



Environment & Health
ESRI Initiative
University of Guelph

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Toxic Substances

- Smog
- POPs (persistent organic pollutants) –there are 12 dangerous chemicals called the ‘dirty dozen’ dioxins & furans are 2 of the 12
- Pesticides
- Pharmaceutical residues in drinking water supplies
(March 2008, it was reported that antibiotics, anticonvulsants, mood stabilizers and sex hormones, among others were found in the drinking water supplies of over 40 million Americans)

A few notes about contaminated drinking water

- As of May 2008, “the health effect of this cocktail of chemicals and drugs has not been studied, but there are many reasons to be concerned about risks for infants and others who are vulnerable...Chemical pollution of ambient waters contributes to the load of chemicals in tap water.” Environmental Working Group, Washington DC, 21 May 2008.

Perfluorochemicals (PFCs)

- These toxins bioaccumulate and remain in blood, liver and other tissues for years
- Some residents of communities in Ohio and West Virginia drinking perflourooctantic acid (PFOA) contaminated tap water had blood levels of PFOA 250 times the national average
- PFOA exposure has been associated with impaired fetal and neonatal development

PFOA contd

- PFOA is now found in bodies of 98% of Americans; often, children younger than 6 years of age have higher PFOA levels compared to adults
- PFOA can cross the placenta and transfer from the mother's body to the fetus
- PFOA exposure increases predisposition to obesity, heart disease, diabetes and stroke

Reproductive Toxicology

UCLA Study (2009)

- Study has found that women who took longer to become pregnant were more likely to have higher blood levels of two common perfluorinated chemicals – perfluorooctane sulphate (PFOS) and perfluorooctanoate (PFOA)
- They are POPs found in fabrics, food packaging, shampoo, nonstick cookware as well as other household products

Early onset of puberty in girls central precocious puberty (CPP)

- New data suggest that certain environmental toxins may disrupt the normal growth and hormonal development of girls
- Some of these toxins, such as the mycoestrogen zearalenone (ZEA) produced by a fungus species that can be found naturally in the environment – have properties similar to the female reproductive hormone estrogen

CPP contd.

- 6/17 girls with CPP (Tuscany)

Ontario Smog Plan Steering Committee

- Total effects of particulate matter
 - 1725 premature deaths (respiratory & cardiac)
 - 1087 hospital admissions
 - 48,000 visits to emergency depts.
 - 567,000 asthma-symptom days
 - 8.35 million restricted-activity days

More about dioxin...

- Dioxins and furans are two closely related groups of chemical byproducts that are produced worldwide
- They are chlorinated compounds and are not produced intentionally
- They are byproducts from a range of chemical, manufacturing and combustion processes (e.g. production of certain pesticides, paper pulp bleaching)

municipal waste incineration, sewage-sludge and hospital-waste incineration are the worst culprits due to incomplete burning (World Health Organization, 2007)

Also caused by diesel-engine exhaust, accidental fires, volcanic eruptions, metal production and combustion of wood (among others)

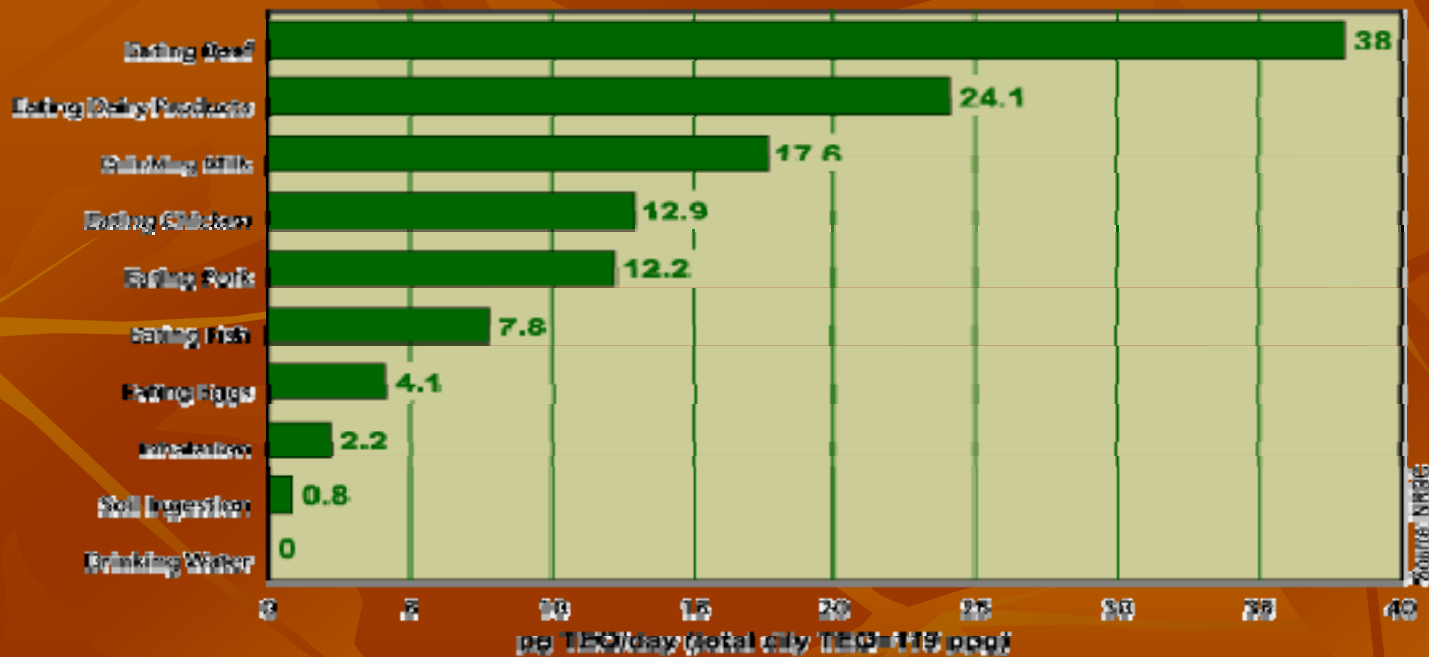
-dioxins and furans are “known” causes of many types of cancer and reproductive problems, abnormalities in fetal development, immune alterations, and disruption of hormones

