

Phthalate and novel plasticizer concentrations in food items from U.S. fast food chains: a preliminary analysis

Lariah Edwards, Ph.D.

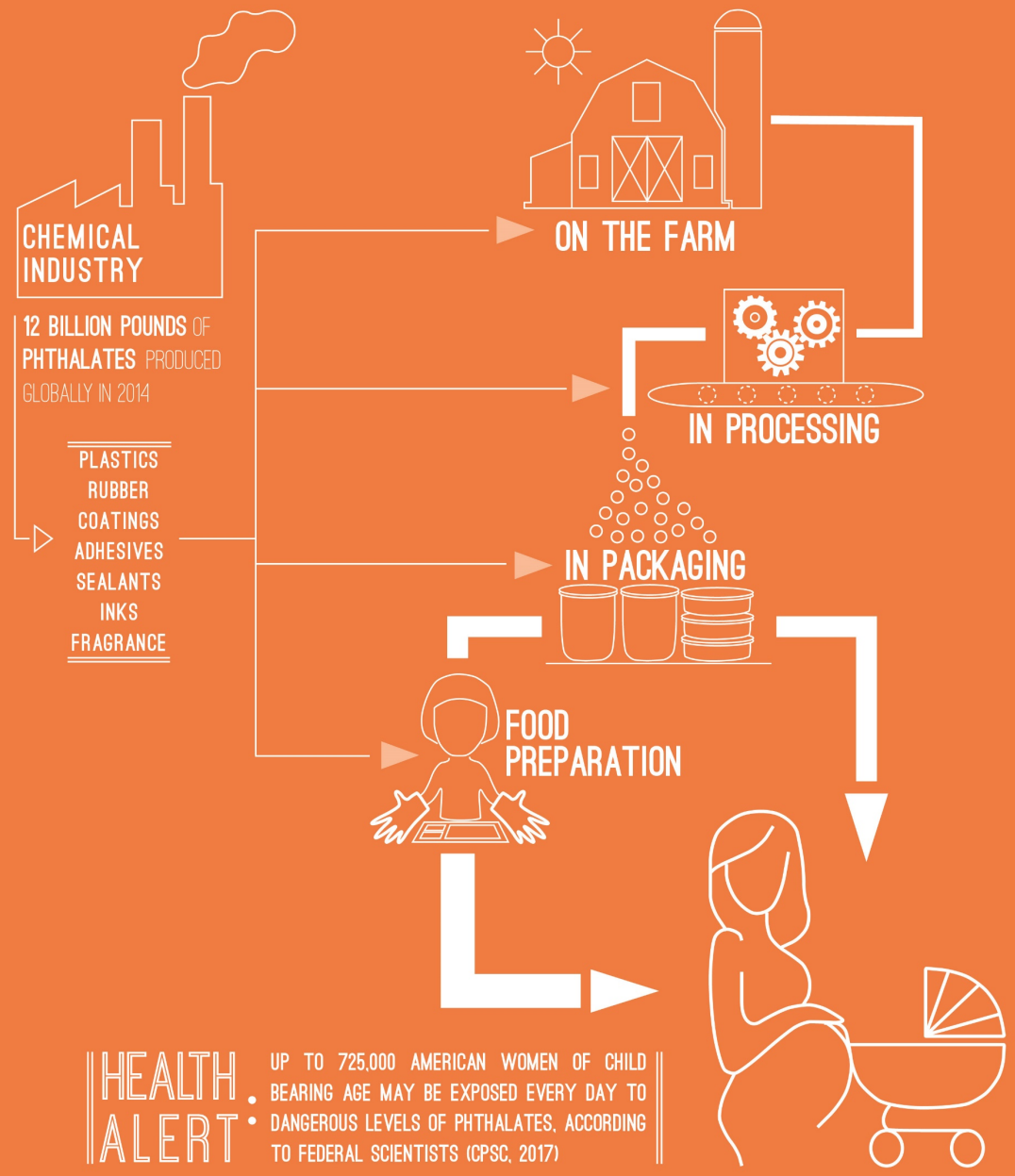
The George
Washington
University

February 17, 2022

Lariah Edwards, Ph.D., Nathan L. McCray, M.P.H, Brianna N. VanNoy, M.P.H., Alice Yau, Ph.D., Ruth J. Geller, M.H.S., Gary

Adamkiewicz, Ph.D., M.P.H., Ami R. Zota, Sc.D., M.S.

