

TOX UPDATE

Alabama Poison Information Center

Navigating Nicotine: The Threat of Poisoning in Plain Sight

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Nicotine poisoning in pediatric patients is a serious and preventable health concern. With the increasing popularity of electronic cigarettes and other nicotine-containing products, there is a growing need to address the risks associated with accidental exposure in children. According to America's Poison Centers, Poison Centers have managed 6,581 exposure cases involving e-cigarette devices and liquid nicotine as of October 31, 2023¹.

Nicotine is a potent stimulant found in tobacco products, including cigarettes, cigars, smokeless tobacco, electronic cigarettes, and nicotine replacement therapies. In pediatric patients, even small amounts of nicotine can lead to toxicity. The lethal dose of nicotine in children is estimated to be as low as 0.5 to 1 milligram per kilogram of body weight². The quantity of nicotine in various products is shown below on the next page^{3,4}.



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ToxUpdate is brought to you by APIC and edited by Rachael Fogel PharmD

Product Type	Amount of Nicotine
Filtered cigarettes	13mg to 30mg
Used Cigarette butt	5mg to 7mg
Cigars	15mg to 40mg
Nicotine gum/lozenge	2mg to 4mg
Nicotine patch	17.4mg to 52.5mg
Liquid nicotine cartridge	Average of 44.8 mg/mL



Nicotine attaches to nicotinic acetylcholine receptors distributed throughout the body, particularly in the autonomic nervous system⁵. Toxic effects are dose-related and arise from excessive stimulation of these receptors, initially causing heightened activity followed by a subsequent inhibition⁵. Consequently, mild to moderate toxicity may manifest with stimulatory symptoms such as gastrointestinal effects, including upset stomach, nausea, and vomiting⁵. Other stimulatory effects include dizziness, headache, tremors, sweating, rapid heartbeat, paleness, and high blood pressure⁵. As receptor inhibition progresses, severe toxicity can result in seizures, confusion, weakness, slow heart rate, low blood pressure, and paralysis of respiratory muscles⁵.

Supportive care and symptom management are effective in managing mild to moderate toxicity. Vomiting, a common occurrence, can limit further systemic absorption⁵. Administering fluids is essential to prevent dehydration in these cases⁵. In instances of severe toxicity, patients may need airway assistance and mechanical ventilation due to altered mental status, excessive secretions, or respiratory distress/paralysis⁵. Atropine can be administered for bradycardia or significant muscarinic signs⁵. Hypotension should be addressed with fluid administration and vasopressors if required. At the same time, benzodiazepines are recommended for managing seizures or severe agitation⁵.

Preventing nicotine poisoning in pediatric patients involves educating caregivers about the dangers of nicotine-containing products and implementing safety measures, such as secure storage. Healthcare providers play a pivotal role in raising awareness about the importance of keeping these products out of reach of children. Nicotine poisoning in pediatric patients is a significant public health concern that requires proactive measures for prevention and effective management. Healthcare professionals must be vigilant in educating parents and caregivers about the risks associated with nicotine exposure in children. By fostering awareness and implementing safety measures, we can reduce the incidence of nicotine poisoning and safeguard the well-being of our youngest population. If a child is suspected to have been exposed to nicotine, contact the Alabama Poison Information Center at 1-800-222-1222.

“Stimulatory effects include dizziness, headache, tremors, sweating, rapid heartbeat, paleness, and high blood pressure.”

Sulfonylureas: One Pill Can Kill

By Christian Hardrick, PharmD

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Sulfonylureas are oral anti-diabetic, prescription medications utilized in conjunction with diet, exercise, and other anti-hyperglycemic medications for the management of type 2 diabetes mellitus and gestational diabetes in adult patients. The three second-generation sulfonylureas available for use in the United States include glimepiride (Amaryl®), glipizide (Glucotrol®), and glyburide (Micronase®)¹. These medications work by reducing glucagon secretion, decreasing insulin metabolism by the liver, increasing insulin sensitivity in peripheral tissues, and stimulating insulin release from pancreatic beta cells. These actions occur regardless of insulin levels.

