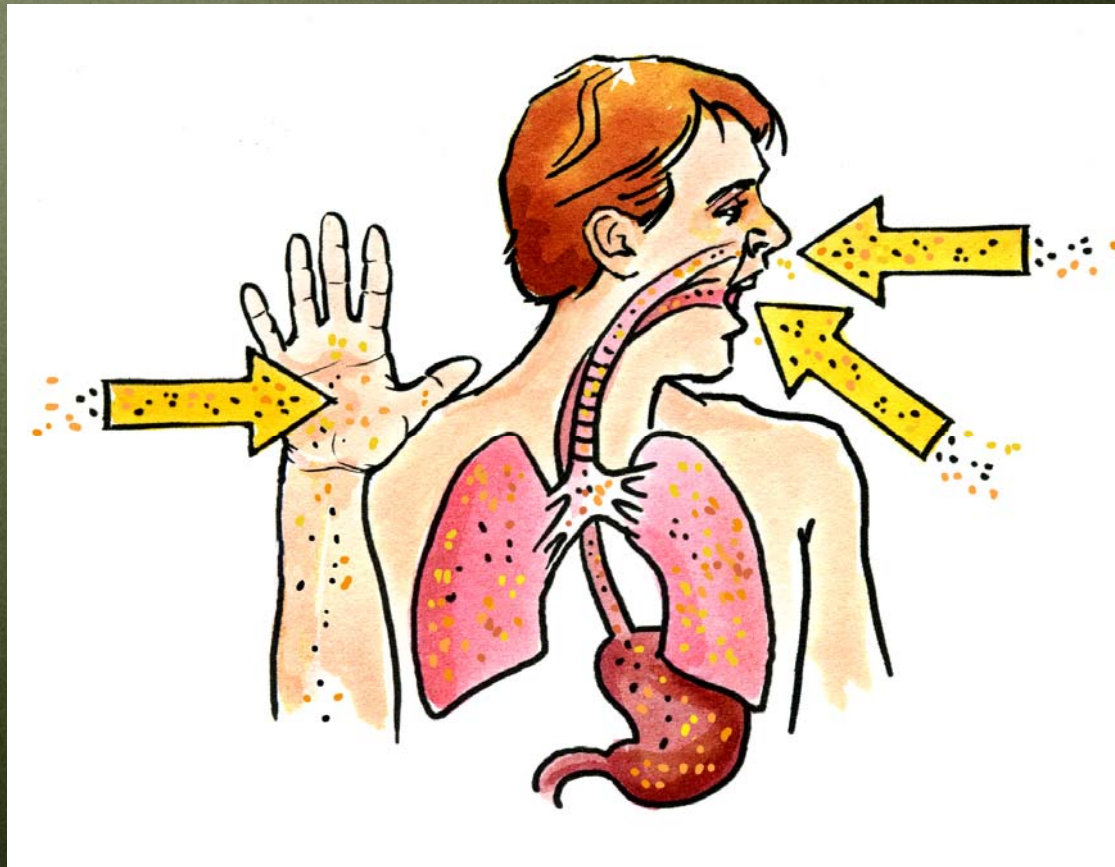


Exposure to PBDEs

Dave Stone, PhD
Environmental & Molecular Toxicology

Importance of Exposure Route



Biomonitoring

Serum 2,3',4,4'-Tetrabromodiphenyl ether (BDE 66) (lipid adjusted)

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population from the National Health and Nutrition Examination Survey.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
Total	03-04	*	< LOD	< LOD	< LOD	1.30 (1.00-2.10)	1999
Age group							
12-19 years	03-04	*	< LOD	< LOD	< LOD	1.30 (<LOD-1.90)	606
20 years and older	03-04	*	< LOD	< LOD	< LOD	1.30 (1.00-2.20)	1393
Gender							
Males	03-04	*	< LOD	< LOD	< LOD	1.40 (1.00-2.60)	970
Females	03-04	*	< LOD	< LOD	< LOD	1.10 (<LOD-2.20)	1029
Race/ethnicity							
Mexican Americans	03-04	*	< LOD	< LOD	< LOD	1.20 (<LOD-1.60)	461
Non-Hispanic blacks	03-04	*	< LOD	< LOD	1.00 (<LOD-2.00)	2.40 (1.40-5.10)	496
Non-Hispanic whites	03-04	*	< LOD	< LOD	< LOD	1.20 (<LOD-2.50)	914

Limit of detection (LOD, see Data Analysis section) for Survey year 03-04 is 1.0.

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample.

* Not calculated: proportion of results below limit of detection was too high to provide a valid result.

