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The Mental Health and Developmental Effects of Bisphenol-A

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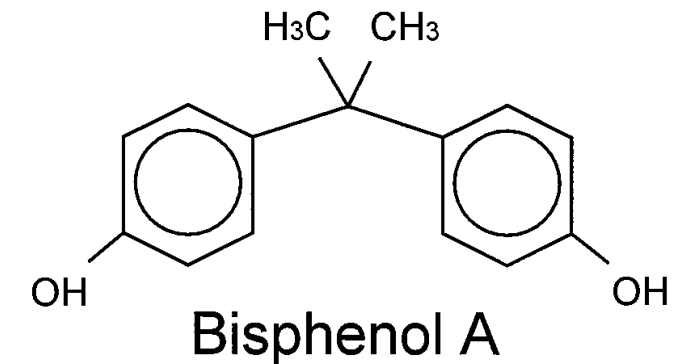
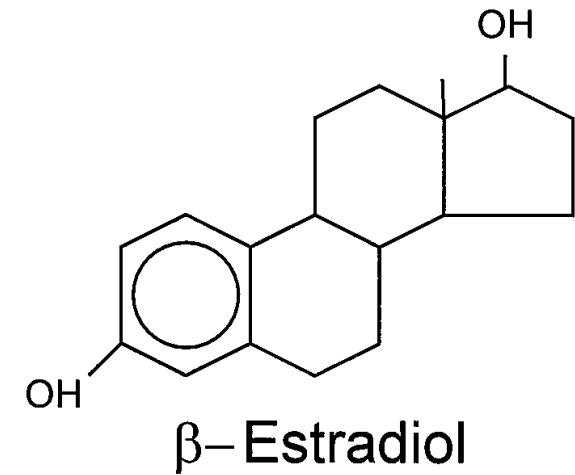
The Mental Health and Developmental Effects of BPA

A Directed Study by Maryann Rettig

April 24, 2024

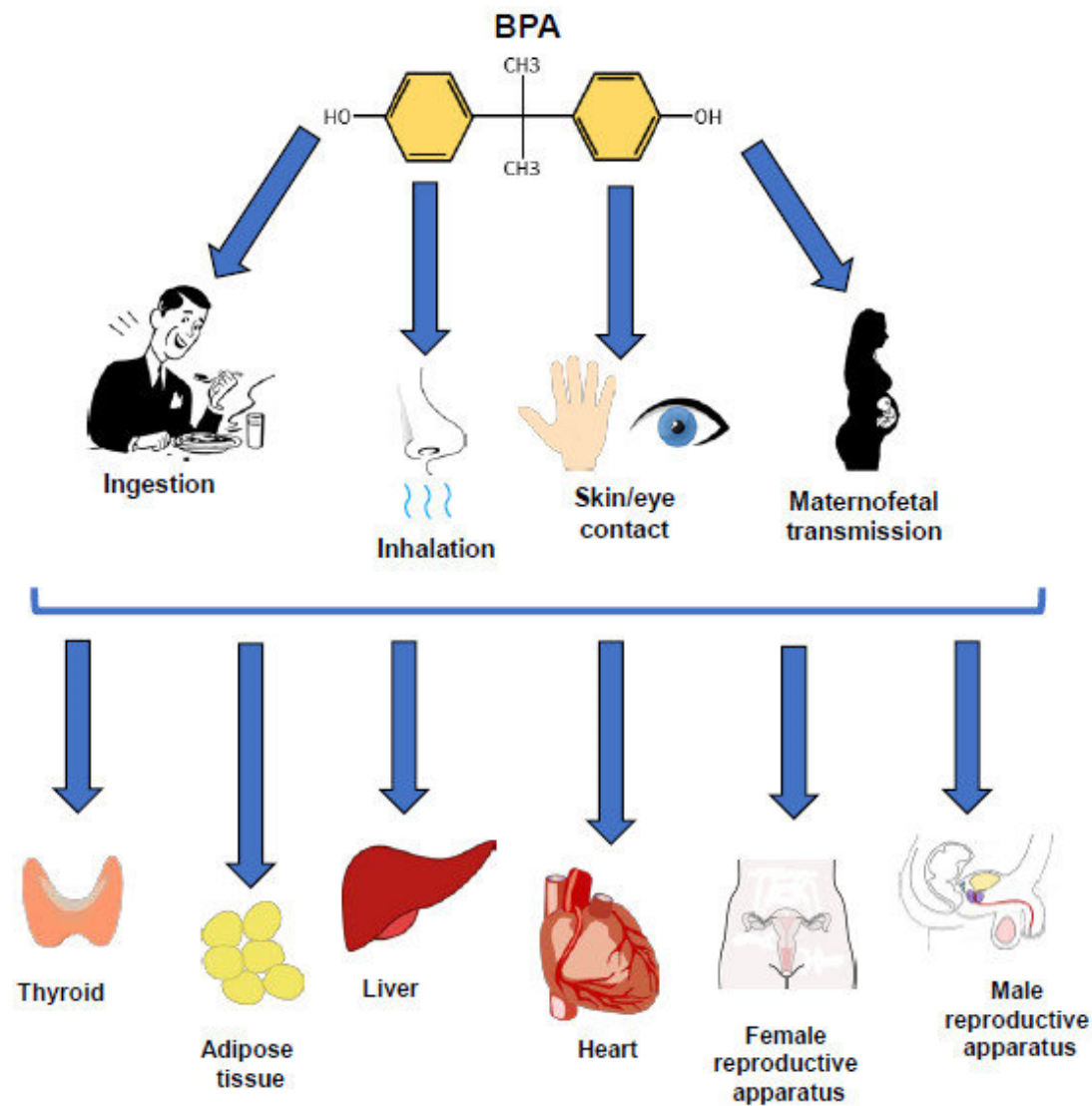
What is BPA?

