What is dioxin?

Dioxins and furans are some of the most toxic chemicals known to science. A draft report released for public comment in September 1994 by the US Environmental Protection Agency clearly describes dioxin as a serious public health threat. The public health impact of dioxin may rival the impact that DDT had on public health in the 1960's. According to the EPA report, not only does there appear to be no "safe" level of exposure to dioxin, but levels of dioxin and dioxin-like chemicals have been found in the general US population that are "at or near levels associated with adverse health effects."

Dioxin is a general term that describes a group of hundreds of chemicals that are highly persistent in the environment. The most toxic compound is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. The toxicity of other dioxins and chemicals like PCBs that act like dioxin are measured in relation to TCDD. Dioxin is formed as an unintentional by-product of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching. Dioxin was the primary toxic component of Agent Orange, was found at Love Canal in Niagara Falls, NY and was the basis for evacuations at Times Beach, MO and Seveso, Italy.

Dioxin is formed by burning chlorine-based chemical compounds with hydrocarbons. The major source of dioxin in the environment comes from waste-burning incinerators of various sorts and also from backyard burn-barrels. Dioxin pollution is also affiliated with paper mills which use chlorine bleaching in their process and with the production of Polyvinyl Chloride (PVC) plastics and with the production of certain chlorinated chemicals (like many pesticides).

Does dioxin cause cancer?

Yes. The EPA report confirmed that dioxin is a cancer hazard to people. In 1997, the International Agency for Research on Cancer (IARC) -- part of the World Health Organization -- published their research into dioxins and furans and announced on February 14, 1997, that the most potent dioxin, 2,3,7,8-TCDD, is a now considered a Group 1 carcinogen, meaning a "known human carcinogen."

Also, in January 2001, the U.S. National Toxicology Program upgraded 2,3,7,8-TCDD from "Reasonably Anticipated to be a Human Carcinogen" to "Known to be a Human Carcinogen." See their reports on dioxins and furans from their most recent 11th Report on Carcinogens. Finally, a 2003 re-analysis of the cancer risk from dioxin reaffirmed that there is no known "safe dose" or "threshold" below which dioxin will not cause cancer.
A July 2002 study shows dioxin to be related to increased incidence of breast cancer.

What other health problems are linked to dioxin exposure?

In addition to cancer, exposure to dioxin can also cause severe reproductive and developmental problems (at levels 100 times lower than those associated with its cancer causing effects). Dioxin is well-known for its ability to damage the immune system and interfere with hormonal systems.

Dioxin exposure has been linked to birth defects, inability to maintain pregnancy, decreased fertility, reduced sperm counts, endometriosis, diabetes, learning disabilities, immune system suppression, lung problems, skin disorders, lowered testosterone levels and much more. For an detailed list of health problems related to dioxin, read the People's Report on Dioxin.

How are we exposed to dioxin?

The major sources of dioxin are in our diet. Since dioxin is fat-soluble, it bioaccumulates, climbing up the food chain. A North American eating a typical North American diet will receive 93% of their dioxin exposure from meat and dairy products (23% is from milk and dairy alone; the other large sources of exposure are beef, fish, pork, poultry and eggs). In fish, these toxins bioaccumulate up the food chain so that dioxin levels in fish are 100,000 times that of the surrounding environment. The best way to avoid dioxin exposure is to reduce or eliminate your consumption of meat and dairy products by adopting a vegan diet. According to a May 2001 study of dioxin in foods, "The category with the lowest [dioxin] level was a simulated vegan diet, with 0.09 ppt.... Blood dioxin levels in pure vegans have also been found to be very low in comparison with the general population, indicating a lower contribution of these foods to human dioxin body burden."

In EPA's dioxin report, they refer to dioxin as hydrophobic (water-fearing) and lipophilic (fat-loving). This means that dioxin, when it settles on water bodies, will rapidly accumulate in fish rather than remain in the water. The same goes for other wildlife. Dioxin works its way to the top of the food chain.

Men have no ways to get rid of dioxin other than letting it break down according to its chemical half-lives. Women, on the other hand, have two ways which it can exit their bodies:

- It crosses the placenta... into the growing infant;
- It is present in the fatty breast milk, which is also a route of exposure which doses the infant, making breast-feeding for non-vegan/vegetarian mothers quite hazardous.

If you're eating the typical North American diet, this is where you are getting your dioxin from:
[A TEQ is a dioxin Toxic EQuivalent, calculated by looking at all toxic dioxins and furans and measuring them in terms of the most toxic form of dioxin, 2,3,7,8-TCDD. This means that some dioxins/furans might only count as half a TEQ if it's half as toxic as 2,3,7,8-TCDD.]

Levels of Dioxin in U.S. Food Supply (1995):

[Chart from May 2001 study by Arnold Schecter et. al., Journal of Toxicology and Environmental Health, Part A,
Note: freshwater fish were farm-raised on a diet of meat, which is why they show the highest dioxin levels in this study.