HOW ARE PHTHALATES GETTING INTO OUR FOOD?



Is your favorite fast-food joint using PFAS in its packaging?



TOXIC-FREE FUTURE Testing by an independent lab showed that these items contained levels of fluorine that suggested treatment with PFAS chemicals

Mind Store

Fast food: high in fat, sugar, and phthalates?

Vol. 124, No. 10 | Research

Recent Fast Food Consumption and Bisphenol A and Phthalates Exposures among the U.S. Population in NHANES, 2003–2010

is companion of

Ami R. Zota, Cassandra A. Phillips, and Susanna D. Mitro

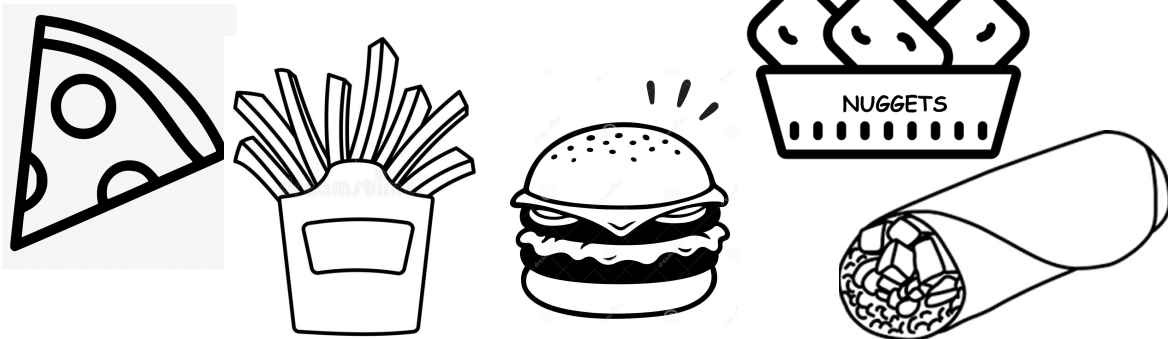
Objectives

1. Characterize ortho-phthalates and replacement plasticizers in food items and food handling gloves from fast food chains
2. Investigate the bioactivity of replacement plasticizers using U.S. EPA ToxCast data



Quantifying chemicals in fast food items

- 64 food items sampled across 2 sampling phases (2017-2018)
- 6 fast food chains, with at least 2 locations per chain across San Antonio, TX
- **3 pairs of gloves** from 3 fast food chains (phase 2 only)
- **11 chemicals analyzed**
 - 8 ortho-phthalates: BBzP, DnBP, DEP, DEHP, DMP, DnOP, DiNP, and DiBP
 - 3 replacement plasticizers: DEHT, DEHA, and DINCH
 - Chemicals analyzed using gas chromatography/mass spectrometry

