

Targeted Analysis

The HERCULES Exposome Research Center develops new tools and technologies to study the exposome.

The Exposome

The exposome is the concept that **environmental exposures** play a role in our **health** over a lifetime. These exposures include what we eat and drink, the air we breathe, our behaviors and lifestyles, and where we work, live and play. Targeted analysis is one approach HERCULES uses to study the exposome.



What is Targeted Analysis?

People come into contact with many chemicals on a daily basis. Targeted analysis helps us understand exposures that make up the exposome by determining the **presence** and **amount** of a chemical in **environmental samples** and **biological samples** such as:



Food



Water



Air



Soil



Cosmetics



Blood



Tools and Methods

The two main tools that are used in targeted analysis are high performance **chromatography** (gas or liquid) and **mass spectrometry**. These tools help scientists **separate the molecules** in order to **detect** and **quantify** chemicals in environmental or biological samples using properties such as molecular mass and structure. These methods are considered "**gold standard**" ways of assessing exposure and give us a lot of confidence in the measurements.



How much of a specific chemical is in the environment?



How much of a specific chemical is in our bodies?

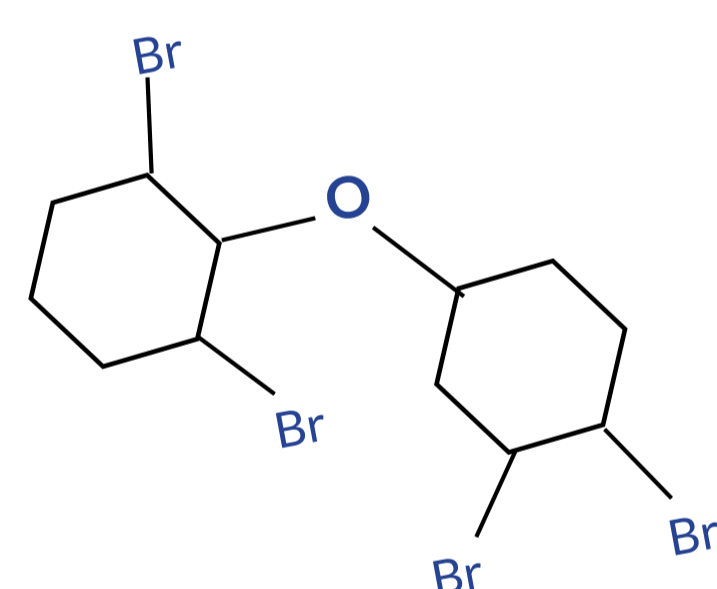


How might this chemical affect our health?



Targeted Analysis in Action

Children's exposure to polybrominated diphenyl ether (PBDE)



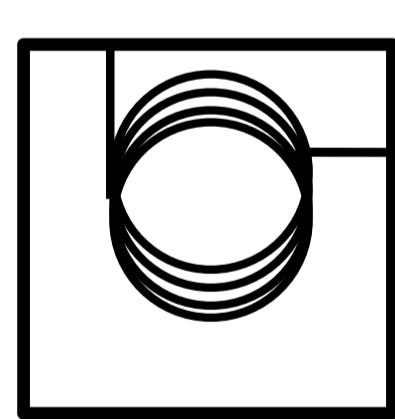
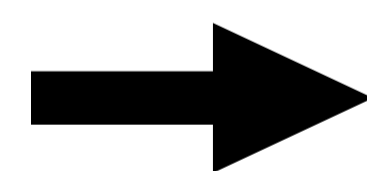
Targeted Analysis was used to investigate **why some children have higher levels of PBDE in their systems**. PBDEs are chemical flame retardants that are added to a wide variety of household products and interfere with thyroid hormones in the body. Thyroid hormones play an important role in growth and development.

Methods

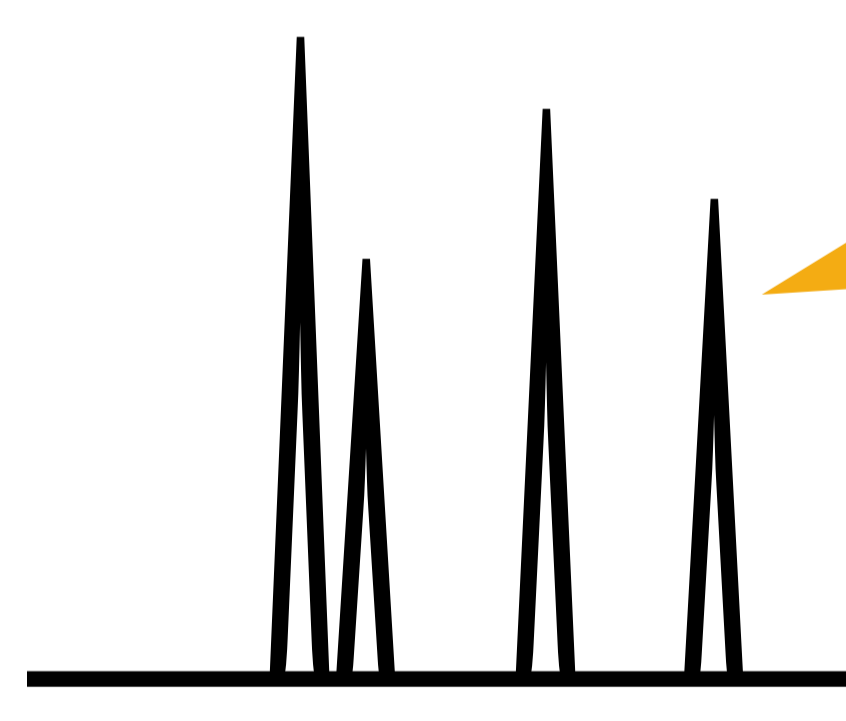
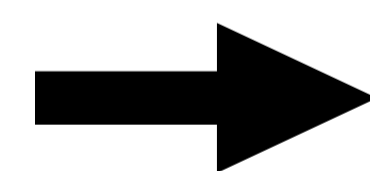
Samples from **house dust**, hand wipes of **children's hands**, and children's **blood** were analyzed for PBDE using **gas chromatography-mass spectrometry (GC-MS)**.



Samples



GC-MS



Chromatogram

Chromatogram peaks show the concentration of various chemicals in samples

PBDE levels in these different sample types were **compared to each other, socioeconomic indicators, and weight**.

Results

Socioeconomic factors (SES) and **body mass index** (BMI) highly impact how much **PBDE** is in young children's blood.

SES



BMI



PBDE levels in blood

This study shows how HERCULES uses targeted analysis to measure a specific chemical in different types of samples. It is also an example of how targeted analysis fits within the broader exposome approach, in which multiple exposures, including socioeconomic status and lifestyle, are understood to affect health outcomes.

How can I learn more?

For more information about HERCULES:
<https://emory.hercules.com/>

For more information about targeted analysis at HERCULES:
<http://www.leaderlaboratory.org>

To read more about the PBDE study:
<https://doi.org/10.1021/acs.est.6b04696>

Darrow, L. A., Jacobson, M. H., Preston, E. V., Lee, G. E., Panuwet, P., Hunter, R. E., Jr, Marder, M. E., Marcus, M., & Barr, D. B. (2017). Predictors of Serum Polybrominated Diphenyl Ether (PBDE) Concentrations among Children Aged 1-5 Years. *Environmental science & technology*, 51(1), 645–654.

