

# Preventing Neonatal Pollution: Protecting the Health of the Next Generation



**Karin Gunther Russ, MS, RN**  
 National Coordinator, Fertility and Reproductive Health Working Group  
 Collaborative on Health and the Environment  
 karin@healthandenvironment.org



## Pollution in Newborns

In our modern industrial society, the public is continually exposed to a wide range of chemicals in food, air, water, and consumer products. There is a common misperception that the placental barrier is protective, filtering out many substances that the mother is exposed to before they reach the fetus. However, recent studies have found more than 200 industrial chemicals present in the umbilical cord blood samples of neonates (1,2,3). In 2010, the President's Cancer Panel report acknowledged that "babies are born pre-polluted." (4) Practitioners working with pregnant women need to know how to screen clients for exposures to environmental contaminants, and to counsel patients on ways to avoid toxicants. This session will present current research on environmental contaminants in pregnant women, current screening tools, and provide resources for patient education on risk reduction.

### Examples of Chemicals Found in Infant Cord Blood

- PFCS - Perfluorinated chemicals (aka "Teflon chemicals")
  - ▶ PFOA - Perfluorooctanoate
  - ▶ PFOS - Perfluorooctane Sulfonate
- Brominated flame retardants
  - ▶ PBDE - Polybrominated diphenyl ethers
  - ▶ PBDD/F - Polybrominated dibenzodioxins, furans
- Additives to plastics, medical devices, cosmetics, personal care products
  - ▶ BPA - Bisphenol A
  - ▶ Phthalates
    - \* DEHP - di-2-ethylhexyl phthalate
    - \* DBP - di-n-butyl phthalate
    - \* DEP - diethyl phthalate
- Pesticides
  - ▶ Atrazine
  - ▶ Chlordane
  - ▶ Chlorpyrifos
  - ▶ DDT - Dichlorodiphenyltrichloroethane
  - ▶ DDE - Dichlorodiphenylethane (metabolite of DDT)
  - ▶ Fungicide - HCB - hexachlorobenzene
- Air Pollution Components
  - ▶ PAH - Polycyclic aromatic hydrocarbons
  - ▶ Dioxin
- PCNs - Polychlorinated naphthalenes (Wood preservatives, varnishes, waste incineration)
- PCBs - Polychlorinated biphenyls (Industrial insulators and lubricants)



## Effects in the Neonate

Prenatal exposure to chemicals in the environment has been associated with a wide variety of negative health outcomes. While the biological mechanisms that lead to these outcomes continue to be studied, researchers are finding strong correlations between exposures to environmental contaminants and adverse health outcomes. Effects may be seen in the short term, during the perinatal period, in childhood, or into adulthood.

### Negative Birth Outcomes



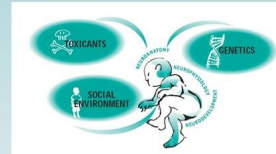
<b>Low Birth Weight</b>	PFOS, PFOA, PBDE, DBP, Pesticides, Air Pollution (26-36)
<b>Preterm Birth</b>	PFOS, PFOA, PBDE, DDT, DDE, Phthalates, Pesticides, Air Pollution, PCBs (39-43)
<b>Birth Defects</b>	Air Pollution, Pesticides, BPA (47-66)

## Prenatal Exposures and Later Disease

The developing fetal brain is especially vulnerable to negative neurodevelopment effects from toxicant exposure. Research in animal models finds an array of chemicals with neurotoxic properties, and epidemiological studies support the correlations in humans. Studies examining the effect of environmental toxins on maternal thyroid function may be of particular significance, since thyroid hormones of maternal origin play an essential role in fetal neurodevelopment. (66-67)

### Impaired Neurodevelopment & Behavior

<b>Neurobehavioral/Neuromotor function</b>	Pesticides, PBDE, PCBS, Phthalates, DDT, DDE (67-69)
<b>Lowered IQ</b>	Pesticides, PBDE (68-70)



### Developmental Origins of Health and Disease

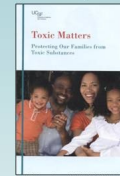
Researchers in the field of the Developmental Origins of Health and Disease (DOHaD) explore how early life exposures affect adult health. DOHaD researchers seek to find the mechanisms by which body systems are programmed during the fetal period. DOHaD builds upon the work of David Barker, M.D., Ph.D., F.R.S., who found that severe malnutrition in pregnancy is associated with a greater likelihood of cardiac disease in adulthood. The hypothesis is that prenatal factors cause a shift in fetal development that favors growth of the brain at the expense of other organs. The resultant tissues are more susceptible to diseases later in life. Studies are finding evidence of epigenetic programming in the womb in response to environmental factors, which may predispose an individual to chronic conditions later in life, such as asthma, obesity, diabetes, heart disease, cancer, and infertility. (75-79)

## Screening for Exposures

Environmental health screening tools designed for the preconceptional and prenatal period are available to assist healthcare providers who provide maternity care to assess for exposures to environmental contaminants. The Green Choices Project and the Alliance of Nurses for Healthy Environments provide examples of prenatal environmental health assessment tools, and are available on-line.

## Counseling Clients

Short term effects of toxicants, such as low birth weight, prematurity and birth defects, contribute significantly to infant mortality. Fetal programming resulting from prenatal factors, including environmental exposures, has long term effects that predispose the individual to chronic disease later in life. To lower the risk of these acute and chronic consequences, interventions that prevent or limit exposures to toxicants during the prenatal period are a valuable public health strategy. The Green Choices Project, UCSF Program on Reproductive Health and the Environment, and Magee-Womens Hospital of UPMC provide materials for counseling patients on risk reduction strategies.



## Training Clinicians

Environmental exposures in pregnancy can alter development during a crucial period. Health care professionals need continuing educational opportunities, in order to better understand the hazards posed by environmental toxicants, and to provide anticipatory guidance to families on avoiding hazardous substances. Although risk reduction is an important prevention measure, many exposures are not avoidable on an individual basis. The UCSF Program on Reproductive Health and the Environment offers information for clinicians on becoming involved in health policy. The Association of Reproductive Health Professionals, Physicians for Social Responsibility, and the Collaborative on Health and the Environment are among the organizations providing resources for professional training and education.

## References

- Available on the APHA 2011 Annual Conference website or by email request.