- **Bisphenol-A (BPA) is a chemical compound in plastics and epoxy resins.**
- **Acts as an endocrine disruptor**
Has been linked to several health complications
- **Less than a day half-life.¹**



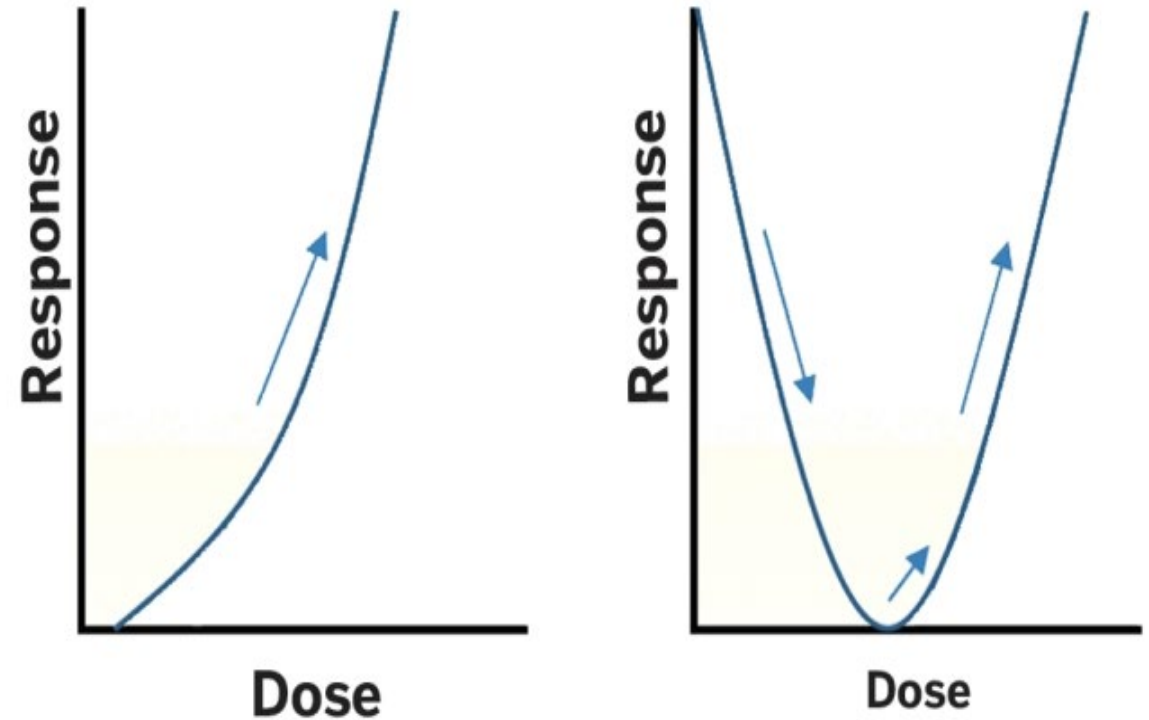
Sources of BPA

- Mainly used in the production of epoxy resins and polycarbonate plastics.²
- Found in numerous items part of everyday life.
- BPA alternatives (BPS and BPF)