CDC 2009

Biomonitoring

Serum 2,2',4,4'-Tetrabromodiphenyl ether (BDE 47) (lipid adjusted)

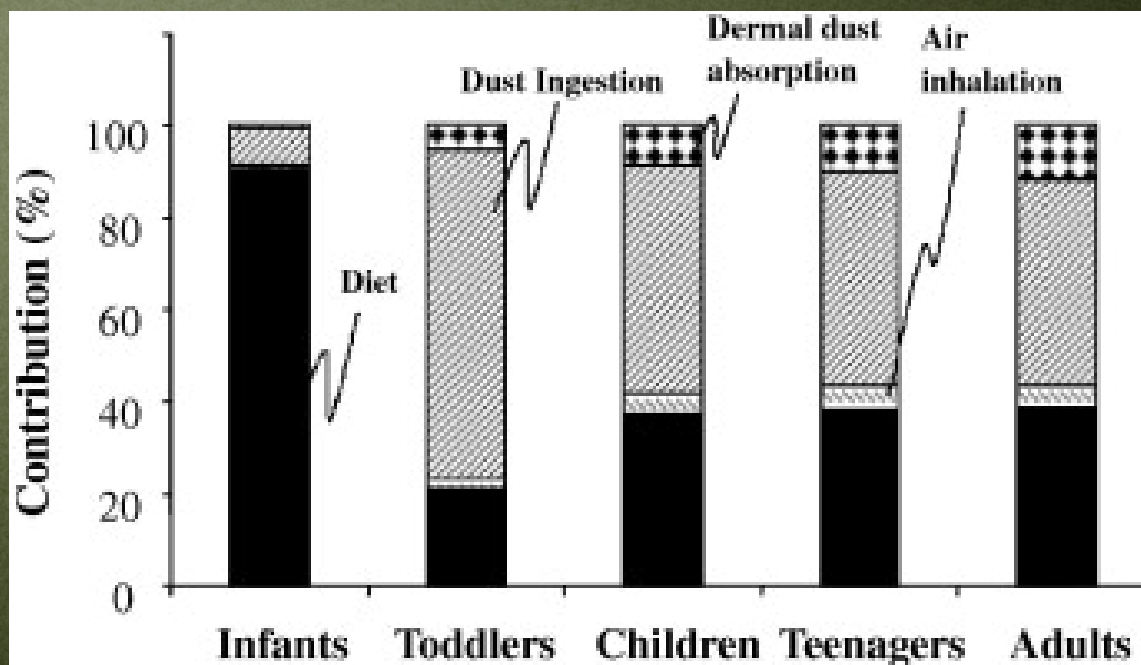
Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population from the National Health and Nutrition Examination Survey.

	Survey years	Geometric mean	Selected percentiles (95% confidence interval)				Sample size
		(95% conf. interval)	50th	75th	90th	95th	
Total	03-04	20.5 (17.6-23.9)	19.2 (15.7-22.3)	41.1 (35.6-49.2)	85.1 (68.8-127)	163 (108-240)	2016
Age group							
12-19 years	03-04	28.2 (24.6-32.3)	27.2 (22.1-33.6)	53.6 (44.9-63.6)	104 (82.4-145)	174 (115-211)	615
20 years and older	03-04	19.5 (16.5-23.1)	18.0 (14.6-21.6)	39.1 (32.8-47.0)	83.3 (63.0-127)	163 (102-240)	1401
Gender							
Males	03-04	21.4 (18.1-25.3)	19.2 (15.8-24.0)	45.2 (37.3-54.9)	94.3 (66.8-148)	168 (112-382)	981
Females	03-04	19.6 (16.4-23.5)	19.1 (14.1-23.2)	38.4 (31.8-46.4)	79.5 (60.7-121)	155 (102-239)	1035
Race/ethnicity							
Mexican Americans	03-04	25.5 (23.0-28.1)	23.6 (21.2-25.5)	47.1 (38.2-56.5)	87.2 (72.0-105)	151 (105-195)	478
Non-Hispanic blacks	03-04	24.3 (20.9-28.2)	21.4 (18.2-25.6)	47.5 (40.7-53.2)	116 (81.8-149)	242 (136-481)	499
Non-Hispanic whites	03-04	19.5 (16.1-23.7)	17.4 (14.4-22.2)	40.2 (33.1-51.9)	85.1 (60.3-142)	163 (90.2-283)	912

Limit of detection (LOD, see Data Analysis section) for Survey year 03-04 is 4.2.