-they are stored in fatty tissue and their half-life in the body is estimated to be 7-11 years

Natural Resources Defense Council

Dioxins in North America

Figure 39
Background Dioxin Exposure in North America
(percent of total TEQ by pathway)



Dioxin Exposure

- Eating beef (38)
- Eating dairy products (24.1)
- Drinking milk (17.6)
- Eating chicken (12.9)
- Eating pork (12.2)
- Eating fish (7.8)
- Eating eggs (4.1)
- Insulation (2.2)
- Soil ingestion (0.8)

- dietary exposure – 90% exposure of human dioxin and furan intake (fatty foods in particular)
- Once dioxides and furans have entered animal tissues – few avenues of departure
- In lactating ♀ dioxins and furans may leave the body in breast milk

Sensitive Sub-groups

- Developing fetus is most sensitive to dioxins
- Newborns with rapidly developing organ systems may also be more sensitive
- People with restricted diets (high consumers of fish)
- People employed in certain occupations (pulp & paper, incineration plants, etc)



Breast-milk testing

- Albania, Austria, Belgium, Cambodia, Canada, Croatia, Czech Republic, Denmark, Estonia, Faeroe Islands, Finland, France, Germany, Hungary, India, Israel, Japan, Kazakhstan, Lithuania, netherlands, New Zealand, Norway, Pakistan, Poland, Russia, Jordan, South Africa, Spain, Sweden, Thailand, United States, United Kingdom, Ukraine, Vietnam, Slovakia

European Union

	1988	1993	change
Rural	28.2	17.7	37% decrease
Urban	29.5	19.2	35% decrease
Industrial	35.9	24	33% decrease

Environmental Health of Children

- 2 petroleum refineries in the East End of Montreal
- Annualized rates of hospitalizations for respiratory health conditions among children 2-4 years of age were approximately 25% higher than rates for Montreal Island children for 1996-2004
- Peak daily SO₂ in residential areas near to the industrial complex can reach values that are >50% higher than daily peaks measured in other areas of the city and in other Canadian cities such as Toronto

- -analyses of children who were between 2 and 4 years of age at the time of their Emergency Department visit or hospitalization
- 46% and 41% of the hospitalizations and of the ED visits were among children who lived to the east of the refineries
- A. Smargiassi et al, “Risk of Asthmatic Episodes in Children Exposed to Sulphur Dioxide Stack Emissions from a Refinery Point Source in Montreal, Canada.” *Environmental Health Perspectives* (April 2009)



**Healthy milk,
healthy baby**

Harrison

“...there is no question that the chemical “dioxin” has received ample attention from the media, the public and governments in both Canada and the U.S. However, in light of the relatively high exposures associated with dioxin contamination of breast milk, and the cultural sensitivity to infant exposure and to breast milk as a symbol of purity, it is striking how little attention there has been to this particular issue. The absence of significant

press coverage, and the relatively low profile of environmentalists in that coverage, suggests that environmentalists have not attempted to publicize this particular issue, whether as a concern in and of itself or as a way to mobilize public concern about persistent toxic substances more generally.”

Explaining the absence of breast-milk contamination from the public agenda

- Alternative hypotheses
 - 1) other risks are more serious?
 - 2) absence of “focusing events”
 - 3) institutional factors

Severity of the Problem

- 4 other environmental issues received more attention in the media
 - 1) dioxins in fish (fisheries closures and advisories issued in both Canada and the U.S.)
- -estimates of lifetime cancer similar: 6.6% of background cancer risk from dioxins is from fish compared to 4-12% from breast milk

- 2) revelation that dioxins had been seeping from bleached cardboard cartons into cow's milk in the US (In Canada, only Quebec responded by voluntarily eliminating the problem by switching to dioxin-free cartons) 1988
- 3) (June 1999) animal feed given to cows and chickens in Belgium was contaminated with dioxins received international press coverage and prompted consumer alarm and bans of Belgian beef, chicken and dairy products by governments around the world

- 4) Alar (1989) – a growth regulator that was used to promote a “better” appearance in apples
 - Was eventually banned in both countries (roughly at the midpoint of the EPA’s range for dioxins in breast milk)
 - The EPA estimated an upper limit lifetime risk of 4.5×10^{-5} for Alar, roughly at the midpoint of the EPA’s range for dioxins in breast milk

Absence of focusing events

- “...sudden, dramatic and often harmful , focusing events give pro-change groups significant advantages” in overcoming opposition from those who seek to keep an issue off the political agenda.
- The absence of a focusing event cannot offer a complete explanation since focusing events are neither necessary nor sufficient for agenda change

Institutional Factors

- However, that neither the public nor regulators in Canada and the US have shown much inclination to focus on dioxins in breast milk suggests that institutional differences are not an important explanatory factor in this case