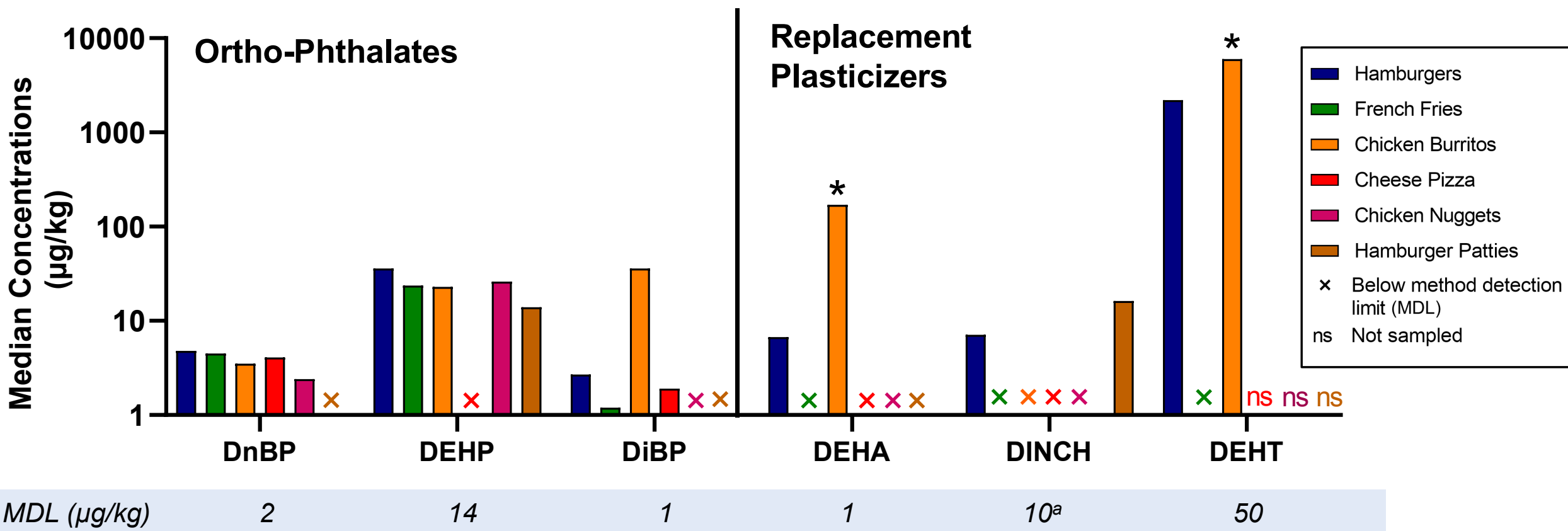


Detection frequencies of chemicals in fast foods items

		Hamburgers (n=21)	Fries (n=10)	Chicken Burritos (n=14)	Cheese Pizza (n=8)	Chicken Nuggets (n=7)	Hamburger Patties (n=4)
	Total % Detect	% Detect	% Detect	% Detect	% Detect	% Detect	% Detect
Ortho-Phthalates							
BBzP	20.3	29	40	7	0	29	0
DnBP	81.3	100	80	71	100	57	25
DnOP	6.3	0	0	0	38	14	0
DEP	39.1	38	50	36	13	29	100
DEHP	70.3	100	70	57	0	100	50
DiBP	38.1	88	57	13	50	0	0
DiNP	28.6	0	0	100	50	0	0
DMP	0	0	0	0	0	0	0
Replacement Plasticizers							
DEHA	40.6	62	30	71	0	0	0
DINCH	14.1	24	0	0	0	29	50
DEHT	86.4	100	0	100	ns	ns	ns

