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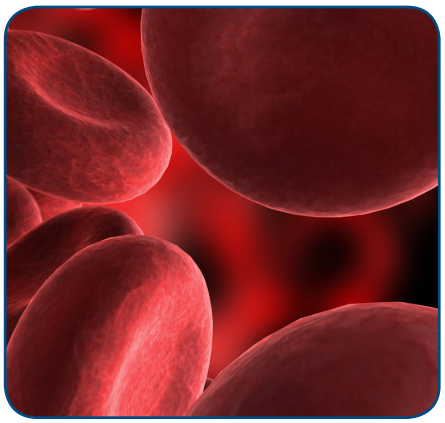
Nutrition Perspectives

University of California, Davis, Department of Nutrition and the Center for Nutrition in Schools

Blood Glucose Levels During Pregnancy and Austism Spectrum Disorders in Offspring



Previous research suggests that maternal diabetes in pregnancy, either type 1, type 2, or gestational, may be associated with the development of autism spectrum disorders (ASD) in offspring. New research published in *JAMA* examining whether hemoglobin A1c (HbA1c) levels during pregnancy are associated with the child being diagnosed with ASD provides further support behind this relationship (1).

In the blood stream, both hemoglobin (as part of red blood cells) and glucose circulate around the body. A small percentage of this glucose will attach itself to hemoglobin; the more glucose in the blood, the more is there to attach. Hemoglobin A1c is the percentage of hemoglobin with glucose attached, which provides a measure of blood glucose control over about three months (the usual lifespan of a red blood cell). In those without diabetes, HbA1c is typically below 5.7 percent. In those with diabetes, HbA1c can be 6.5 percent and above.

Using data from Kaiser Permanente of Southern California, a large health care provider, the researchers were able to track 35,819

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Children whose mothers had HbA1c levels above 6.5 percent were 79 percent more likely to be diagnosed with ASD compared to those whose mothers had HbA1c less than 5.7 percent.

mother and child pairs from early pregnancy until the child was around 5 years age. During that time, approximately 2 percent of children in the cohort were diagnosed with ASD. The researchers analyzed HbA1c levels in early pregnancy and whether it was associated with a diagnoses of ASD and found that there was a relationship, but only when HbA1c was above 6.5 percent. Children whose mothers had HbA1c levels above 6.5 percent were 79 percent more likely to be diagnosed with ASD compared to those whose mothers had HbA1c less than 5.7 percent. However, because only 2 percent of children in the entire sample were diagnosed with ASD and only 1 percent of mothers had HbA1c levels above 6.5 percent, the sample for this group only included 15 children.

Elevated blood glucose during pregnancy has been associated with other risks, such as higher rates of caesarian section, preeclampsia, and birth defects (3). While the study had several limitations, it lends further support behind the importance of glucose management during pregnancy.

References:

1. Xiang AH, Chow T, Martinez MP, et al. Hemoglobin A1c Levels During Pregnancy and Risk of Autism Spectrum Disorders in Offspring. JAMA. 2019 Jun 9. doi: 10.1001/jama.2019.8584.
2. Use of Glycated Haemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus: Abbreviated Report of a WHO Consultation. Geneva: World Health Organization; 2011. 2, Glycated haemoglobin (HbA1c) for the diagnosis of diabetes. Available from: https://www.ncbi.nlm.nih.gov/books/NBK304271/
3. Wilmot EG, Mansell P. Diabetes and pregnancy. Clin Med (Lond). 2014;14(6):677–680. doi:10.7861/clinmedicine.14-6-677

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Sleep May Help With Appetite and Food Choice

While sleep may not be a cure-all, research suggests it might help with appetite control or food choices.

There's an old adage that "sleep is medicine." A recent review of studies regarding sleep duration extension and risk factors found that while this may actually be the case with some risk factors for diabetes and cardiovascular disease, it is not a panacea (1).

The authors reviewed the scientific literature for studies that focused on increasing the duration of sleep and analyzed at least one outcome related to cardiovascular disease or type 2 diabetes. They found seven studies that matched their criteria. While these studies varied in methods and participants and results were mixed, the authors were able to identify a few positive outcomes based on the research.