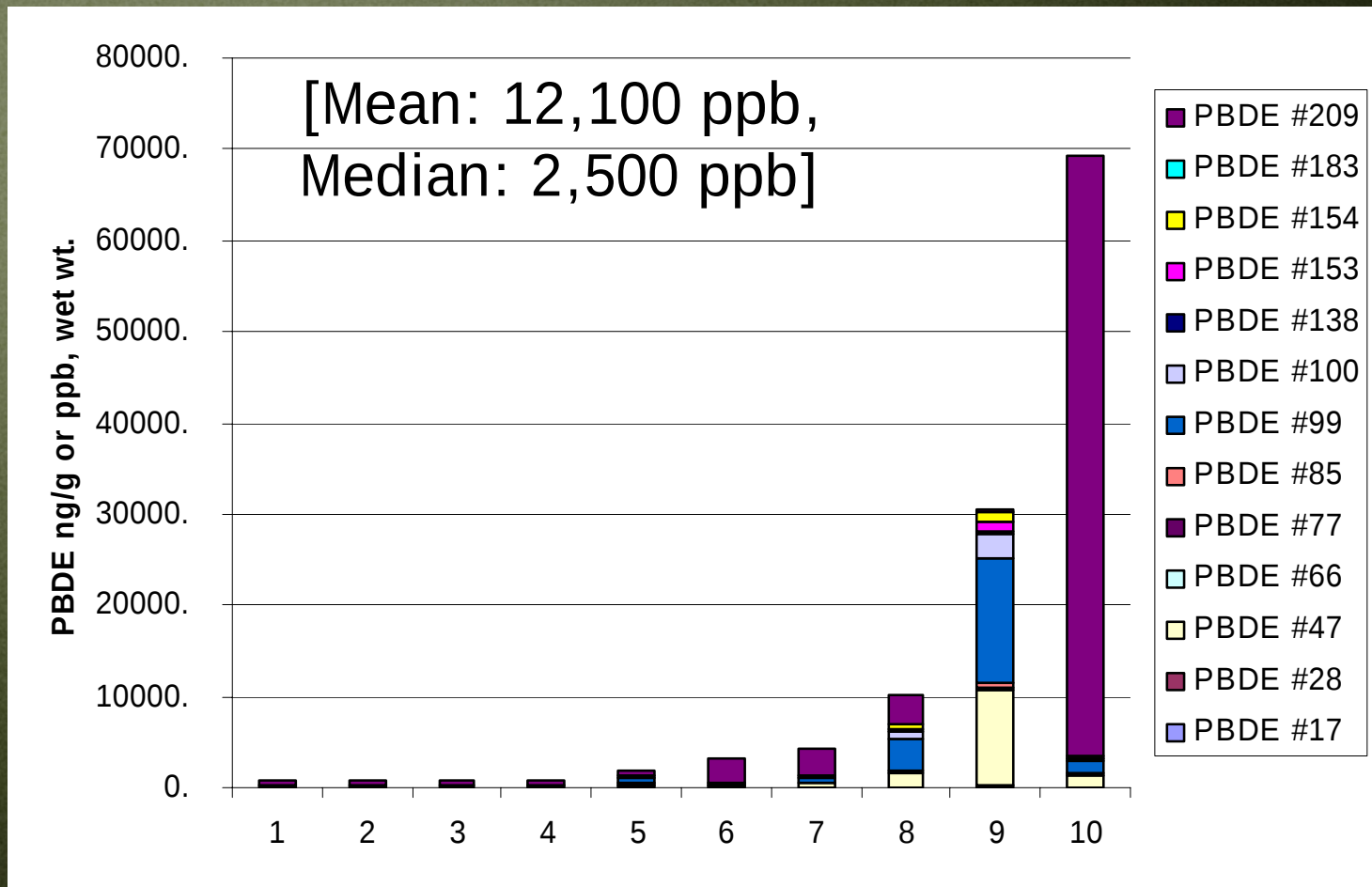
CDC 2009

Age and Exposure Route



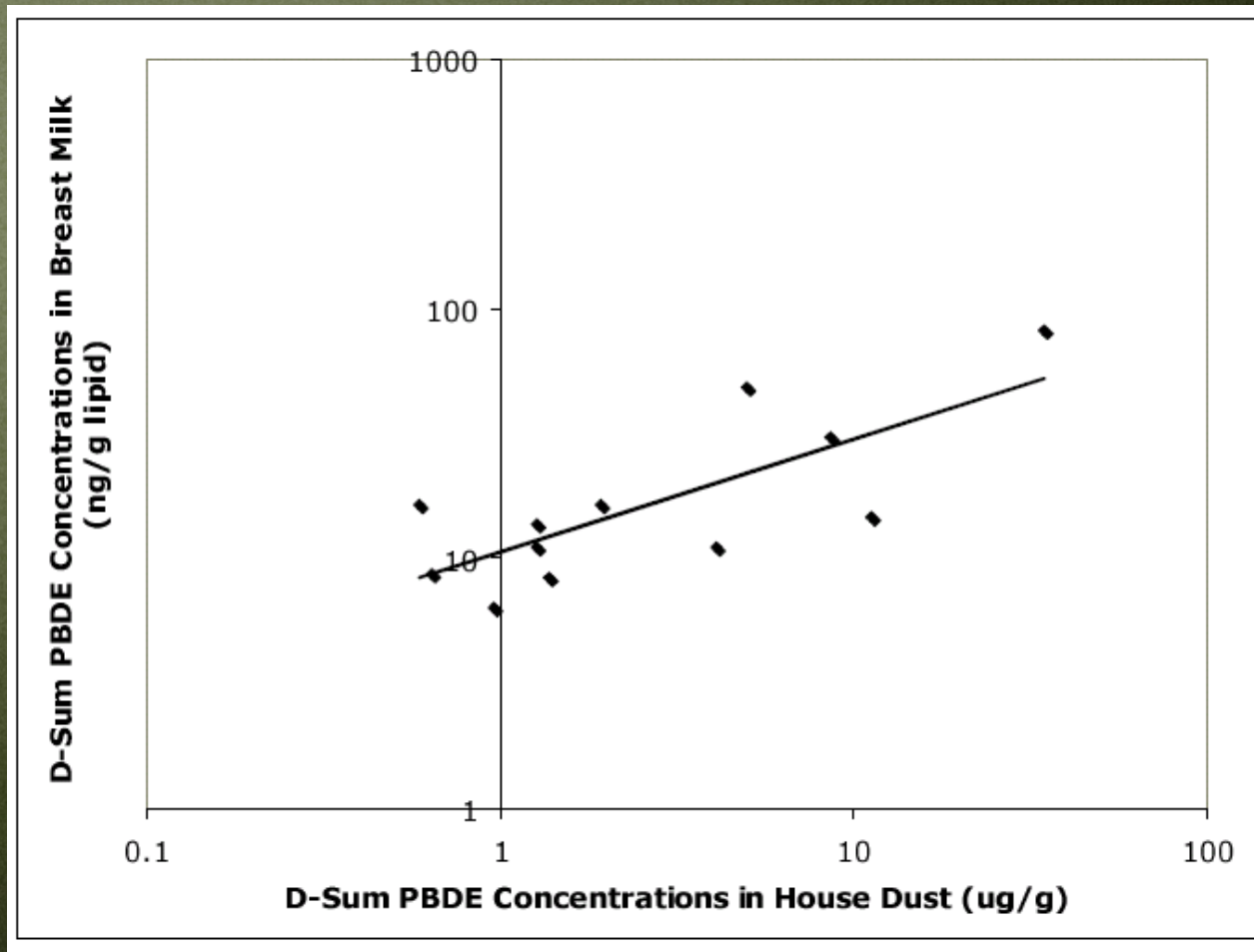
Johnson-Restrepo & Kannan 2009