Sulfonylureas are the second leading cause of oral anti-hyperglycemic overdose, with half of cases occurring in pediatric patients². Children are at an increased risk of toxicity because they have reduced glycogen stores, increased glucose consumption, and impaired glycogenolysis and gluconeogenesis^{3,4}. Therefore, sulfonylureas are considered to be a **"one pill can kill"** medication in the pediatric population. The onset of symptoms generally occurs 2-8 hours after ingestion but can be delayed beyond 24 hours. Common signs and symptoms are reflective of hypoglycemia and include weakness, hunger, pallor, palpitations, and tremors. More severe cases can result in seizures, coma, and death. Pediatric patients experience irritability and lethargy prominently¹. Toxicity is concerning due to diminished serum glucose concentrations leading to decreased glucose/energy available for the brain, causing neuroglycopenia. Depleted serum glucose alongside elevated serum insulin and c-peptide levels assist with diagnosis. If available, patients should be provided with nutrition and given oral glucose supplementation or intramuscular glucagon. All pediatric patients with suspected or confirmed ingestion should be sent to an emergency department and be observed for a minimum of 24 hours. In the hospital, treatment is multimodal. Intravenous access should be obtained as early as possible. Decontamination with gastric lavage or activated charcoal may provide benefit early on but usually are not effective or appropriate. The primary treatment of sulfonylurea-induced hypoglycemia is administration of dextrose-containing fluids to combat excess insulin³. However, prolonged activity of sulfonylureas and dextrose-stimulated insulin release can result in recurrent hypoglycemia. Therefore, octreotide is a critical adjunctive agent. In this setting, octreotide functions as a mimic of endogenous somatostatin. This leads to more potent inhibition of the secretion of insulin and glucagon³.

Dosing is generally 1-1.5 mcg/kg (up to 50 mcg) as a single dose administered subcutaneously or intravenously, with repeat doses every 6 hours as needed³. Neither route has a more pronounced benefit, but some literature has shown a preference for subcutaneous except when peripheral circulation may be compromised⁴. Continuous infusions of octreotide have been used in severe refractory cases in adults, but there is no strong evidence for use in the pediatric population. Literature supports octreotide decreasing recurrent hypoglycemic events and the amount of dextrose needed in comparison to dextrose monotherapy^{4,5,6,7,8,9}. As with all exposures, please contact the Alabama Poison Information Center (APIC) for assistance at 1-800-222-1222!

“All pediatric patients with suspected or confirmed ingestion should be sent to an emergency department and be observed for a minimum of 24 hours.”

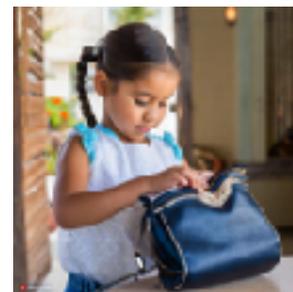
Tips for Keeping Children Safe During the Holidays from the Perspective of a Poison Control Specialist

By Rachael Fogel PharmD, Specialist in Poison Information

It truly is the most wonderful time of the year! It is also a busy time of the year here at the Alabama Poison Information Center. Even though the holidays are winding down, there are still potential dangers that pose threats to children. Here are some helpful tips to ensure the safety of children during the holiday season and all year round!

Be Mindful of Medicines

When traveling, ensure that medicine is kept out of children's reach. Children sometimes accidentally ingest medication that has been packed inside luggage. If a family member is visiting you, provide them a safe place to store their medications. If you are visiting a family member, ask them to move medication to a secure location.



Decorate with nontoxic plants

Although beautiful, some plants associated with the holidays can be toxic if ingested, including mistletoe, holly berries, and poinsettias.

Check the Gift List Twice

Many popular toys have the potential to cause harm and may require a call to poison control.

- Orbeez or Water Beads
 - These colorful and squishy beads are attractive to kids. When put in water, they expand many times their size. If swallowed, they can cause bowel obstruction.
- Button Batteries
 - Small disc-shaped or button batteries found in many toys can cause internal damage if swallowed by creating an electrical current.
- Magnets
 - Avoid toys with magnets that can be ingested, as multiple magnets can attract each other in the gut, causing obstruction and tissue injury.



