital staff & clinicians	Sara Garcha, Margaret Hendren, Kelly-Ann Haslauer, many lab techs, labour & delivery nurses, physicians & midwives
Chemistry, blood samples	Jon Martin (U of A), Andreas Sjodin (US CDC)
Chemistry, home samples	Tom Harner, Mahiba Shoeib, Sum Chi Lee, James Yao, Derek Muir (Environment Canada)
Participants	152 women and their families!

CHirP Funding

Research funding

- Health Canada
- BC Medical Services Foundation
- BC Environmental and Occupational Health Research Network
- UBC Centre for Health and Environment Research
- BC Ministry of the Environment

Scholarships

- CIHR Interdisciplinary Women's Reproductive Health scholarship
- CIHR/UBC Bridge Program Senior Scholarship
- Michael Smith Foundation Senior Fellowship
- Pacific Century Graduate Scholarship
- University Graduate Fellowship
- Robert Caton Scholarship (runner-up)
- CFUW Dr Marion Elder Grant Scholarship
- NSERC Doctoral Scholarship
- NSERC supplement - L'Oreal Scholarship for Women in Science



Thank you - any questions?

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www.cher.ubc.ca/chirp

How to reduce toxin exposures in the home

- Avoid foam-containing furniture & baby products meeting the “California Furniture Flammability standard TB117”
- Consider non-foam mattresses & furniture (natural latex, wool)
- Reduce exposure to indoor dust
- Open your windows (home & car), spend time outside
- Wash hands before eating
- Eat low on the food chain
- Switch to non-toxic cleaning products
- No plastic in the microwave or dishwasher
- Choose non-plastic containers to store fatty foods
- Avoid micro-waved popcorn & fast food wrappers
- Use BPA-free bottles, sippy cups, water bottles
- Avoid toys containing lead, phthalates, BPA
- Choose non-toxic materials during home renovations