In one study, in which the participants were overweight and habitually slept less than 6.5 hours a night, the authors noted that when increasing their sleep, they experienced a decrease in appetite as well as a desire for sweet and salty foods. The authors noted that a sleep extension intervention may be especially beneficial for behavior change in those who have difficulties with appetite control or food choices. However, these data were collected at a single time point in the morning. Food choices and appetite vary at different times of day, and if the data were collected in the evening the results might be very different.

For the most part, however, the studies found little to no improvement in other risk factors. In one study, in which participants habitually slept less than 6.5 hours a night, fasting plasma insulin levels were significantly lower after 3 nights in which they slept 10 hours compared to 3 nights in which they were restricted to 6 hours of sleep. Seemingly at odds with these results, a study examining whether sleep extension improves fasting blood glucose found that fasting blood glucose increased and was correlated with the increased duration of sleep. Other studies found no improvement in mean body weight, body fat, waist circumference, or blood pressure.

The studies included in the review varied widely in their methodology, making it difficult to draw conclusions.

While these results are interesting, it's worth noting that with the broad variability in the

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study design, any conclusions drawn should be tentative. This review primarily demonstrates how little research currently exists on this topic, and what does exist varies widely in methodology. Some studies included only time-in-bed extension, while others included interventions on sleep hygiene and bedtime routine. Some were only a few days long, while other lasted 6 weeks. Some included only healthy adults while inclusion criteria for others was the presence of hypertension or prehypertension. All had small sample sizes. Further research is needed with larger sample sizes and potentially more standardized methods in order to firmly establish that sleep extension is an effective method for improving risk factors for cardiovascular and diabetes.

Reference:

1. Henst RHP, Pienaar PR, Roden LC, Rae DE. The effects of sleep extension on cardiometabolic risk factors: A systematic review. J Sleep Res. 2019 Jun 5:e12865. doi: 10.1111/jsr.12865.

By Anna M. Jones, Department of Nutrition, University of California, Davis.

Overweight and Obesity Prevalence Declined in WIC Toddlers Between 2010 and 2016

The prevalence of overweight and obesity in children aged 2-4 participating in WIC declined from 32.5 percent in 2010 to 29.1 percent in 2016.

Over the last several decades, obesity in children has steadily increased. It appears, however, that the tide may be turning in certain groups. A recent study of obesity in children aged 2-4 participating in WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) found that while obesity rates increased between 2000 and 2010, they declined between 2010 and 2016 (1).

In order to receive WIC benefits, participants must have a household income at or below 185 percent of the federal poverty level. When enrolling in WIC and when recertifying annually, children's height and weight are measured by WIC staff, which are then used to calculate Body Mass Index (BMI) percentile-for-age. Children with a BMI percentile at or above the 85th percentile are considered overweight, while those with a BMI percentile at or above the 95th percentile are considered obese. Because these data are collected for every child participating in WIC, the researchers were able to include over 12 million children in the study.

In 2010, the prevalence of overweight or obesity in children aged 2-4 years in this sample was 32.5 percent, which declined significantly to 29.1 percent in 2016. The

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The declines in overweight and obesity may be partly due to the changes in WIC packages that went into effect in 2009.

prevalence of obesity alone decreased significant from 15.9 percent in 2010 to 13.9 percent in 2016. While the changes may seem relatively small, because of the large sample size hundreds of thousands fewer children between 2-4 years of age were considered overweight or obese in 2016 compared to 2010.

The researchers speculate that the declines might be related to changes in the WIC food package that went into effect in 2009 to align the foods provided with recommendations in the Dietary Guidelines for Americans. The WIC program provides vouchers to participating families to purchase foods, such as milk, cheese, beans, grains, and juice. The changes to the package decreased the amounts of some foods and beverages (such as juice and cheese), increased fruits and vegetables, and required low-fat or fat-free milk and whole grains (2).

References:

1. Pan L, Freedman DS, Park S, et al. Changes in Obesity Among US Children Aged 2 Through 4 Years Enrolled in WIC During 2010-2016. JAMA. 2019 Jun 18;321(23):2364-2366. doi: 10.1001/jama.2019.5051.
2. Daepp MIG, Gortmaker SL, Wang YC, et al. WIC Food Package Changes: Trends in Childhood Obesity Prevalence. Pediatrics. 2019 May;143(5). pii: e20182841. doi: 10.1542/peds.2018-2841. Epub 2019 Apr 1.

By Anna M. Jones, Department of Nutrition, University of California, Davis.