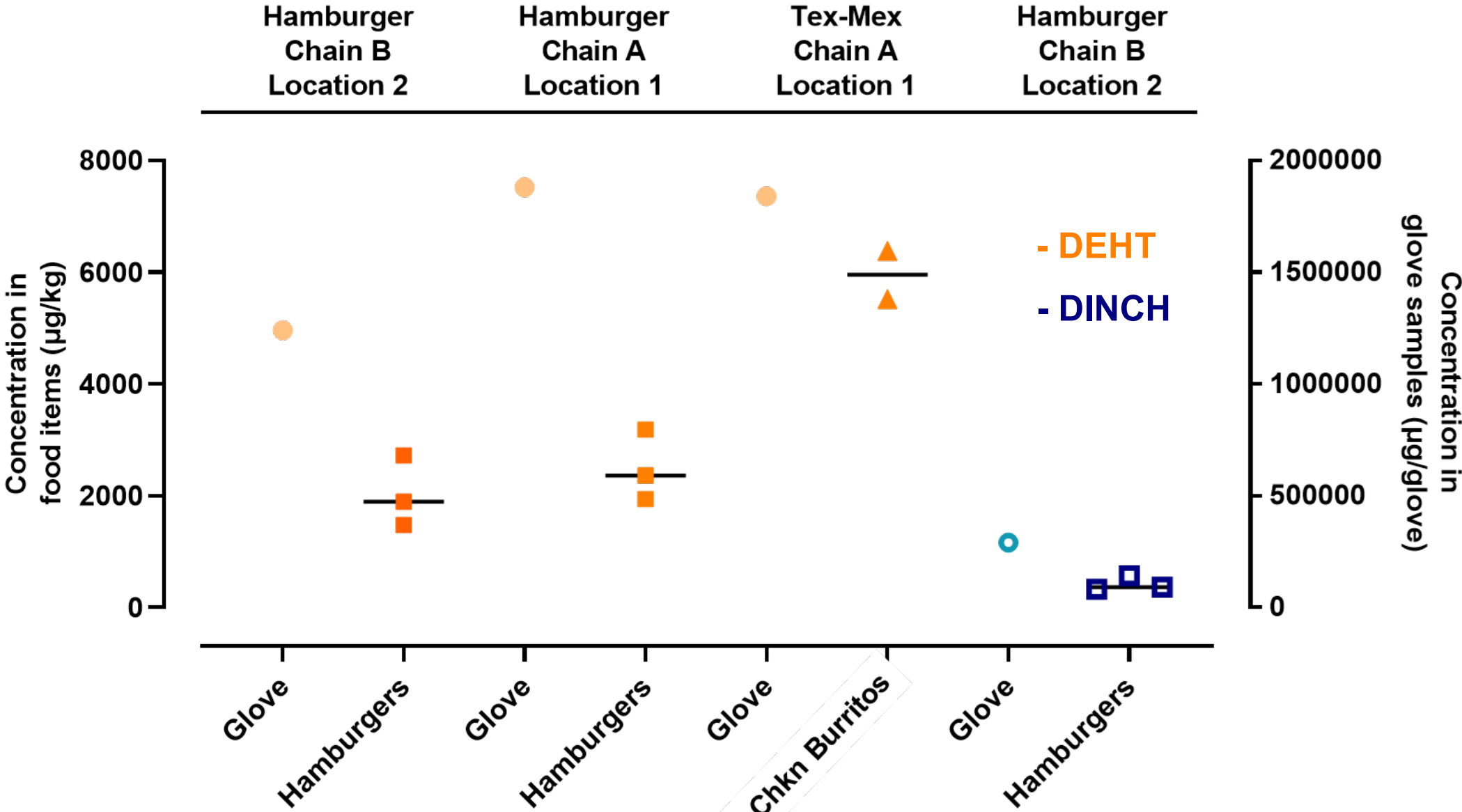
*DiNP and DiBP are phase 1 analytes only (n=42); DEHT is a phase 2 analyte only (n=22)

Comparison of median plasticizer concentrations



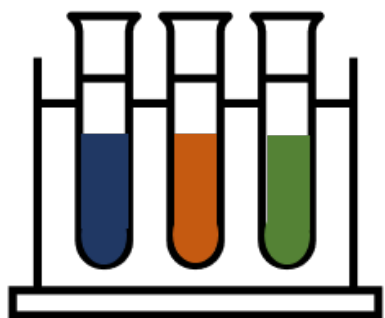
^aMDLs varied across phases for DINCH. Phase 1=5 $\mu\text{g}/\text{kg}$; Phase 2=10 $\mu\text{g}/\text{kg}$.

