

## THYROID AND PREGNANCY

### Early pregnancy exposure to Bisphenol A may affect thyroid hormone levels

#### BACKGROUND

In recent years, there has been increased awareness of the effect of chemicals in our environment on body processes. Those that interfere with the endocrine glands and hormone levels are called endocrine disruptors. Two such endocrine disruptors are bisphenols and triclosan. Bisphenols are a group of chemicals used to make commonly used plastics such as those for food and water containers, receipts, CDs, DVDs, toys, and plastic bags. Triclosan is an antibacterial chemical frequently used to make hand sanitizers or other personal care products. They are commonly detected in environments, and consequently, in humans.

Animal studies have shown that bisphenols and triclosan may affect thyroid function. Bisphenol A (BPA) may affect uptake of iodine into thyroid gland, which is required to make thyroid hormone. It may also affect deiodinase enzymes that convert  $T_4$  to  $T_3$ . However, these actions of BPA have not been shown in humans. BPA use has been since restricted in many countries, and now substituted with other bisphenols such as bisphenol S (BPS) and bisphenol F (BPF). There are not many studies on the effects of BPS, BPF, or triclosan on human thyroid function, especially in pregnancy.

Normal thyroid hormone levels in pregnancy is critical for baby's development, so this study was done to evaluate potential association of BPA, BPS, BPF, and triclosan levels in pregnant women and their thyroid hormone levels.

#### THE FULL ARTICLE TITLE

Derakhshan An et al 2019. Association of urinary bisphenols and triclosan with thyroid function during early pregnancy. Environ Int 133(Pt A):105123. PMID: 31521814.

#### SUMMARY OF THE STUDY

A total of 1996 pregnant women in Sweden were included in the study between September 2007 and March 2010. None had twin pregnancy or thyroid disease, or took

thyroid medications. Blood and urine samples were collected at their first prenatal visit, which was on average at 10 weeks of pregnancy. Several different measures of thyroid function (thyroid stimulating hormone (TSH), thyroxine ( $T_4$ ), and triiodothyronine ( $T_3$ )), and thyroid antibody levels were measured from blood sample. The majority of thyroid hormone made by thyroid gland is in the form of  $T_4$ , which is changed to a more active form,  $T_3$  in the body. BPA, BPS, BPF, and triclosan levels were measured from urine samples.

BPA, BPS, BPF and triclosan were detected in most of pregnant women in the study (99% for BPA, 80% for BPS, 88% for BPF, and 93% for triclosan). However, the levels were overall low. Higher BPA levels were associated with lower  $T_4$  levels, but not with changes in TSH. In very early pregnancy (at average of 7 weeks of pregnancy), higher BPA levels were also associated with higher  $T_3$  levels. This was not true a little later in pregnancy (at average of 12 weeks of pregnancy). However, higher BPA levels were also associated with lower  $T_4:T_3$  ratios, suggesting that it may be associated with higher conversion of  $T_4$  to  $T_3$ . There were no associations between BPS, BPF, or triclosan levels and thyroid hormone levels. Thyroid antibody levels did not have any effect on the findings.

#### WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This study shows that exposure to BPA may affect thyroid hormone levels in very early pregnancy. BPA was associated with lower  $T_4$  levels, but also lower  $T_4:T_3$  ratios, suggesting higher conversion from  $T_4$  to  $T_3$ . However, exposure to BPF, BPS, or triclosan did not have significant effect on thyroid hormone levels in this study.

Overall, the amount of bisphenols and triclosan measured in urine samples was low, about 1,000 times lower than the safe levels of exposure recommended by the U.S. Environmental Protection Agency or the European Food

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Safety Authority. At this lower level of exposure, there may not be significant effect on thyroid hormone levels in pregnancy in humans. However, further studies are

needed to confirm these findings and find out how these chemicals affect thyroid hormone levels in humans.

— Sun Lee, MD

### ATA THYROID BROCHURE LINKS

Thyroid Disease in Pregnancy: <https://www.thyroid.org/thyroid-disease-pregnancy/>

Thyroid Function Tests: <https://www.thyroid.org/thyroid-function-tests/>

### ABBREVIATIONS & DEFINITIONI

**Bisphenols:** a group of chemicals used to make commonly used plastics such as those for food and water containers, receipts, CDs, DVDs, toys, and plastic bags. Common bisphenols are bisphenol A, S and F. BPA use has been since restricted in many countries.

**Triclosan:** an antibacterial chemical frequently used to make hand sanitizers or other personal care products.

**Endocrine disruptors:** chemical pollutants in the environment that can affect the action of endocrine glands. Examples include bisphenol A (BPA), polychlorinated biphenols (PCBs), perfluoroalkyl substances (PFAs) and organochlorines (OCs).

**TSH: thyroid stimulating hormone** – produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.

**Thyroxine (T<sub>4</sub>):** the major hormone produced by the thyroid gland. T<sub>4</sub> gets converted to the active hormone T<sub>3</sub> in various tissues in the body.

**Triiodothyronine (T<sub>3</sub>):** the active thyroid hormone, usually produced from thyroxine.

**Deiodinase enzymes:** these enzymes convert T<sub>4</sub> to T<sub>3</sub> on the cellular level by removing an iodine molecule from T<sub>4</sub>.