SOURCE: DUST



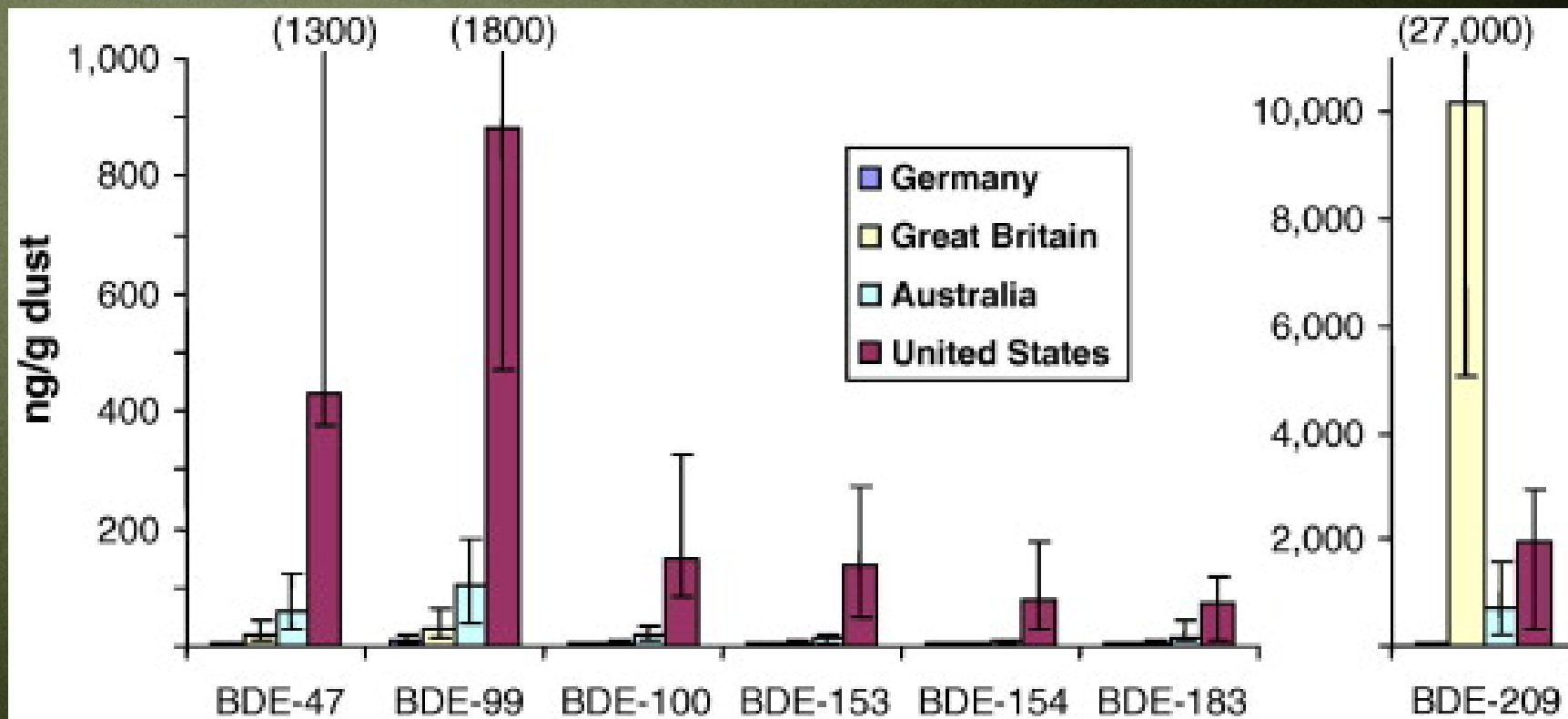
Schechter et al, 2005

Breast Milk vs. Dust (ug PBDE/g dust)