Replacement plasticizers detected in foods and gloves collected from same restaurant

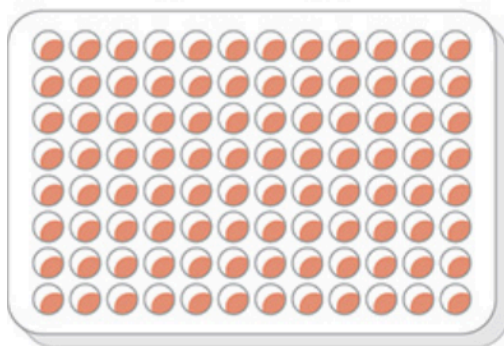


ToxCast analysis of replacement plasticizers

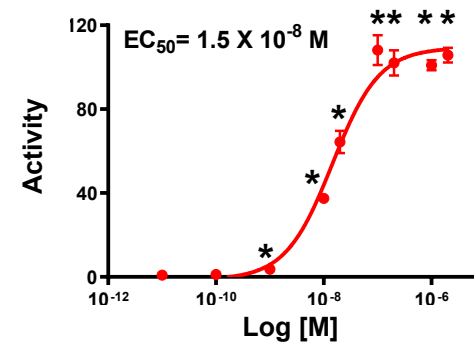
Introduce test compounds
(e.g., DEHT, DEHA, DINCH)



Measure activity for
specific endpoint or gene
(e.g., ER, AhR, PPARg)

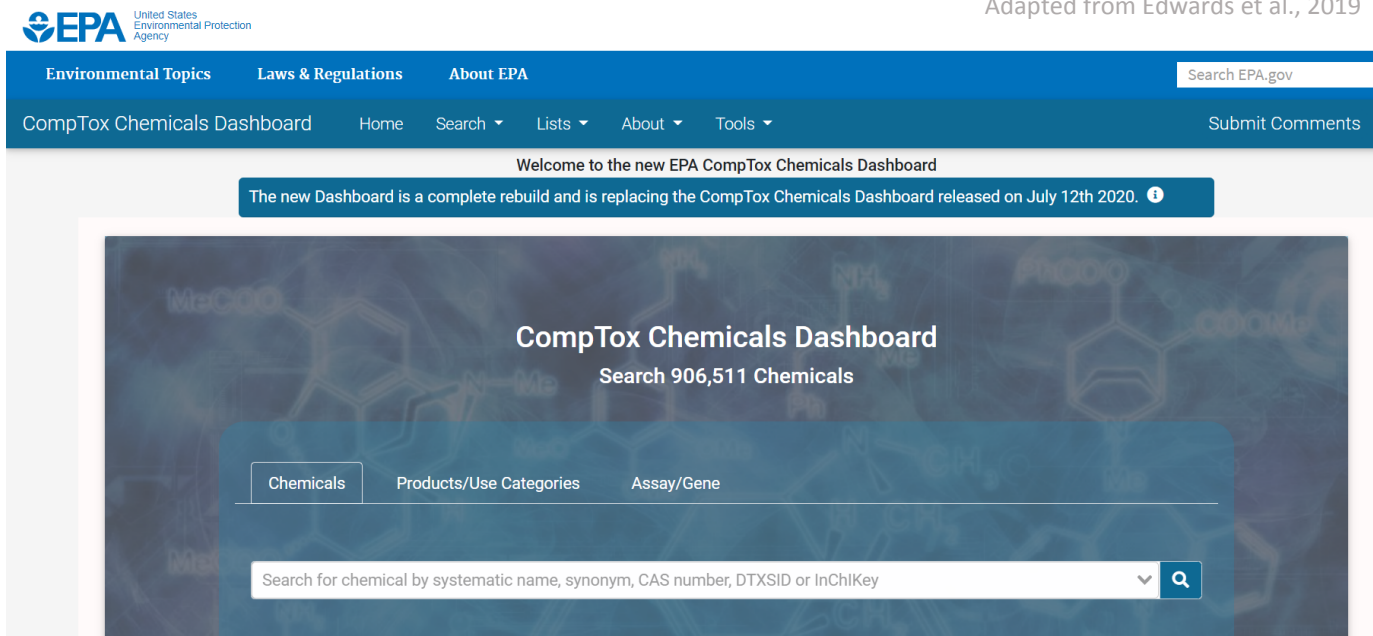


Conduct statistical
analyses of results



Adapted from Edwards et al., 2019

Queried ToxCast for
nuclear receptor
bioactivity
information for
replacement
plasticizers



