

BPA Substitutes and Obesity

A review of the epidemiology and pathophysiology

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Introduction: Obesity

Obesity = BMI greater than or equal to 30 kg/m²

Risk factor for:

- T2DM
- CAD
- HTN
- Dyslipidemia
- Sleep apnea
- Stroke
- Osteoarthritis
- Various cancers

According to the World Health Organization, the worldwide prevalence of obesity has tripled since 1975.

Introduction: “Obesogens” and BPA

Obesity develops from an energy imbalance caused by physical inactivity, excess dietary consumption, or both. However, the development of obesity can be **influenced by a multitude of different environmental and societal factors**.

Endocrine disruptors: exogenous compounds found in the environment that can interact with endocrine pathways in the body and contribute to disease

- Called “**obesogens**” when in reference to obesity; one of the factors that can play a role in the pathogenesis of obesity

Bisphenol A (BPA): compound used in the manufacturing of polycarbonate plastics and epoxy resins that has been shown to exhibit obesogenic activity

- Found in metal cans, water bottles, piping, thermal paper, and dental sealants
 - Can leach BPA into the environment and food



Image credit: Epoxycraft.com

Introduction: BPA-Substitutes and Obesity

While the trend of BPA-free products is more prevalent now than in the past, concern still remains about the compounds that replace it, such as **BPS** and **BPF**. Both of these BPA substitutes have been shown to have endocrine disrupting activity with regard to androgenicity and estrogenicity.

The purpose of this review is to assess the current literature on BPA substitutes and their relation to obesity.

This review seeks to:

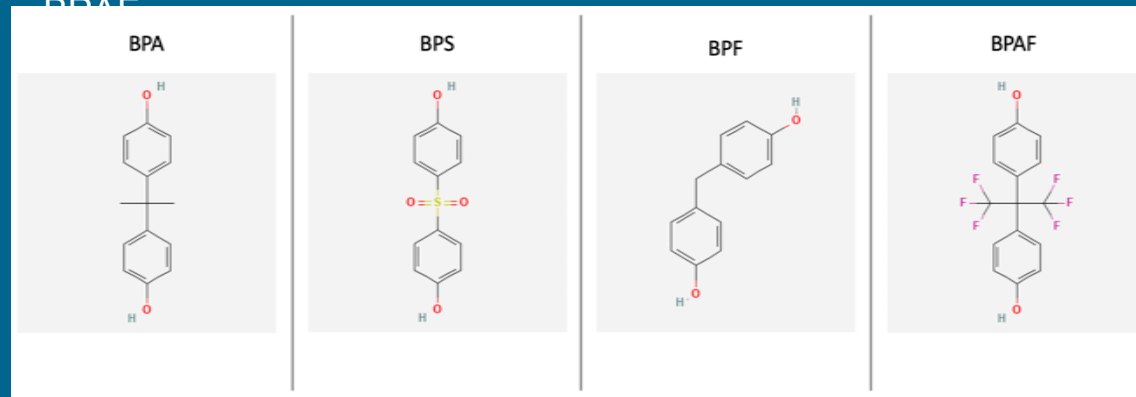
- describe our current understanding of the epidemiology of BPA substitutes in relation to obesity.
- explore the pathophysiology behind BPA substitute exposure and obesity.



Image credit: valescientific.org

Background: Chemical Structures and Sources of Exposure

Figure 1: The 2D chemical structures of BPA, BPS, BPF, and BPAF



- Exposure sources of BPA substitutes:
 - Environmental sources: Indoor dust, water, sewage, sediments
 - Food
 - Consumer products: personal care products, thermal receipt paper, recycled paper products
- Most prevalent BPA substitute = BPS

Epidemiology

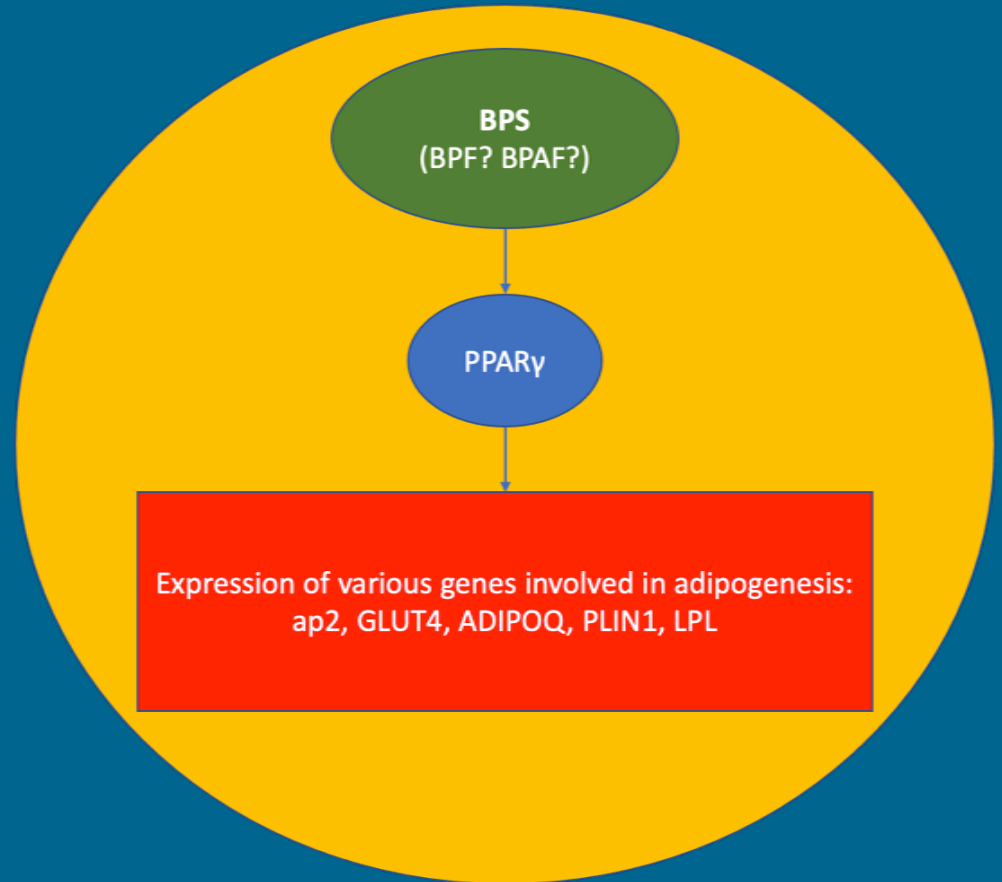
What do population-based studies suggest about the relationship between BPA substitutes and obesity? There is an...