Be Careful with Oven Cleaners

Who doesn't love fresh baked cookies? Always check the label of the spray used to grease the pan! Not only can oven cleaner be mistaken for cooking spray, it can also cause exposure if not properly wiped off after cleaning the inside of the oven. Make sure to follow all directions carefully when using oven cleaner. Check out this link from the Alabama Department of Health for more information about recent cases involving oven cleaner.

<https://www.alabamapublichealth.gov/blog/2023/12/nr-21.html>

Call the Alabama Poison Information Center if any exposure is suspected or more information is wanted.

1-800-222-1222

References

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1. E- Cigarettes & Liquid Nicotine. America's Poison Centers - e-cigarettes and liquid nicotine. Accessed November 4, 2023. <https://www.aapcc.org/track/ecigarettes-liquid-nicotine>.
2. Barbuto AF: Nicotine poisoning (e-cigarettes, tobacco products, plants, and pesticides) In: Atlas SJ, Kunins L, eds. *UpToDate*. UpToDate Inc; 2023. Updated June 20, 2022. Accessed November 4, 2023. <https://www.uptodate.com>
3. Salomon ME: Nicotine and Tobacco Preparations. In: Flomenbaum ME, Goldfrank LR, Hoffman RS, et al, eds. *Goldfrank's Toxicologic Emergencies*, 8th ed. McGraw-Hill, New York, NY 2006, pp 1221-1230.
4. Omaiye EE, Luo W, McWhirter KJ, et al: Disposable puff bar electronic cigarettes: chemical composition and toxicity of e-liquids and a synthetic coolant. *Chem Res Toxicol* 2022; 35(8):1344-1358.
5. Nicotine. POISINDEX System. Greenwood Village, CO: Truven Health Analytics. <https://www.micromedexsolutions.com> . Updated September 14, 2023. Accessed November 4, 2023.

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1. Costello RA, Nicolas S, Shivkumar A. Sulfonylureas. [Updated 2023 Jul 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK513225/>
2. Gummin DD, Mowry JB, Beuhler MC. (2022) 2021 Annual Report of the National Poison Data System© (NPDS) from America's Poison Centers: 39th Annual Report, *Clinical Toxicology*, 60:12, 1381-1643, DOI: 10.1080/15563650.2022.2132768
3. Klein-Schwartz W, Stassinios GL, Isbister GK. Treatment of sulfonylurea and insulin overdose. *Br J Clin Pharmacol*. 2016;81(3):496-504. doi:10.1111/bcp.12822
4. Smith SW, Howland M. Octreotide. In: Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS, eds. *Goldfrank's Toxicologic Emergencies*, 11e. McGraw Hill; 2019. Accessed November 12, 2023. <https://accesspharmacy.mhmedical.com/content.aspx?bookid=2569§ionid=210262313>
5. Dougherty PP, Klein-Schwartz W. Octreotide's role in the management of sulfonylurea-induced hypoglycemia. *J Med Toxicol*. 2010;6(2):199-206. doi:10.1007/s13181-010-0064-z
6. Boyle PJ, Justice K, Krentz AJ, Nagy RJ, Schade DS. Octreotide reverses hyperinsulinemia and prevents hypoglycemia induced by sulfonylurea overdoses. *J Clin Endocrinol Metab*. 1993;76(3):752-756. doi:10.1210/jcem.76.3.8445035
7. Glatstein M, Scolnik D, Bentur Y. Octreotide for the treatment of sulfonylurea poisoning. *Clin Toxicol (Phila)*. 2012;50(9):795-804. doi:10.3109/15563650.2012.734626
8. McLaughlin SA, Crandall CS, McKinney PE. Octreotide: an antidote for sulfonylurea-induced hypoglycemia. *Ann Emerg Med*. 2000;36(2):133-138. doi:10.1067/mem.2000.108183McLaughlin SA, 8. Crandall CS, McKinney PE. Octreotide: an antidote for sulfonylurea-induced hypoglycemia. *Ann Emerg Med*. 2000;36(2):133-138. doi:10.1067/mem.2000.108183
9. Carr R, Zed PJ. Octreotide for sulfonylurea-induced hypoglycemia following overdose. *Ann Pharmacother*. 2002;36(11):1727-1732. doi:10.1345/aph.1C076