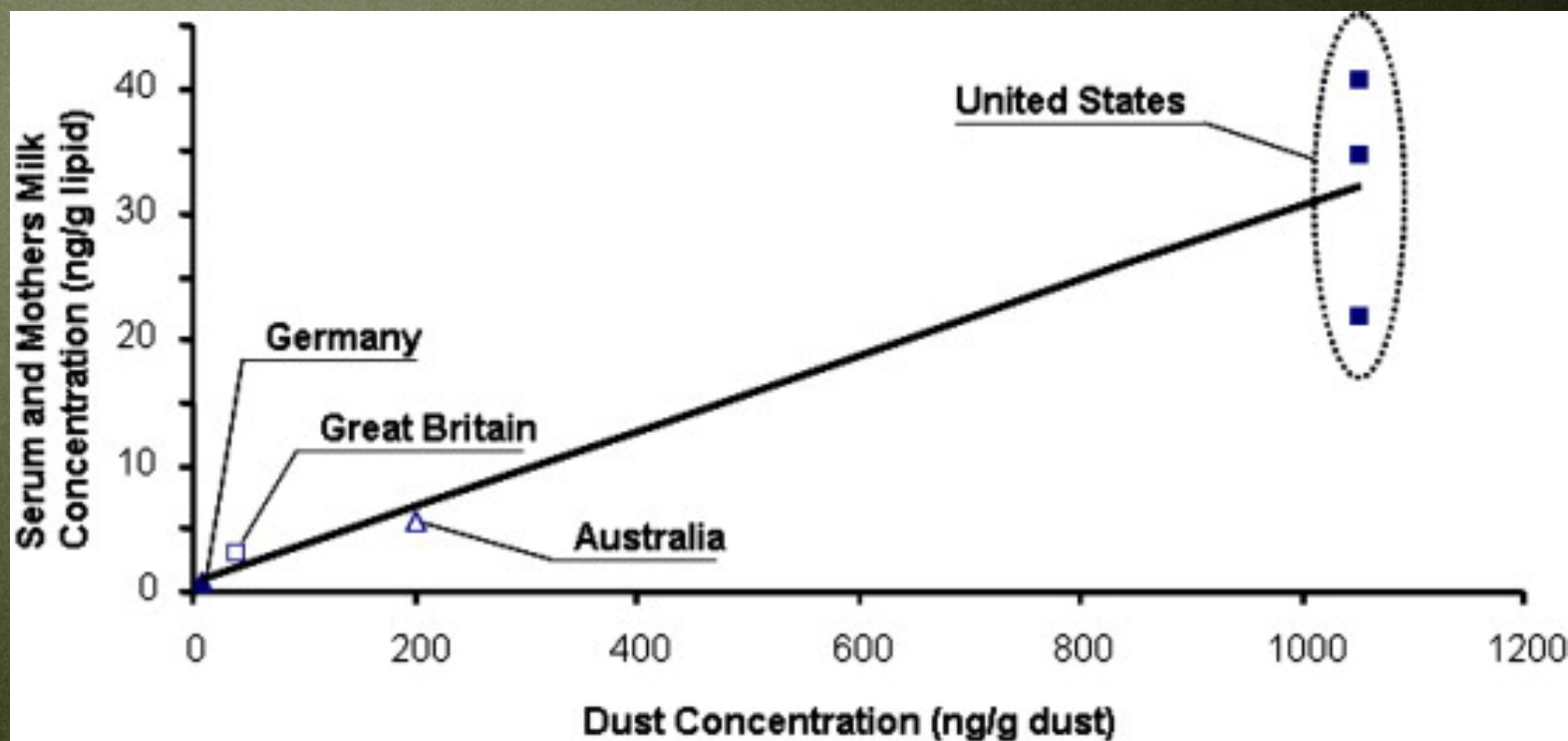
Wu et al., 2007

PBDEs in dust from various countries



Sjödin et al. 2008

Serum & breast milk vs. dust from various countries



Schechter et al., 2003, Kalantzi et al., 2004, Vieth et al., 2004, Wolff et al., 2005, Harden et al., 2005

Source: Air

Personal air monitoring in Boston

- 469 pg/m³ for non-209 BDEs,

- 174 for 209 BDE

- 4x increase in particulate-bound BDE in personal air compared with room air (cloud effect)