BPA in Feminine Hygiene Products

- A recent study has detected BPA leaching out of feminine hygiene products.³
- Seen to decrease the viability of oocytes.⁴



3. Gao, Chong-Jing. Environmental International, 2020, vol 136, 105465

4. Ronit Machtinger, Catherine M.H. Combelles, Stacey A. Missmer, Katharine F. Correia, Paige Williams, Russ Hauser, Catherine Racowsky, Bisphenol-A and human oocyte maturation *in vitro*, *Human Reproduction*, Volume 28, Issue 10, October 2013, Pages 2735–2745, <https://doi.org/10.1093/humrep/det312>

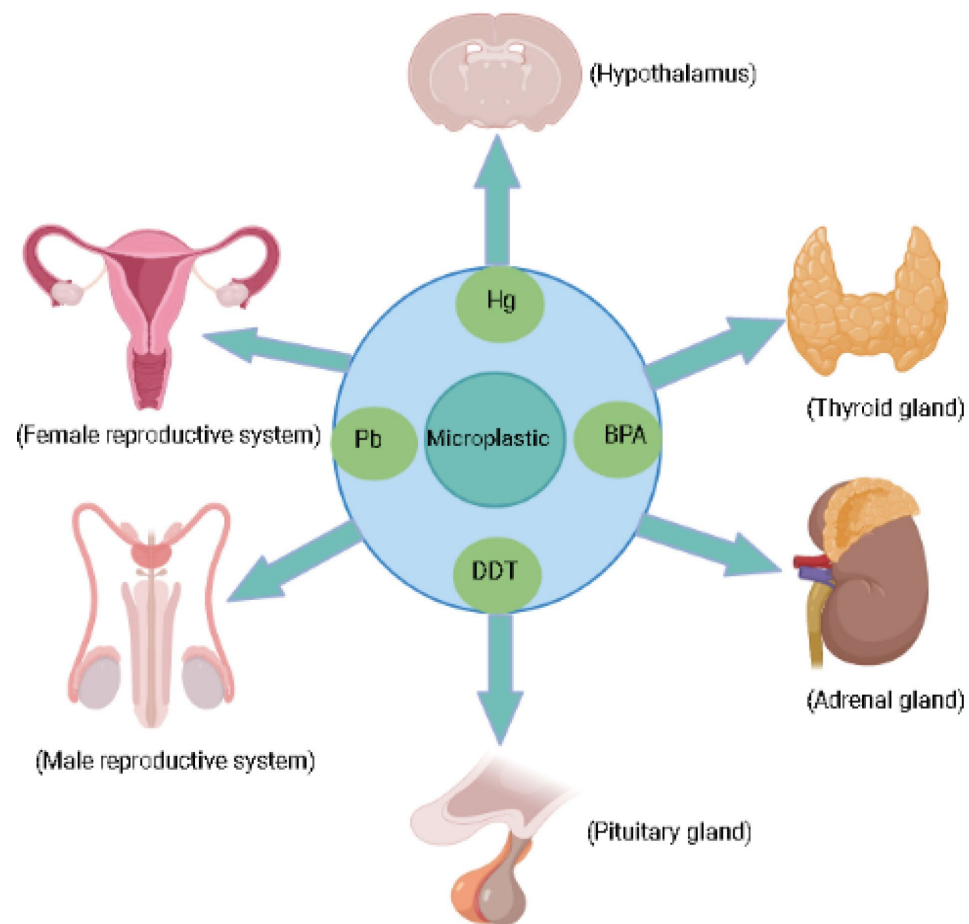


Sex Differences in Exposure

- **Females were seen to have higher urinary BPA concentrations than males.⁵**
- **Effects of gestational BPA exposure on behavior domains larger among girls than boys.²**

What is an Endocrine Disruptor?