For more information on dioxin in the food supply...

- Intake of Dioxins and Related Compounds from Food in the U.S. Population (May 2001 study in the Journal of Toxicology and Environmental Health showing ongoing high levels of dioxins in meat and dairy products)
- How Toxic is Your Diet?
- Dioxins and Dioxin-like Compounds in the Food Supply: Strategies to Decrease Exposure (National Academy of Sciences, 2003)
- Dioxin/PCB contamination scandal in the Belgium and European food supply (1999)

EPA's Dioxin Reassessment Report and Related Government Documents

Since 1985, the U.S. Environmental Protection Agency (EPA) has been working on publishing a study of the health problems associated with dioxin. This report has been delayed repeatedly and is still not released in its final form. However, draft versions and related documents are available:

Where Dioxin Comes From:

- Database of Sources of Environmental Releases of Dioxin-Like Compounds in the United States (March 2001)

Health Effects Reports:

- Health Risks from Dioxin and Related Compounds Evaluation of the EPA Reassessment (National Academy of Sciences, July 2006)
- Draft Dioxin Reassessment as submitted to National Academy of Sciences for their review (October 2004)
- Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds (September 2000)
- Dioxin and Related Compounds Page
- Original 1994 EPA Draft Dioxin Reassessment -- Estimating Exposure
- Original 1994 EPA Draft Dioxin Reassessment -- Risk Characterization
- Original 1994 EPA Draft Dioxin Reassessment -- Health Assessment Documents

Read about the convoluted nearly 20 year history of EPA's dioxin reassessment to learn why it is still not out in final form. For more details on this, read the Behind Closed Doors report about the chemical industry's efforts to block final release of EPA's dioxin report.

U.S. General Accounting Office (GAO) Reports:

- Environmental Health Risks: Information on EPA's Draft Reassessment of Dioxins (April 2002 report reaffirming that EPA's science is sound) [Read the Alliance for Safe Alternatives' Summary of the Report]
- "EPA's Science Advisory Board Panels: Improved Policies and Procedures Needed to Ensure Independence and Balance" (June 2001) [Read the Alliance for Safe Alternatives' Summary of the Report]
Links

Good Overviews of Dioxin

- What is Dioxin? (Center for Health, Environment and Justice factsheet)
- Toxic Alert: Dioxin
- Health Effects of Dioxins

Documents available from the Center for Health, Environment and Justice:

- What's Dioxin?
- Dioxin Q & A (Alliance for Safe Alternatives factsheet)
- Dioxin Science Updates
- How to Start to Stop Dioxin Exposure in Your Community
- American People's Dioxin Report (November 1999)
  - Executive Summary
  - Technical Support Document (lots of great information on dioxin sources and health effects)

Other Valuable Resources:

- Dioxin 2004 Symposium - links to numerous research papers on dioxin
- Environmental Health Perspectives - free access to many scientific papers on dioxin health effects
- Center for the Biology of Natural Systems (dioxin studies)
  - Study links dioxin pollution in Arctic to North American sources (October 2000)
  - Dioxin Fallout in the Great Lakes: Where It Comes From; How to Prevent It; At What Cost (June 1996)
- Our Stolen Future (the webpage continues where the book left off, documenting the harms of dioxins and other endocrine disrupting, hormone-mimicking chemicals)
- Environmental Health News (breaking news on recent science on environmental health)

- No Evidence of Dioxin Cancer Threshold (Cancer Weekly, 2003) -- (Or, in plain English, there's no known safe level of dioxin.)
- Boston passes resolution to avoid purchasing products known to release dioxin when manufactured or disposed of (unfortunately, they failed to include PVC plastic, the most notorious product in this category)
- COPA's PCB Information Service (Very good collection of dioxin & PCB resources -- "Remediation Technologies, Health Effects, Regulations, Superfund Case Studies, References & More")
- Toxics and Environmental Health Links

Books on Dioxin:

- The Dioxin War: Truth And Lies About A Perfect Poison (July 2004) [background info on the book: here and here]
- Our Stolen Future: How We Are Threatening Our Fertility, Intelligence and Survival (March 1997)

Endocrine Disruptors

- e.hormone: your gateway to the environment and hormones (Center for Bioenvironmental Research at Tulane and Xavier Universities)
- EPA Endocrine Disruptors Research Initiative
Dioxins and Incineration:

- Metals as Catalysts for Dioxin Formation
- Continuous Emissions Monitoring of Dioxins
- Electrostatic Precipitators (ESPs) Breed Dioxins (ESPs are a type of pollution control device used in some incinerators)

Anti-Incineration Links:

- Global Anti-Incinerator Alliance (GAIA)
  - Waste Incineration: A Dying Technology
- Greenpeace Anti-Incineration Resources
  - Chlorine, Combustion and Dioxins: Does Reducing Chlorine in Wastes Decrease Dioxin Formation in Waste Incinerators?
  - The Problem with Incineration
  - Types of Incineration
  - Alternatives to Incineration
  - Greenpeace Reports on Incineration
  - Archive of many more Greenpeace reports on incineration and dioxin
  - Incineration and Human Health Report
  - The Construction Cost of Municipal Waste Incinerators - Counter Measures against Dioxin. The Entire Picture of Domestic Expenditure and Its Trend (May 2001)
- Incineration & Why It Must Stop
- Dioxin Levels down by 46% since closing of Columbus Garbage Incinerator
- Largest Known Dioxin Air Pollution Source (Harrisburg, PA Trash Incinerator) Closed in June 2003 (though a new incinerator has been built in its place)

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Environmental Research Foundation's
RACHEL's Environment & Health Weekly Issues

Dioxin & Incineration

#326 Carol Browner's Opportunity [Jacksonville]
#325 Troubles Engulf Hazardous Waste Incineration
#314 Cement And Kiln Dust Contain Dioxins
#312 EPA Memo Says All Hazardous Waste Incinerators Fail To Meet Regulations
#311 The Jacksonville, Arkansas Incinerator
#280 Hazardous Waste Incinerators Fail, EPA Says
#179 Medical Incinerators Emit Dangerous Metals And Dioxin, New Study Says
#82 Incineration of Infectious Waste: Poorly Understood Hazards
#45 Part 4: Scientists Study How 'Mass Burn' Incinerators Produce Dioxin
#31 Part 1: Do 'Mass Burn' Incinerators Endanger Humans?
Dioxin & Health Effects

#463 Dioxin and Health
#438 Warning on Male Reproductive Health [endocrine disruptors]
#436 The Dogs of War [pesticides; antibiotics]
#414 Potent Immune System Poison [dioxin]
#400 EPA Investigates Monsanto
#365 New Era in Toxicology [endocrine disruptors]
#364 Dioxin and PCBs and Endometriosis
#353 Dioxin Causes Human Cancers
#343 Do Chemicals Diminish Masculinity? [endocrine disruptors]
#290 Dioxin 'Demasculinizes' Rats [endocrine disruptors]
#264 Endocrine Disruptors--Part 2: Major Challenge To Business As Usual
#263 Endocrine Disruptors--Part 1: Chemicals In Environment Affect Sexual Growth In Wildlife. And Humans?
#219 Dioxin--Part 4: New Study Links Dioxin To Human Cancer
#212 Report Links Herbicide Exposure To Illnesses Among Vietnam Veterans
#175 Dioxin--Part 3: New Evidence That Dioxin Causes Human Cancers & Other Diseases
#173 Dioxin--Part 2: Gauging The Toxicity Of Dioxin
#171 Dioxin--Part 1: Dioxins And Cancer: Fraudulent Studies
#120 Dangers Of Dioxin Exposures: Absorption Through The Skin
#73 Study Of Dioxin-Exposed Humans Reveals Cancer, Birth Defects

Dioxin Politics

#479 Nationwide Dioxin Campaign
#457 Dioxin Inquisition
#405 Turning Point for the Chemical Industry [dioxin]
#391 Dioxin Reassessed, Part 2
#390 Dioxin Reassessed, Part 1
#363 Taking the Handle Off the Chlorine Pump
#346 Detoxifying Everything [Bad journalism]
#310 The N.Y. Times Detoxifies Dioxin [Again]
#283 Army Opens A Front [chemical weapons incinerators]
#275 Dioxin Detoxification Campaign [paper industry]
#270 EPA: Dioxin Damages Human Immune System
#269 EPA: New Picture of Dioxin's Toxicity Emerges
#249 Dioxin Dangers -- What's Going On?
#248 A Tale Of Science And Industry [dioxin]

Dioxin-Related Email Lists / Archives
**Ban Toxics List:** [Ban Toxics List Archives](http://www.ejnet.org/dioxin/) (to subscribe, send a blank email to: [ban-toxics-subscribe@yahoogroups.com](mailto:ban-toxics-subscribe@yahoogroups.com))

There used to be an email list called "dioxin-l" which no longer exists, but its archives are available at the following pages:

- [Archives of the Dioxin-L List](http://www.ejnet.org/dioxin/)
- [Search the old dioxin-l archives](http://www.ejnet.org/dioxin/)
- [Archives since 12/20/1999](http://www.ejnet.org/dioxin/)
- [dioxin-l archives for 1999](http://www.ejnet.org/dioxin/)
- [dioxin-l archives for 1998](http://www.ejnet.org/dioxin/)
- [dioxin-l archives for 1997](http://www.ejnet.org/dioxin/)
- [dioxin-l archives for 1996](http://www.ejnet.org/dioxin/)
- [dioxin-l archives for 1995](http://www.ejnet.org/dioxin/)

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