Vitamin D Deficiency in Middle Childhood May be Associted With Behavior Problems in Adolescence

Vitamin D deficiency has been linked to a variety of health conditions, including depression and schizophrenia in adults. Previous research suggests that it may be related to behavior issues in children. A recent study investigated how vitamin D deficiency in children aged 5 to 12 years was related to clinical behavior problems at follow-up six years later.

This study was nested with a larger longitudinal study in Colombia called the Bogota School Children Cohort that examined nutrition and health measures in school children over several years. At baseline, blood was drawn in order to assess vitamin D status and height and weight were measured in all the children in the study. A subset of these (n=273) were randomly selected to also

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complete behavior questionnaires at follow-up. Questionnaires were administered to both the parent and the child in order to compare responses and asked about externalizing behaviors (aggressive and rule-breaking), internalizing behaviors (anxious, depressed, and withdrawn), and other behaviors (attention, social, and thought problems).

The researchers found that children with vitamin D deficiency in middle childhood were 80 percent more likely to have externalizing behavior problems at follow-up than those who were not deficient. This held true for both parent reports as well as child self-reports. It was also found to be associated with parent-reported internalizing behaviors, although it was not the case for child self-reported behaviors.

Because sunlight is required for the body to produce vitamin D in the skin, time outdoors can be a way to help meet vitamin D needs.

The study authors suggested that because the vitamin D deficiency preceded the behavior problems identified at follow-up that there may be a causative relationship and that middle childhood may be a critical time for this relationship. However, they did not assess behavior at baseline, so it possible that these behavior problems may have been present during baseline as well. Furthermore, while the children in the sample were on average 9 years old at baseline, they ranged in age from 5 to 12. As a result, the oldest children in the study were 12 at baseline, which is older than the youngest were at follow-up. This makes it difficult to conclude that middle childhood is a critical period for vitamin D status as some of the children were beginning to enter adolescence. They also did not collect data about other factors that may be related to behavior issues as well as vitamin D status, such as family home environment.

The researchers suggested that middle childhood might be a critical time for vitamin D status.

Reference:

1. Robinson SL, Marín C, Oliveros H, et al. Vitamin D Deficiency in Middle Childhood Is Related to Behavior Problems in Adolescence.J Nutr. 2019 Aug 20. pii: nxz185. doi: 10.1093/jn/nxz185.

By Anna M. Jones, Department of Nutrition, University of California, Davis.

Outbreak of Multidrug-Resistant *Salmonella* Linked to Beef and Mexican-Style Soft Cheeses

Researchers at the Centers for Disease Control and Prevention (CDC) have identified a new multidrug-resistant (MDR) strain of Salmonella enterica, a common source of food-borne illness. This strain, called MDR Salmonella enterica Newport or MDR Newport, was detected for the first time in 2016 as part of routine monitoring and linked to hundreds of cases of illness in 32 states that took place in 2018 and 2019 (n=255). Of these cases, 29 percent were hospitalized, 6 percent were admitted to intensive care, and two patients died.

Unpasteurized dairy, such as the soft cheeses implicated in this outbreak, are a common source of food-borne illness.

These infections were linked to two possible sources. While only 209 patients provided information on recent travel, 43 percent of these had recently travelled to Mexico and indicated they had consumed soft, unpasteurized cheeses such as queso fresco or Oaxaca soft cheese. Of those that had not travelled to Mexico, many (29 percent) indicated they had also consumed Mexican-style soft cheeses and nearly all (93 percent) reported eating beef. One of the ways the CDC narrows down the source of an outbreak is to compare the foods eaten by those who became ill to a similar group of healthy individuals. They found that many more of those who became ill had consumed beef compared to the healthy group, which suggest that beef is one of the likely culprits. When the CDC researchers conducted DNA testing of samples from cheese and beef that may have been related to the outbreak they found that they were nearly identical. This suggested that the contamination of the cheese with MDR Newport likely came from the cows that provided the milk. Dairy cattle are often used as a source for ground beef, which may also explain the connection between the two potential sources of the outbreak. The researchers were able to detect the strain in beef from both Mexico and the United States.

Multidrug-resistant Salmonella was detected in cattle in both the US and Mexico.