- Association between BPA substitute exposure and obesity
 - In adults
 - In children and adolescents
- Association between BPA substitute exposure and obesity-related disease
 - T2DM and HTN

How can this relationship be explained at the pathophysiological level?

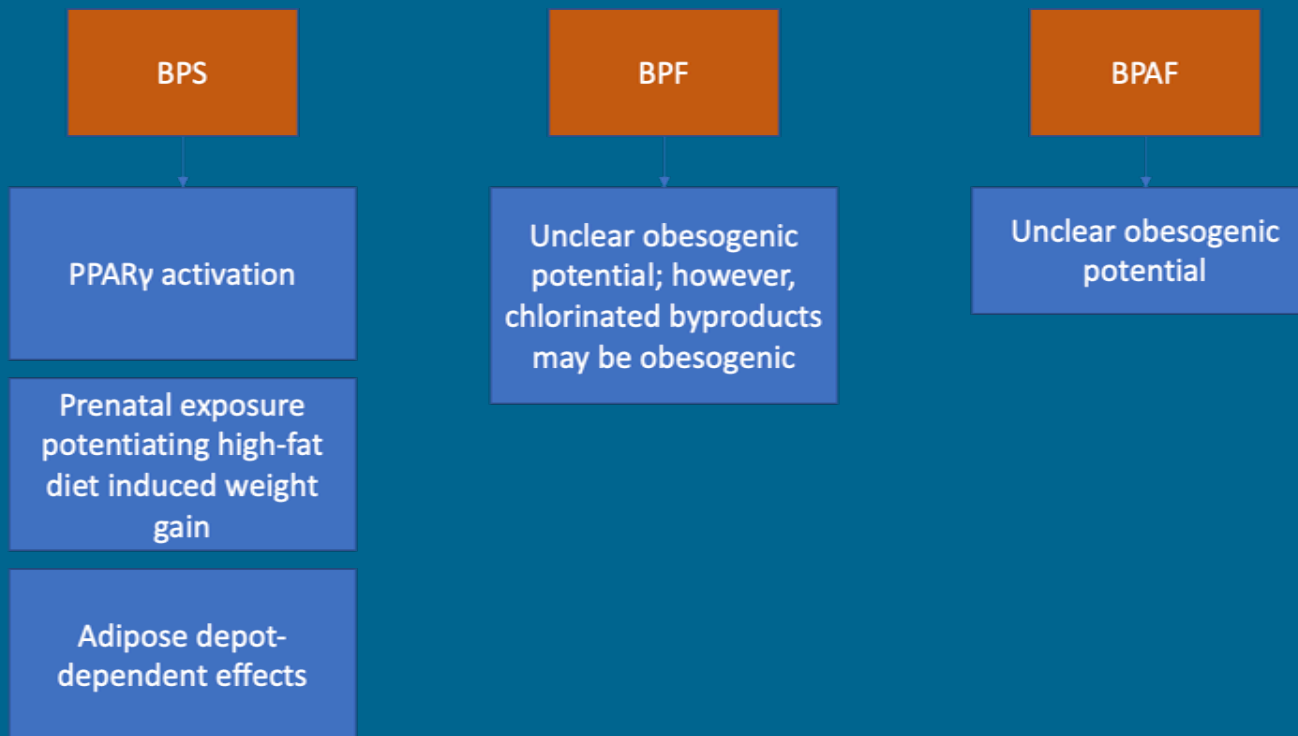
Pathophysiology: PPAR γ - master regulator of adipogenesis

Figure 2: The pathophysiological link between BPA substitutes and obesity is most likely through PPAR γ activation.



Pathophysiology: Obesogenic Mechanisms

Figure 3: Possible mechanisms by which BPA substitutes act as obesogens



Discussion

- Are public health measures warranted given our current understanding of these compounds?
 - In June of 2020, Switzerland became the first country to ban both BPS and BPA in thermal paper.
- In the primary care setting, obesity is one of the most common conditions seen in patients.
- It will be increasingly important for PCPs to be aware of the environmental and social factors that contribute to obesity.

References



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