

Impact of Environmental Chemicals on Childhood Obesity

This focus sheet is to inform policy makers, government agencies, and disease prevention programs about the potential contribution of environmental chemicals to childhood obesity.

Obesity is Epidemic in Children

Obesity is a condition of excessive body fat. Since body fat is difficult to measure, obesity in children is typically defined as having a Body Mass Index or BMI (weight/height²) in the top 5% of standard growth charts that are specific to age and sex.¹

Rates of childhood obesity have tripled in just one generation and obesity now affects 17% of U.S. children.²

Obese children are more likely to develop chronic diseases such as type 2 diabetes and asthma. They are more likely to have high blood pressure and high cholesterol which are risk factors for cardiovascular disease. Obese children are likely to become obese adults and have higher risk of certain cancers, heart disease, stroke, and shorter lifespan.²

Risks Factors for Children Being Overweight and Obese

Children from low-income families and children of Hispanic, African-American, American Indian, and Pacific Islander ancestry are more likely to be obese.³ Other risk factors for development of obesity are:

- Consumption of an unhealthy diet.³
- Low level of physical activity.²
- Living in environments that lack access to healthy food and physical activities.
- Excessive time spent watching TV, on a computer, or playing video games.²
- Maternal tobacco use, excessive weight gain, or maternal diabetes during pregnancy.⁴
- Low birth weight with rapid weight gain in early infancy.⁴
- Not having been breastfed.^{2,4}
- Use of certain medications.⁵

Emerging Evidence of Chemical Contribution to Obesity

There is growing scientific evidence that exposure to environmental chemicals could be contributing to the obesity epidemic. Environmental chemicals known or suspected to promote obesity^{8,9} include:

- Tobacco smoke.
- Nicotine.
- Organotins.
- Organophosphate insecticides.
- Perfluorooctanoic acid (PFOA).
- Bisphenol A.
- There is also some suggestive evidence that phthalates, polybrominated diphenyl ethers (PBDEs), DDT, and polychlorinated biphenyls (PCBs) may contribute to obesity.

In Washington:

- In 2010, 10% of tenth grade students were obese and another 14% were overweight (defined as having a BMI in the top 5-15% on growth charts for their age and sex).⁶
- The fraction of adults who are obese more than doubled over the past 20 years. Increasing from 10% in 1990 to 26% in 2010.³
- Medical costs associated with adult obesity were estimated at 1.3 billion in 2003 dollars.⁷

Animal research has shown that exposure to certain chemicals during fetal and early life periods can permanently alter metabolism and cause obesity later in life. Molecular research into the mechanism by which they alter metabolism has shown multiple pathways. Some chemicals affect gene expression and promote cells into becoming fat cells during normal organ and tissue development – others increase the size of fat cells, or permanently alter hormone regulation of appetite and energy metabolism. Evidence that these chemicals are directly contributing to human obesity is still limited but is strongest for maternal use of tobacco during pregnancy.^{8,9,10}

Federal Research Priority

In 2010, the White House Task Force on Childhood Obesity recommended that health agencies prioritize research into the effects of possible obesity-causing chemicals.⁴

In 2011, the National Institutes of Health launched a 3-year effort to fund research exploring the role of environmental chemical exposures in obesity, type 2 diabetes, and metabolic syndrome.¹²

Reducing the Burden of Disease

Obesity is associated with chronic low-grade inflammation and serious medical problems like type 2 diabetes, which are difficult to treat in children. It is important to concentrate on prevention of this condition.

There is growing evidence that obesity may be surpassing smoking as the most costly and detrimental preventive cause of terminal diseases in the U.S. A recent estimate suggests that obesity accounts for 17% of all U.S. medical costs each year.¹¹

Identifying chemicals that contribute to obesity in people would help us intervene early in life to reduce the risk of developing obesity. Protecting developing children from environmental chemicals that contribute to obesity could help reduce the burden of disease.

For More Information

- Obesity, Washington State Department of Health: www.doh.wa.gov/YouandYourFamily/IllnessandDisease/Obesity.aspx
- Childhood Obesity, CDC: www.cdc.gov/healthyyouth/obesity/facts.htm
- White House Task Force on Childhood Obesity, Report to the President, 2010: www.letsmove.gov/sites/letsmove.gov/files/TaskForce_on_Childhood_Obesity_May2010_FullReport.pdf
- Role of Environmental Chemicals in Diabetes and Obesity - A National Toxicology Program Workshop Review, Environmental Health Perspectives, 2012: www.ncbi.nlm.nih.gov/pmc/articles/PMC3385443/

References

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²Centers for Disease Control and Prevention. *Childhood Overweight and Obesity* www.cdc.gov/obesity/childhood/ (Accessed July 2012).

³WA Dept of Health, *Obesity in Washington State*. DOH 345-291. February 2009.

⁴White House Task Force on Childhood Obesity; Report to the President "Solving the problem of childhood obesity within a generation." May 2010. http://www.letsmove.gov/sites/letsmove.gov/files/TaskForce_on_Childhood_Obesity_May2010_FullReport.pdf

⁵Ratzoni G. et al (2002) Weight gain associated with olanzapine and risperidone in adolescent patients: a comparative prospective study. *J Am Acad Child Adolesc Psychiatry* 41(3): 337-343).

⁶WDOH, *Washington State Healthy Youth Survey: 2010 Analytical report*. DOH 210-084. June 2011. www.doh.wa.gov/Portals/1/Documents/Pubs/210-084_WashingtonStateHYS2010.pdf

⁷Finkelstein EA, Fiebelkorn IC, Wang G. State-level estimates of annual medical expenditures attributable to obesity. *Obesity Research* 2004; 12(1):18-24.

⁸Thayer, KA et al. (2012) Role of environmental chemicals in diabetes and obesity: a National Toxicology Program workshop review. *Environ Health Perspect* 120(6): 779-789.

⁹Merrill, M. and L. Birnbaum (2011) Childhood obesity and environmental chemicals. *Mount Sinai J of Med* 78:22-48.

¹⁰Heindel, J. and F. vom Saal (2009) Role of nutrition and environmental endocrine disrupting chemicals during the perinatal period on the aetiology of obesity. *Molecular and Cellular Endocrinology* 304: 90-96.

¹¹Cawley and Meyerhoefer (2010) The medical care costs of obesity: an instrumental variables approach. *National Bureau of Economic Research*.

¹²NIH. *Role of Environmental Chemical Exposures in the Development of Obesity, Type 2 Diabetes and Metabolic Syndrome (R01)*. <http://grants.nih.gov/grants/guide/pa-files/PA-11-170.html>