This strain of MDR Newport was found to be resistant to azithromycin, in addition to several other common antibiotics. This is troubling, because azithromycin is one of the recommended

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treatments for Salmonella infections. In fact, many of the patients in this outbreak received azithromycin or other antibiotics to which the bacterium is resistant. It's important to note that most cases of food-borne illness go unreported, which likely means there were many more cases of MDR Newport caused by beef or unpasteurized cheese that were not able to be counted by the CDC in their investigation. The CDC recommended that consumers avoid eating soft cheeses made with unpasteurized milk and to cook beef to safe temperatures (145° F for steaks and roasts followed by a 3 minute rest, and 160° F for ground beef).

Reference:

1. Plumb ID, Schwensohn CA, Gieraltowski L, et al. Outbreak of Salmonella Newport Infections with Decreased Susceptibility to Azithromycin Linked to Beef Obtained in the United States and Soft Cheese Obtained in Mexico - United States, 2018-2019. MMWR Morb Mortal Wkly Rep. 2019 Aug 23;68(33):713-717. doi: 10.15585/mmwr.mm6833a1.

By Anna M. Jones, Department of Nutrition, University of California, Davis.

Danger: Don't Drink Miracle Mineral Solution or Similar Products

In addition to causes severe reactions, these solutions may also result in patients delaying seeking treatment for serious illnesses.

If you're drinking "Miracle" or "Master" Mineral Solution or other sodium chlorite products, stop now. The U.S. Food and Drug Administration (FDA) has received many reports that these products, sold online as "treatments," have made consumers sick.

The FDA first warned consumers about the products in 2010. But they are still being promoted on social media and sold online by many independent distributors. The agency strongly urges consumers not to purchase or use these products.

The products are known by various names, including Miracle or Master Mineral Solution, Miracle Mineral Supplement, MMS, Chlorine Dioxide (CD) Protocol, and Water Purification Solution (WPS). When mixed according to package directions, they become a strong chemical that is used as bleach.

Some distributors are making false—and dangerous—claims that Miracle Mineral Supplement mixed with citric acid is an antimicrobial, antiviral, and antibacterial liquid that is a remedy for autism, cancer, HIV/AIDS, hepatitis, flu, and other

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conditions. But the FDA is not aware of any research showing that these products are safe or effective for treating any illness. Using these products may cause you to delay other treatments that have been shown to be safe and effective.

The bottom line: Sodium chlorite products are dangerous, and you and your family should not use them.

The product instructions involve mixing the supplement with an acid, which results in the formation of chlorine dioxide, a powerful bleaching agent.

MMS Consumers Are Drinking Bleach

Websites selling Miracle Mineral Solution describe the product as a liquid that is 28 percent sodium chlorite in distilled water. Product directions instruct people to mix the sodium chlorite solution with a citric acid, such as lemon or lime juice, or another acid before drinking. In many instances, the sodium chlorite is sold with a citric acid "activator." When the acid is added, the mixture becomes chlorine dioxide, a powerful bleaching agent.

Both sodium chlorite and chlorine dioxide are the active ingredients in disinfectants and have additional industrial uses. They are not meant to be swallowed by people.

Miracle Mineral Solution Causes Severe Reactions

Drinking any of these chlorine dioxide products can cause nausea, vomiting, diarrhea, and symptoms of severe dehydration. Some product labels claim that vomiting and diarrhea are common after ingesting the product. They even maintain that such reactions are evidence that the product is working. That claim is false.

Moreover, in general, the more concentrated the product, the more severe the reactions. The FDA has received reports of consumers who have suffered from severe vomiting, severe diarrhea, life-threatening low blood pressure caused by dehydration, and acute liver failure after drinking these products. If you have had a negative reaction to any of them, consult a health care professional as soon as possible.

Health care professionals and patients are encouraged to report adverse events or side effects related to the use of these products to the FDA's MedWatch Safety Information and Adverse Event Reporting Program:

- Complete and submit the report online at https://www.accessdata.fda.gov/scripts/medwatch/index.cfm
- Download form at https://www.fda.gov/safety/medical-product-safety-information/forms-reporting-fda or call 1-800-332-1088 to request a reporting form, then complete and return to the address on the form, or submit by fax to 1-800-FDA-0178.

Source: FDA Consumer Updates. August 12, 2019; https://www.fda.gov/consumers/consumer-updates/danger-dont-drink-miracle-mineral-solution-or-similar-products

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