- EDCs are natural or man-made chemicals that block or mimic the body's hormones.⁶
- Exposure *in utero* or early postnatal could cause growth and development.⁵



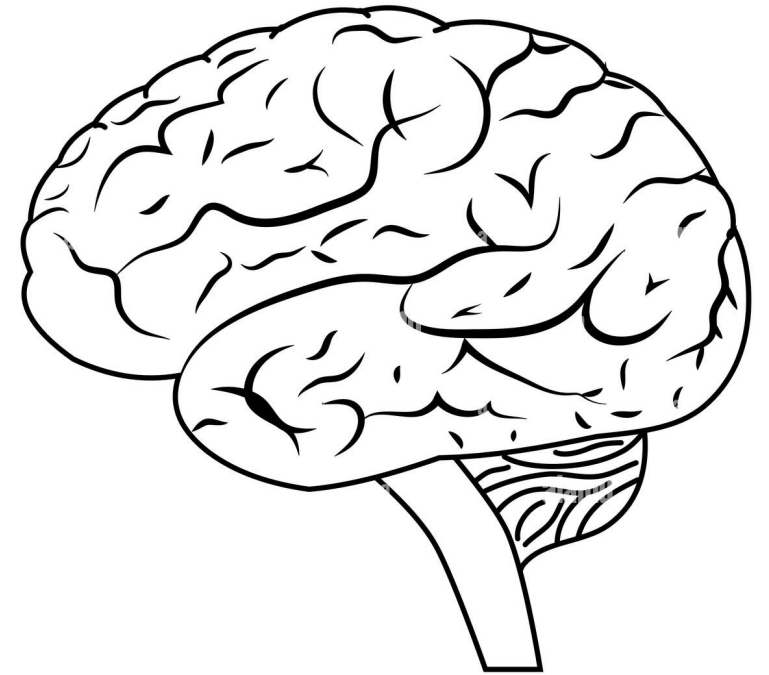
Prenatal Exposure

- BPA is able to cross the placenta and accumulate in the fetal compartment.¹
- Prenatal higher BPA alternative exposure is associated with impaired psychomotor development.¹



Child Developmental Effects

- Prenatal exposure has been reported to cause neurodevelopmental and behavioral effects in children.
- Significant results found gestational BPA exposure associated with higher measures of subsequent behavioral patterns.²