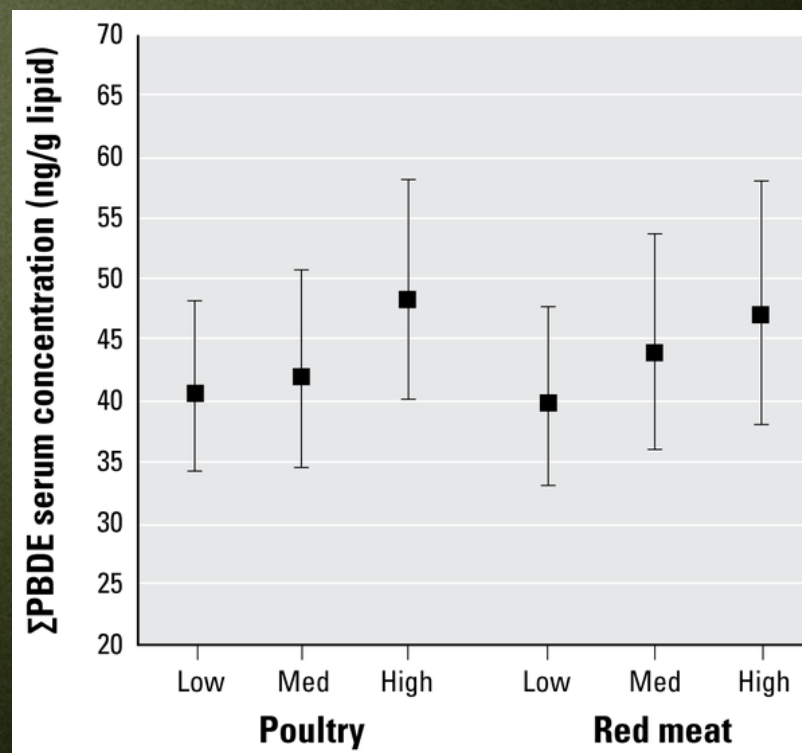
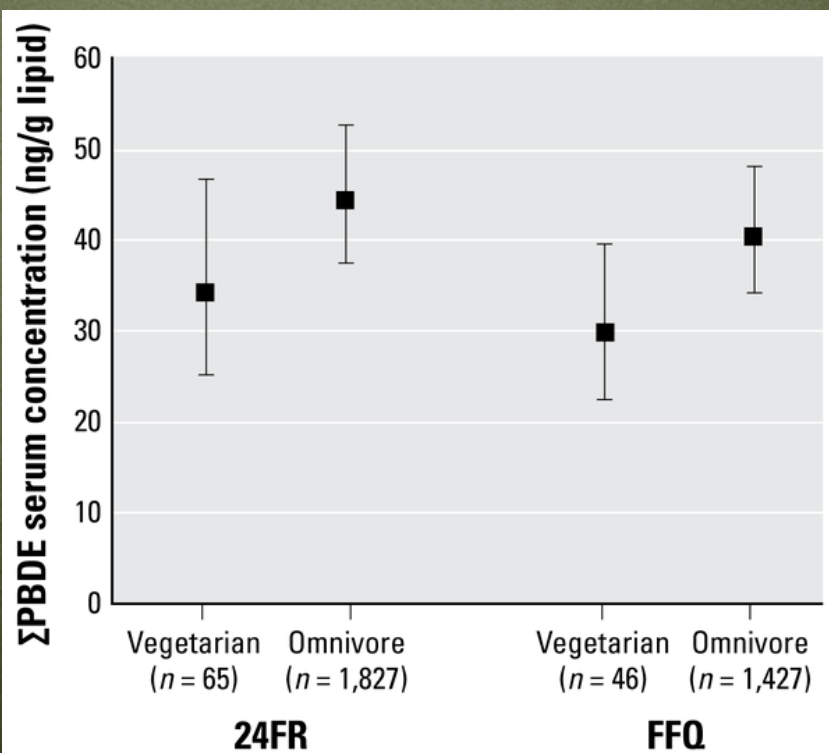
- inhalation may account for ~22% of BDE-209 exposure in U.S. adults



Schultz

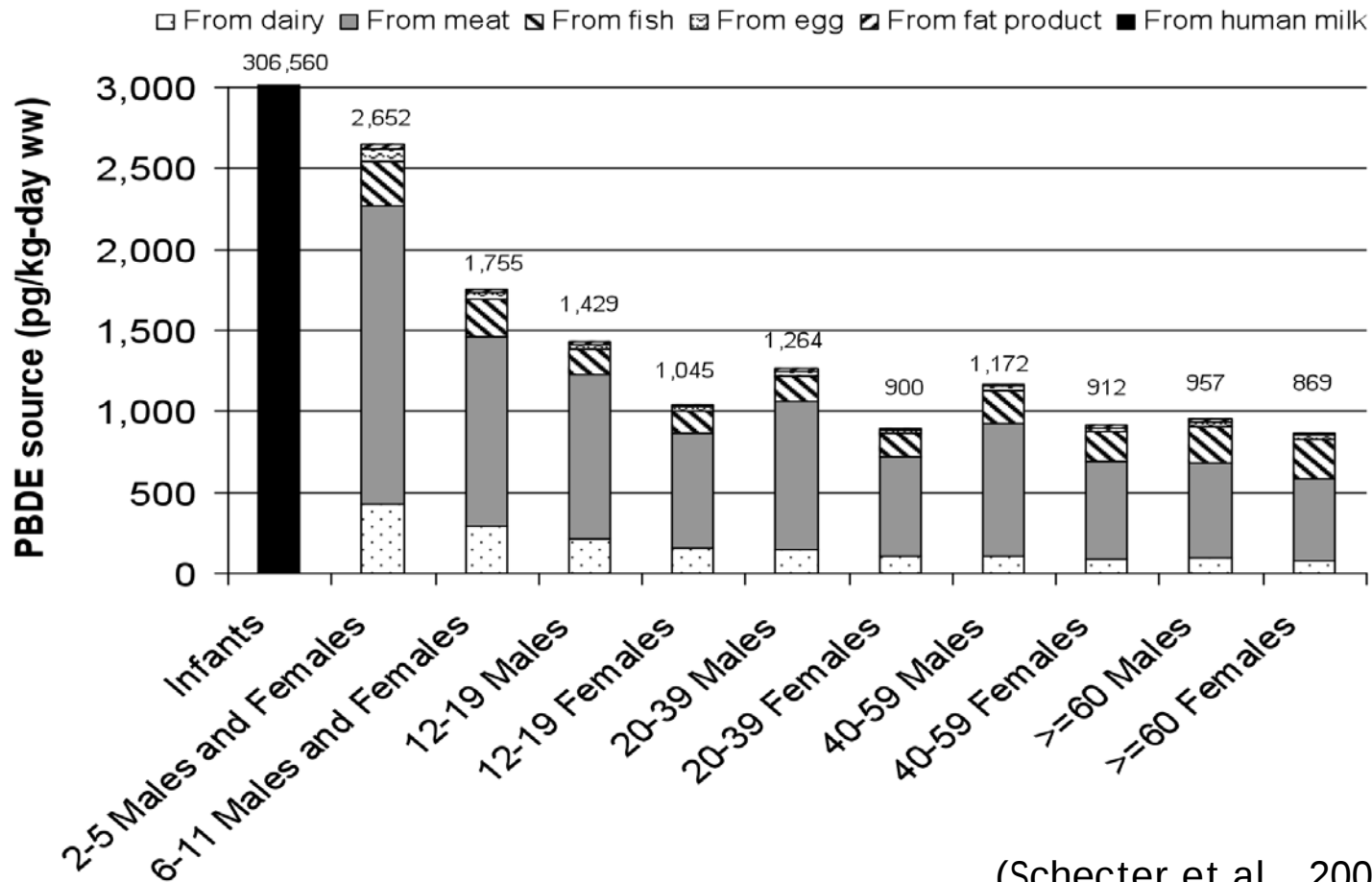
(Allen et al, 2007)

