Sugar substitutes during pregnancy

Eliza Pope Gideon Koren MD FRCP FACMT Pina Bozzo

Abstract

**Question** I have a pregnant patient who regularly consumes sugar substitutes and she asked me if continuing their use would affect her pregnancy or child. What should I tell her, and are there certain options that are better for use during pregnancy?

**Answer** Although more research is required to fully determine the effects of in utero exposure to sugar substitutes, the available data do not suggest adverse effects in pregnancy. However, it is recommended that sugar substitutes be consumed in moderate amounts, adhering to the acceptable daily intake standards set by regulatory agencies.

Sugar substitutes, also referred to as artificial sweeteners, are a great alternative for those looking to replace glucose in their diet. With an increased prevalence of diabetes and other diet-related diseases, sugar replacements are becoming increasingly popular in items such as food, drinks, oral hygiene products, and pharmaceutical products. Canada's Food and Drug Regulations specifies how sugar substitutes can be used, as well as the amount allowed, in products, and indicates approval for use of the following nonnutritive artificial sweeteners: acesulfame potassium, aspartame, neotame, polydextrose, Stevia, sucralose, sugar alcohols (known as polyols), saccharin, and thaumatin.

Health Canada states that consumption of sugar substitutes during pregnancy does not pose a health risk but recommends that they be used in moderation so as to not replace nutrients needed for a healthy pregnancy. For cases in which pregnant women require sugar substitutes, it is recommended that they consume them according to the acceptable daily intake (ADI). The ADIs have been established by the Food Directorate of Health Canada, and are the same as those set by the Joint Expert Committee of Food Additives of the Food and Agricultural Organization and the World Health Organization. Table 1 summarizes the ADIs for commonly used sugar substitutes and the amount found in commonly consumed products.

A meta-analysis reported that low-calorie beverages approved by the US Food and Drug Administration for consumption during pregnancy did not affect preterm delivery when outcomes for women consuming such beverages were compared with those of women who did not drink sugar-substituted beverages.

**Sugar substitutes**

**Acesulfame potassium.** Acesulfame potassium is a high-intensity sweetener used in food, beverages, oral hygiene products, and a number of pharmaceutical products. In the small intestine, aspartame breaks down into aspartic acid, phenylalanine, and methanol at levels that are nontoxic to adults, children, and fetuses. Several animal studies do not suggest concerns with use of aspartame during pregnancy. Human studies found that the breakdown products of aspartame cross the placenta. An animal study reported that fetuses exposed to acesulfame potassium through the amniotic fluid had an increased preference for sweet solutions and acesulfame potassium solution in adulthood when compared with those in the control group. However, these results were reported for concentrations of acesulfame potassium that were substantially greater than typical human exposure.

**Aspartame.** Aspartame is one of the most common artificial sweeteners used in food and drink. In the small intestine, aspartame breaks down into aspartic acid, phenylalanine, and methanol at levels that are nontoxic to adults, children, and fetuses. Several animal studies do not suggest concerns with use of aspartame during pregnancy. Human studies found that the breakdown products of aspartame cross the placenta. However, a dose of 200 mg/kg of aspartame (4 to 5 times the ADI) did not lead to toxicity, such as methanol poisoning or increase in fetal blood phenylalanine levels to the range associated with mental retardation in offspring. Based on available data, consumption...
of aspartame during pregnancy is not expected to be a concern when staying within the acceptable daily limit. It is important to note that women with phenylketonuria should avoid aspartame owing to its breakdown into phenylalanine.

Neotame. Neotame is a sparsely used chemical derivative of aspartame that is much sweeter. Thus far, there are limited data on any potential effects of neotame consumption during pregnancy.

Saccharin. Until recently, saccharin was banned as a sweetener in Canada. The compound crosses the human placenta at term. In a study conducted in rhesus monkeys, fetal elimination of saccharin was much slower than on the maternal side, suggesting that repeated ingestion of saccharin by the mother could lead to a considerable accumulation of the substance in the fetus. However, animal data that report exposure with doses 100 to 400 times the human ADI do not suggest a risk of malformations. A case-control study reported no increased risk of spontaneous abortions in women who consumed saccharin.

Stevia. Stevia was approved by Health Canada as a food additive in 2012. It is becoming increasingly popular as a natural alternative to artificial sweeteners. The compound originates from the leaves of the Stevia rebaudiana plant, and is used as a noncaloric sweetener. In animal studies, Stevia did not increase toxicity in rat embryos, nor did it affect fertility or pregnancy outcomes. However, there are no data on the outcomes of use of Stevia during human pregnancies.

Sucralose. Sucralose is another common artificial sweetener. Animal studies report no increased risk of malformations or other adverse fetal effects with exposure to high-dose levels of sucralose during pregnancy.

Polyols and polydextrose. Polyols are compounds that occur naturally but they are manufactured for use commercially. Canada’s Food and Drug Regulations indicate approval for the use of the following sugar alcohols: “hydrogenated starch hydrolysates, isomalt, lactitol, maltitol, maltitol syrup, mannitol, sorbitol, sorbitol syrup, xylitol and erythritol.” Limited evidence exists on the effects of polyols during pregnancy. However, owing to the presence of polyols in both maternal and fetal samples from normal pregnancy, it is likely that these compounds are safe when consumed in moderation.

Polydextrose is another compound that is approved as a food additive. Unlike polyols, polydextrose supplements texture without adding sweetness to foods. It is a synthetic indigestible glucose polymer and is classified as a dietary fibre; therefore, it is not expected to be a concern.

Thaumatin. Thaumatin is a sweet protein derived from the Thaumatococcus daniellii plant. Although little evidence exists on the effects of thaumatin during pregnancy, the protein is processed in the body similarly to other dietary proteins and therefore is not expected to have adverse effects during pregnancy.

Conclusion
While data concerning the use of sugar substitutes during pregnancy are limited, they do not suggest an increased risk of toxicity, adverse pregnancy outcomes, or neonatal issues. It is recommended that they be consumed in moderation and that pregnant women adhere to the ADI levels outlined by regulatory directives.
References

Motherisk questions are prepared by the Motherisk Team at the Hospital for Sick Children in Toronto, Ont. Ms Pope, currently a student at McMaster University in Hamilton, Ont, was a member of Motherisk at the time of preparing this update. Dr Koren is Director and MS Bozzo is Assistant Director of the Motherisk Program. Dr Koren is supported by the Research Leadership for Better Pharmacotherapy during Pregnancy and Lactation. Do you have questions about the effects of drugs, chemicals, radiation, or infections in women who are pregnant or breastfeeding? We invite you to submit them to the Motherisk Program by fax at 416 813-7562; they will be addressed in future Motherisk Updates. Published Motherisk Updates are available on the Canadian Family Physician website (www.cfpc.ca) and also on the Motherisk website (www.motherisk.org).