The screenshot shows the EPA CompTox Chemicals Dashboard. At the top is the EPA logo and navigation links: Environmental Topics, Laws & Regulations, and About EPA. Below this is a search bar and a 'Submit Comments' button. A welcome message states: 'Welcome to the new EPA CompTox Chemicals Dashboard. The new Dashboard is a complete rebuild and is replacing the CompTox Chemicals Dashboard released on July 12th 2020.' The main content area features the title 'CompTox Chemicals Dashboard' and 'Search 906,511 Chemicals'. There are three tabs: 'Chemicals', 'Products/Use Categories', and 'Assay/Gene'. A search input field is at the bottom with the placeholder text 'Search for chemical by systematic name, synonym, CAS number, DTXSID or InChIKey'.

Replacement plasticizers interact with nuclear receptor signaling pathways

Gene Name	ToxCast Assay Name ^a	DEHT	DINCH	DEHA
Retinoid X receptor-beta (RXR β)	ATG_RXRb_TRANS_up	×		×
Pregnane X receptor (PXR)	ATG_PXRE_CIS_up		×	
Estrogen receptor (ER α)	TOX21_ERa_BLAAntagonist_ratio			×

Summary

- Phthalates and replacement plasticizers were widespread in prepared meals available at popular fast food restaurants
 - Consistent with literature linking fast food consumption to higher concentrations of phthalate biomarkers in humans
- Generally, foods containing meats had higher concentrations of chemicals
- Lack of studies investigating these chemicals in U.S. fast foods
 - Studies have reported higher concentrations of certain phthalates in meat and dairy products
 - Additionally, studies have reported finding phthalates in grocery stores foods and school lunches

Summary

- Replacement plasticizers, not phthalates, were detected in gloves collected from the same restaurants as food items
 - Our concentrations are consistent with a study conducted by the Ecology Center
- Ortho-phthalates = well-studied, strong evidence for health effects
- Replacement plasticizers = more data is needed to understand human health effects
- Although findings are geographically limited, results might reflect an industry wide concern

Fast food as an exposure source raises health equity concerns

- Certain racial/ethnic groups, like Non-Hispanic Blacks, are more likely to eat fast foods than others because of many factors
 - Kwate et al., 2009 found higher densities of fast food restaurants in predominately Black neighborhoods in New York
- This may lead to exposure inequities

Health & Place 15 (2009) 364–373



Contents lists available at [ScienceDirect](#)

Health & Place

journal homepage: www.elsevier.com/locate/healthplace



Inequality in obesigenic environments: Fast food density in New York City

Naa Oyo A. Kwate^{a,*}, Chun-Yip Yau^b, Ji-Meng Loh^b, Donya Williams^a

^a Department of Sociomedical Sciences, Mailman School of Public Health, Columbia University, 722 W. 168th Street, 5th Floor, New York, NY 10032, USA

^b Department of Statistics, Columbia University, 1255 Amsterdam Avenue, New York, NY 10027, USA

ARTICLE INFO

Article history:
Received 14 January 2008
Received in revised form
30 April 2008
Accepted 7 July 2008

Keywords:
Fast food
Neighborhoods
African American/Black
Racial segregation
Obesity

ABSTRACT

The high prevalence of obesity in African American populations may be due to the food environment in residential communities, and the density of fast food restaurants is an important aspect of the restaurant landscape in US cities. This study investigated racial and socioeconomic correlates of fast food density in New York City. We found that predominantly Black areas had higher densities of fast food than predominantly White areas; high-income Black areas had similar exposure as low-income Black areas; and national chains were most dense in commercial areas. The results highlight the importance of policy level interventions to address disparities in food environments as a key goal in obesity prevention efforts.