Source: Diet

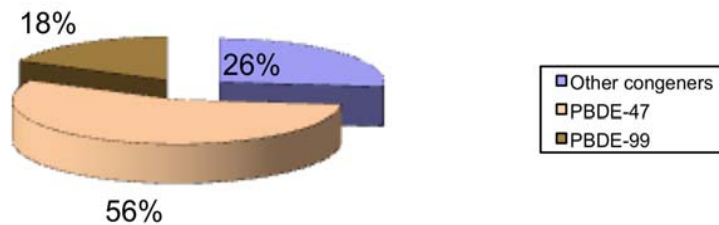


Fraser et al. 2009

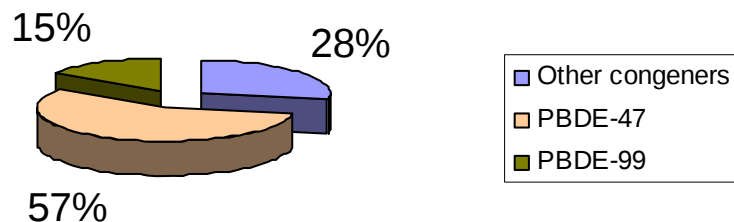
Dietary Intake of PBDEs in U.S. Population (Age and Food Group)



(Schechter et al., 2006)



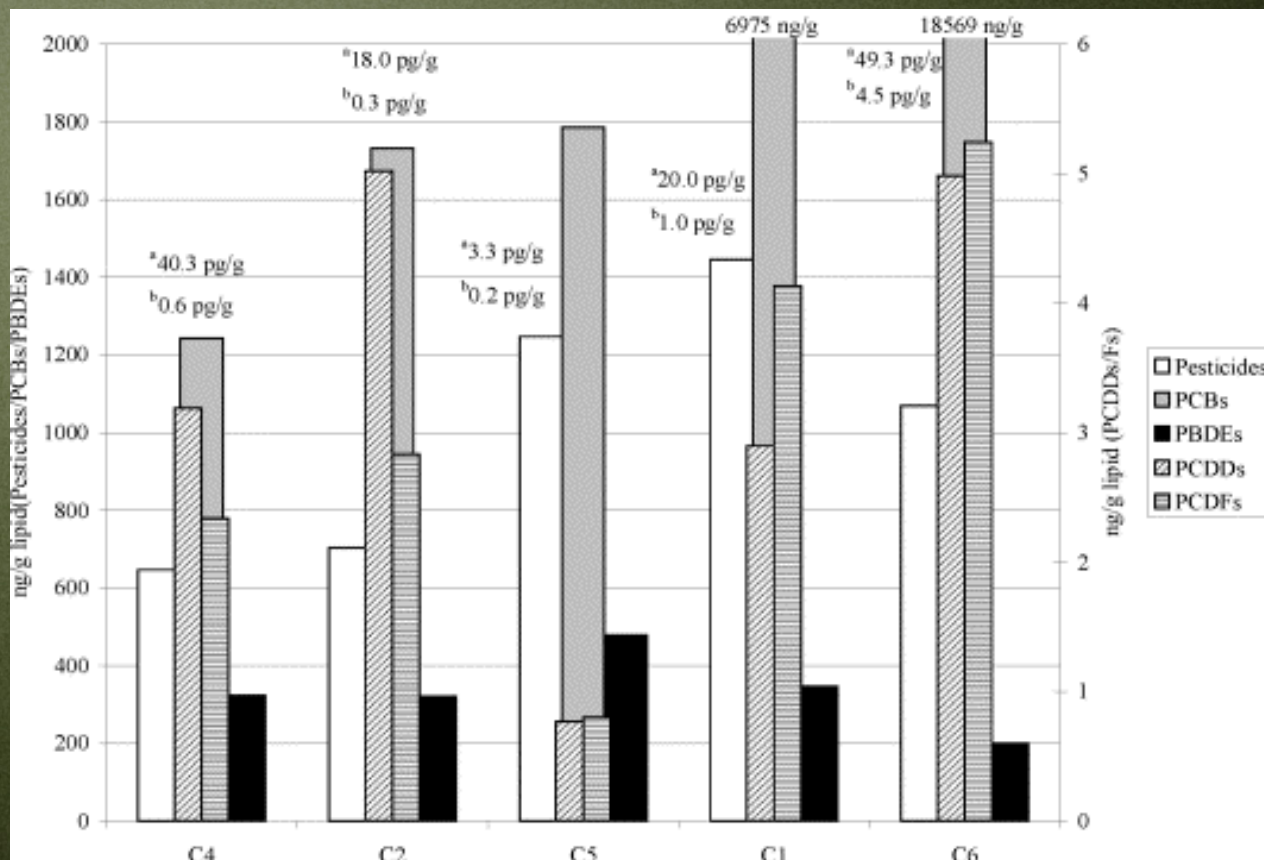
Lamprey (Willamette Falls):
3.34 ug/kg total PBDEs



