We Are What We Eat:
Non-Stick Chemicals, Plasticizers and Other Endocrine Disruptors in Our Food and Our Bodies

with EWG’s Alexis Temkin, PhD
Endocrine Disrupting Chemicals: EDCs

“EDCs are chemicals that may interfere with the body’s endocrine system and produce adverse developmental, reproductive, neurological and immune effects” - NIEHS

Children and the developing fetus are particularly vulnerable to the health effects associated with EDC exposure.

Exposure can contribute to development of chronic diseases.

Children are also at risk for higher levels of exposure.

1. Consumer more food and water per body weight relative to adults.
2. Eat one type of food over and over again.
Routes of Chemical Exposure

- Inhalation
- Dermal Absorption
  Personal Care Products
- Ingestion through Drinking Water
- Ingestion through Food
Which Chemicals Have Been Detected in Our Foods?

US FDA Total Diet Study monitors 800 contaminants and nutrients in food

USDA Pesticide Data Program monitors 450 pesticides and their breakdown products

Broad range of health effects including endocrine disruption, neurotoxicity and developmental toxicity

- Heavy Metals
- Persistent Organic Pollutants (POPs)
- Carcinogens
- Industrial Chemicals
Dietary behavior trends influence exposure to chemicals

- Fast food consumption
- Mercury and POPs in seafood and meat
- Pesticide residues are reduced in children on an organic diet

Can exposures reach unsafe levels?
Estimated Daily Intake of Food-Borne Toxins Above Cancer Benchmark Values

Risk ratios (mean calculated intake: cancer benchmark values)

Contaminants:
- Arsenic
- Chlordane
- Dieldrin
- DDE
- PCDD/Fs

*Source: Vogt et al. 2012 Environmental Health

*Cancer benchmarks available for listed contaminants only.
How Does Our Food Come to Contain EDCs and Other Contaminants?

Intentional addition of chemicals to food
1. Food additives
2. Pesticide residue

Accidental contamination of food with chemicals
1. Environmental bioaccumulation from legacy contaminants
2. Migration of food contact materials
3. Food processing
Everything Added to Food in the US

Over 4000 chemicals on the Food Additive List

GRAS – Generally recognized as safe

Thousands of chemicals are approved as food additives

1. Many of these chemicals have not been fully evaluated for safety

2. Our understanding of how chemicals may pose health risks is changing and evolving

3. We see value reductions in limits deemed "safe" – not the other way around
SURFACTANTS & EMULSIFIERS
Gut health as a toxicity endpoint
The gut microbiome is emerging as an important component to understanding human disease.

- Obesity, inflammation, IBS and colon cancer

Diet and chemicals can shift and alter gut microbiome populations.

Chemicals can change gut permeability and influence nutrient and chemical absorption.

- polysorbate 20, carboxy methyl cellulose, dioctyl sodium sulfosuccinate

Source: KJ Groh et al. 2017 Food and Chemical Toxicology
Chemicals as Food Contact Materials
One week of food for a family in India and Guatemala

Fresh fruits and vegetables, limited processed grains and cereals, few canned and packaged goods.

Source: http://world.time.com
One week of food for a family in North Carolina and California

Highly processed foods, food wrapped in plastics and other packages, few fresh fruits and vegetables.

Source: http://world.time.com
Chemicals as Food Contact Materials

Phthalates
PVC, plastics, lids, unknown sources

Per and Poly Fluorinated Compounds
Food Wrappers, Paper & Board

BPA & Other Bisphenenols
Can linings as epoxy resins
Phthalates

Plasticizers are chemicals added to plastics (PVC) to give them certain characteristics

- *Flexibility, malleability et.*

Not bound to plastic polymer and can leach/migrate from materials into foods
Phthalates in Foods

Phthalates – antiandrogens

- Bread and dairy are highest exposure sources
  - Packaging? Processing?
- Have some regulations on use and migration limits in Europe
- Violations often found
Estimated Daily Intake for the Phthalate DEHP Based on Diet and Life Stage

EPA Reference Dose
EFSA TDI

Serrano et al 2014 Environmental Health
BPA and other Bisphenols

Can Linings and Canned Foods

Detected in 63 of 105 canned food samples at levels at up to 65 ng/g

Regrettable substitution

1. BPA exposure is declining but we are beginning to see increases in other bisphenols – reports indicate they have very similar and sometimes more harmful toxicological properties

2. BPS has been shown to migrate above EU regulated specific migration limits

Source: Schecter et al. 2010 Environmental Science and Technology
Per and poly fluorinated compounds (PFCs or PFAS)

Food Wrappers, Paper & Board

• Health Effects
  • Cancer, immune toxicity, low birth weight, obesity and increase in cholesterol, sex hormones

• Function
  • Non-stick chemicals
  • Used as grease, oil and water repellants
Analysis of Fluorine Content in Representative Sample of Fast Food Packaging in the US

- Dessert & Bread Wrappers: 50%
- Sandwich & Burger Wrappers: 38%
- Paperboard: 20%
- Paper Cups: 0%

Schaider et al. 2017 Environmental Science and Technology Letters
Can You Reduce Your Exposure Through Diet?

Yes, but it’s complicated…

Intervention studies can teach us what’s in our food

Phthalates

1. Spices – ground coriander
2. Dairy – butter, cream, milk and cheese

Source: Sathyanarayana et al. 2013 Journal of Exposure Science and Environmental Epidemiology
Can You Reduce Your Exposure Through Diet?

EWG’s Dirty Dozen™ & Clean Fifteen™

This years will be released in April
Support Chemical Policy Change

Ingredient use and disclosure bills

• Washington state just passed HB 2658 to ban perflourinated chemicals in food packaging materials if alternatives can be found

• State and local legislatures are listening
Take Away

• Food is a major route of human exposure to chemicals, many of which are EDCs
• Children may be particularly vulnerable to chemical exposures through food
• Phthalates, per and poly fluorinated chemicals and bisphenols are prevalent in foods likely due to their use in food contact materials
• Health effects and safety levels of mixtures of chemicals in foods are poorly assessed
• Dietary modification can influence/reduce exposures
Questions?