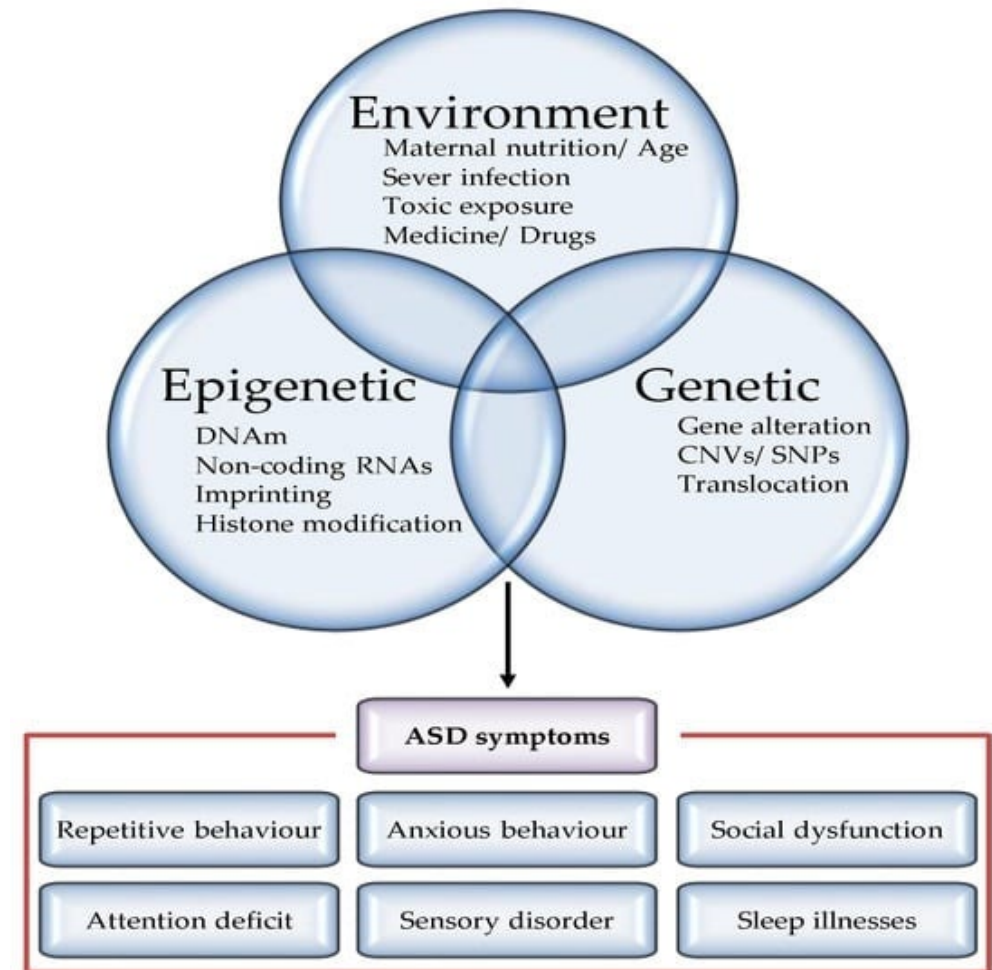


Autism and ADHD Mechanisms

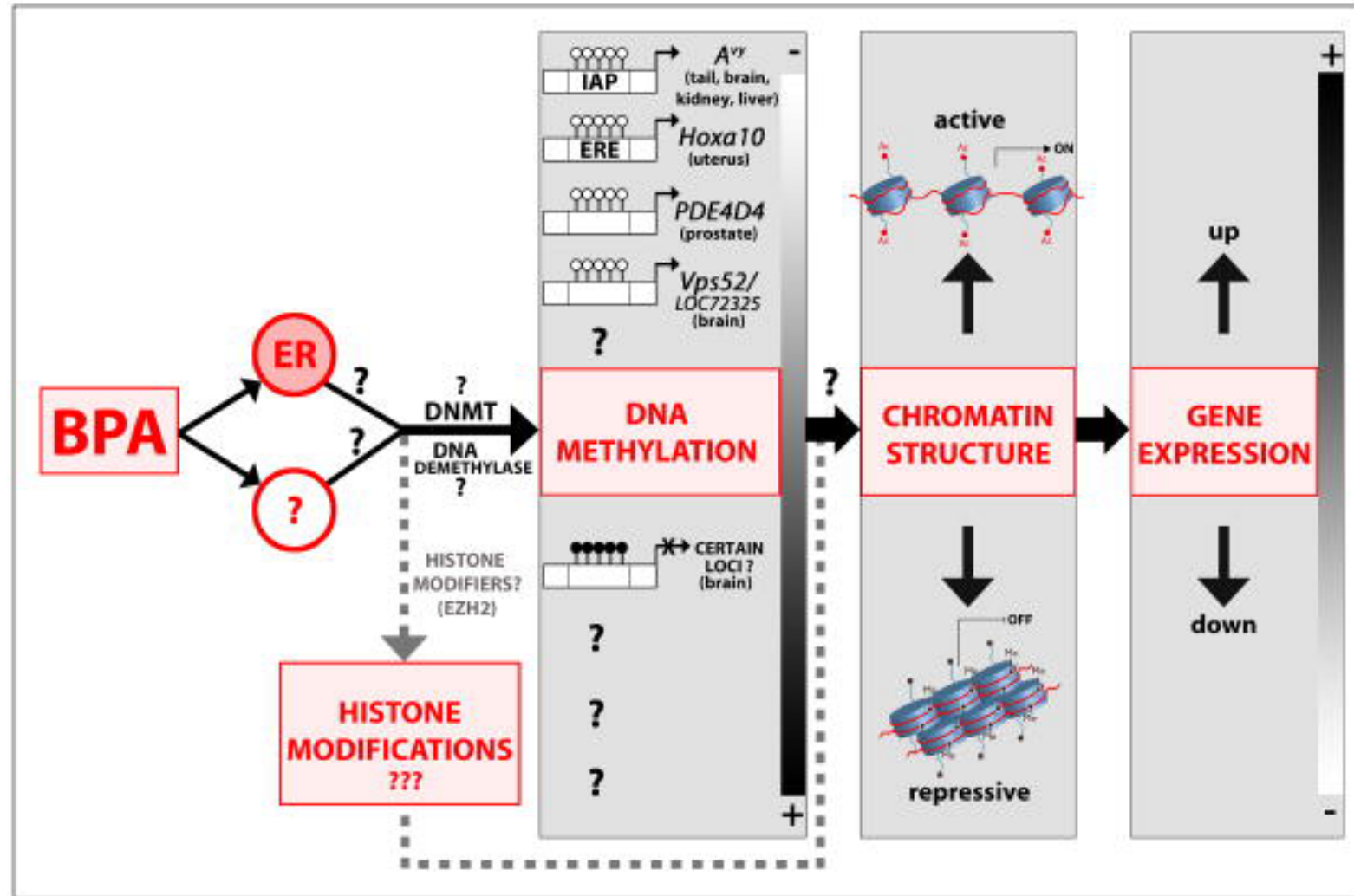
- **A study investigated the mechanisms underlying autism and ADHD.⁷**
- **BPA increased gene expression of dopamine transporter in a study in adult rats after neonatal exposure.⁷**