Salmon (Clackamas River):
2.29 ug/kg total PBDEs

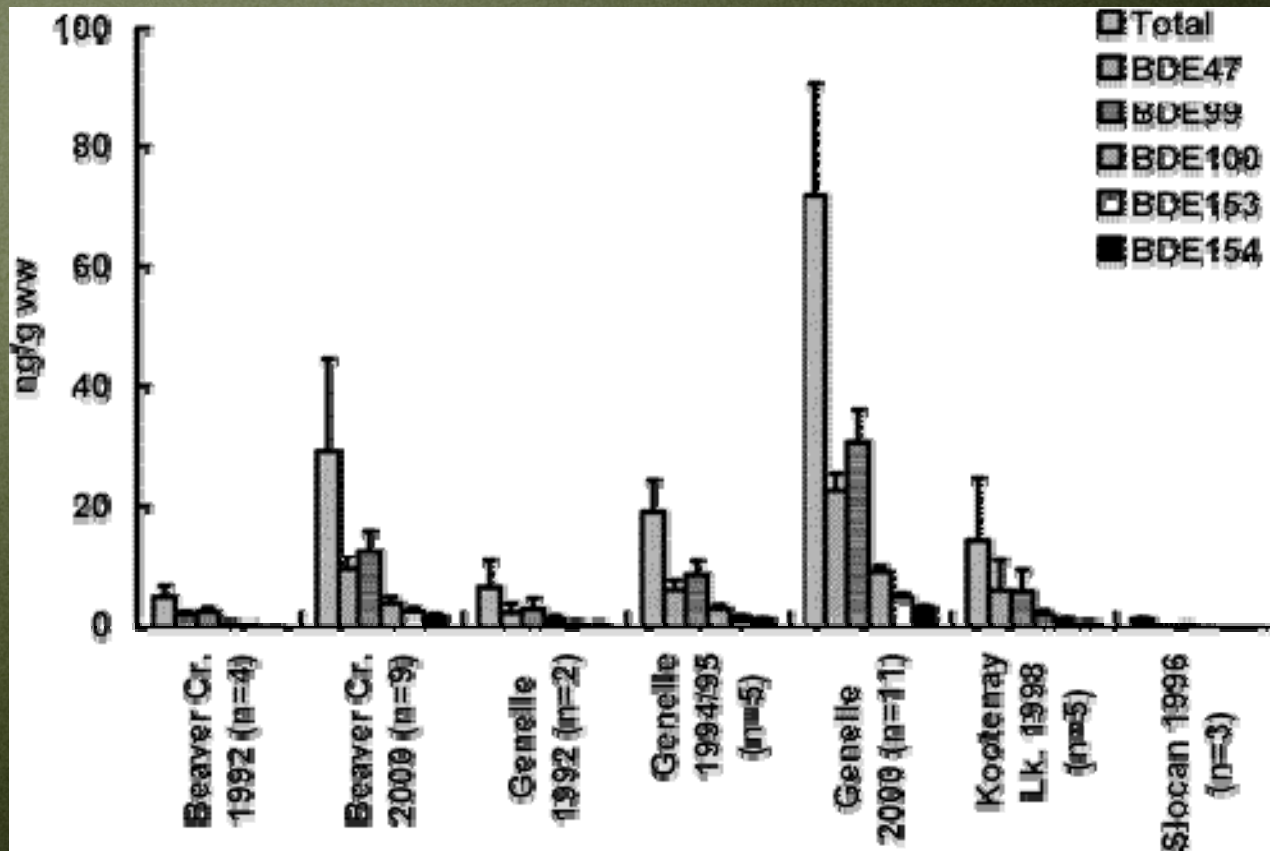
Stone 2005

Dungeness Crab – British Columbia



Ikonomou et al. 2002

Columbia River FW fish over time



Rayne et al. 2003

Summary: Exposure to PBDEs

Ingestion is the primary route of exposure to PBDEs. Dermal absorption is considerable as well.

Sources of exposure are widespread. House dust and the diet are major sources.

Exposure levels among individuals and locations can vary dramatically.

Consumption of local fish and food intimately connects us and our families to PDBE contamination.