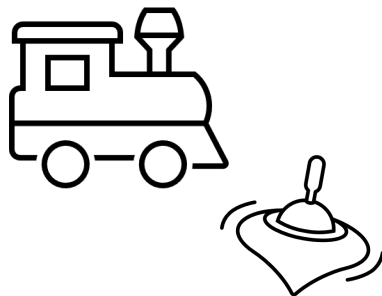
© 2008 Elsevier Ltd. All rights reserved.

The state of phthalate policy

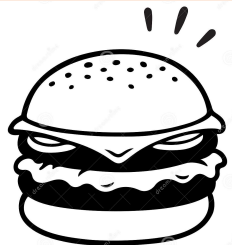
- Only some phthalates are regulated and **only** in children's toys and childcare articles



CPSC says
no phthalates
allowed



FDA says
phthalates
allowed



Environmental Topics ▾

Laws & Regulations ▾

Report a Violation ▾

About EPA ▾

[Assessing and Managing Chemicals under TSCA](#)

Chemicals Undergoing Risk Evaluation under TSCA

- Butylbenzyl phthalate (BBzP)
- Di-*n*-butyl phthalate (DnBP)
- Di-2-ethylhexyl) phthalate (DEHP)
- Di-isobutyl phthalate (DiBP)
- Diisononyl phthalate (DiNP)
- **Di-isodecyl phthalate (DIDP)**
- **Dicyclohexyl phthalate (DCHP)**

Ones in blue not included in our study

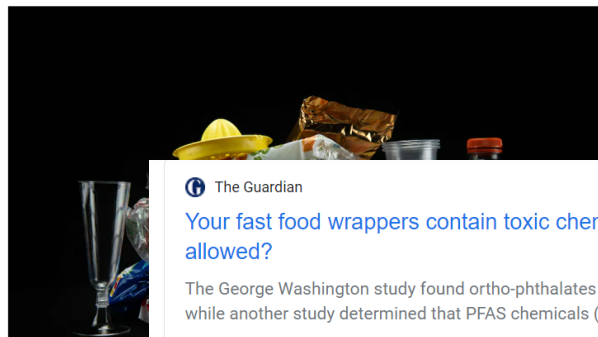
The potential to drive policy



Business
Some fast-food items contain plastics linked to serious health problems, new report shows

Chemicals that research has shown to be linked to reproductive harm and learning problems in children were found in popular menu items

Listen to article



110 news

outlets

2,399 Twitter impressions



Representative Raja Krishnamoorthi (IL)
Chairman of Economic and Consumer Policy

wrote a letter...

The Guardian
Your fast food wrappers contain toxic chemicals. Why is that allowed?
The George Washington study found ortho-phthalates in burritos and burgers, while another study determined that PFAS chemicals (the non-stick...
Nov 3, 2021

Verywell Health
Scientists Find Harmful Industrial Chemicals in Fast Food
Traces of plastics have found their way into fast-food meals. ... "Phthalates are found in a lot of packaging, processing, and handling equipment,...
Nov 8, 2021

Gizmodo
All the Fast Food You Love Contains Hormone-Disrupting ...
Hormone-disrupting chemicals known as phthalates were found in many fast food meals tested as part of new research. The study authors found...
Oct 26, 2021

News Policy Opinion Events Jobs HILL.TV Changing America

CONSUMERS FOR Safe CBD
Observational studies Clinical trials FDA Review

THE HILL

FDA must address endocrine-disrupting phthalates: House Oversight

BY SHARON UDASIN - 01/10/22 01:45 PM EST

36 COMMENTS

Questions? Happy to connect about the work or Agents of Change!



**AGENTS
OF CHANGE**
IN ENVIRONMENTAL JUSTICE

Applications Are Now Open!

Who should apply: Early career environmental justice researchers from systematically marginalized backgrounds

Deadline: 11:00pm EST on April 15, 2022

For more info and to apply, please visit our website:
<https://agentsofchangeinej.org/application/>

Email: Imedwards@gwu.edu

Twitter: @lariah_e