Epigenetic Influence

- *In utero* and early postnatal exposure may produce effects such as impaired brain development, sexual differentiation, behavior, and immune function.⁸
- Genetics and the environment contribute to these effects.⁸



Model for Epigenetic Effects



A potential model for BPA-induced epigenetic effects.⁸

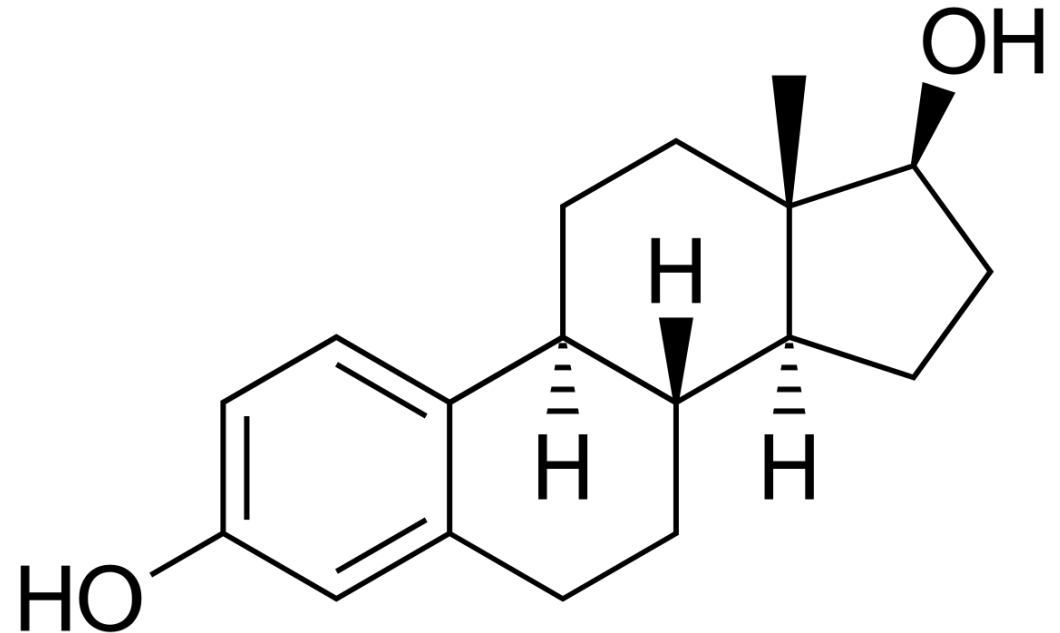


BPA and Schizophrenia?

- **Schizophrenia research has continued to find evidence of possible endocrine involvement in the disease.⁷**
- **Numerous proposals of endocrine disruption caused by BPA as a presumed cause of schizophrenia.⁷**

Estrogen Effects

- Various lines of evidence support the role of estrogen-related abnormalities in schizophrenia.⁷
- Estrogen receptors play a role in neuropsychiatric disorders.⁷
- ER_{alpha} mRNA is decreased in the amygdala, frontal cortex, and hippocampus in psychiatric illnesses.⁷





Abnormalities of Proteins and Processes

- A relationship between schizophrenia and BPA disruption is related to the Sonic Hedgehog(SH) factor.⁷
- Hypomethylation occurs in both schizophrenia and BPA exposure.⁷
- Ca²⁺ abnormalities may be linked between BPA exposure and schizophrenia.⁷



Abnormalities of Behavior

- **Fear is a correlation between symptoms of schizophrenia and offspring of prenatal BPA exposure.⁷**
- **Changes in pain sensitivity were observed in both schizophrenia and BPA exposure.⁷**
- **Correlation does not equal causation.**

Summary

- **BPA is an estrogen-mimicking compound found in numerous plastic-like materials.**
- **Prenatal exposure to BPA contributes to developmental, behavioral, and mental health effects.**
- **Epigenetic influence of BPA can occur in utero.**
- **The "safe dose" needs to be reevaluated.**

Acknowledgements

- **Dr. Sara Hubbard**
- **J.D. Patterson Summer Research Program**
- **Carl Goodson Honors Program**