

Laundry detergent capsules and pediatric poisoning

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Abstract

Question A 4-year-old girl was brought into the emergency department vomiting after having had ingested a laundry detergent capsule (LDC) from under the sink at her house. What is the risk of LDC poisoning? What can be done to treat these children?

Answer Laundry detergent capsules are relatively new to supermarket shelves in North America, and there has been an emergence of case reports in the literature describing LDC poisoning, which is worse than poisoning from other laundry detergents. Very little is known about the mechanisms causing these severe reactions, which include airway compromise and esophageal perforation, but the attractive appearance of these capsules and easy access at home has governments and health officials concerned about an increase in poisoning. No residual problems have been associated with these cases to date; however, further research is needed to assess long-term effects.



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Laundry detergent capsules (LDCs)—frequently found in stores as liquid tabs, pods, tablets, and sachets—are small, single-use concentrated detergent packets.¹ Most capsules consist of a water-soluble polyvinyl alcohol membrane. The mixture is usually composed of an anionic detergent, a cationic surfactant, and a nonionic detergent²; and while all brands contain irritants, some also contain alkaline substances.³ Laundry detergent capsules are usually brightly coloured and, as such, might be mistaken by children for candy or toys, which encourages ingestion. Laundry detergent capsules have been available in Europe since 2001⁴ and were introduced to North America a decade later. With mounting sales of LDCs, reports of pediatric poisoning have started to appear.⁵

Mechanism of poisoning

Household cleaning products rank in the top 5 most common exposures for children who are 5 years of age and younger.⁶ Laundry detergent capsules have 3 main routes of exposure: ingestion, ocular, and dermal.

Ingestion. Ingestion is the most common method of exposure. In a UK cross-sectional study of 518 participants with LDC poisoning, exposure by ingestion occurred in 80% of patients—96% of whom were younger than 5 years of age.¹ In another cross-sectional study, the Centers for Disease Control and Prevention demonstrated that 94% of children with LDC exposure by ingestion were 5 years of age and younger.⁷ The polyvinyl membrane casing is easily soluble when exposed to

saliva or moist skin, making LDCs a potential poison.⁸ An LDC is the most commonly ingested household product, accounting for 70% of all ingested detergents.⁸

For ingestion alone, the most common symptoms include vomiting (24.1%, 95% CI 20.3% to 28.1%), coughing (4.1%, 95% CI 2.5% to 6.1%), nausea (3.5%, 95% CI 2.1% to 5.4%), drowsiness (1.7%, 95% CI 0.8% to 3.3%), and rash (1.7%, 95% CI 0.8% to 3.3%).¹ Although rare, airway compromise and esophageal perforation have also occurred.³ In a recent cross-sectional study from Milan, Italy, examining 578 children (81% of whom were younger than 4 years old), 76% of children with LDC ingestion were symptomatic, compared with only 27% of children with other laundry detergent ingestion.⁹ The increased rate of ingestion and the severity of symptoms in LDC cases have been noted in several studies; however, the exact mechanism of action is still unknown.^{1,5,7} Several components in LDCs have been speculated as causative agents, including propylene glycol.⁵

Ocular. Ocular exposure alone occurred in 9.4% of cases in a UK study, and in 6.4% of cases in an Italian group; most patients were younger than 5 years of age.^{1,9} Eye exposure frequently causes conjunctivitis (65.6%, 95% CI 52.3% to 77.3%), discrete eye pain (9.8%, 95% CI 3.7% to 20.2%), and keratitis (3.3%, 95% CI 0.4% to 11.4%).¹ Theories explaining the cause of ophthalmic damage include the alkalinity of LDCs² and the concentration of surfactant, resulting in elevated intracellular calcium, acidification, and eye injury.¹

Dermal. Williams et al reported dermal exposure alone resulted in rash (57.1%, 95% CI 18.4% to 90.1%), skin irritation (28.6%, 95% CI 3.7% to 71.0%), chemical burn (28.6%, 95% CI 3.7% to 71.0%), and paresthesia (14.3%, 95% CI 0.4% to 57.9%).¹ Alkaline substances can activate protease enzymes that damage the skin by breaking down proteins.¹⁰ Moreover, phosphates in detergents can cause chemical burns.¹¹

Management of LDC poisoning

Treatment after LDC exposure should include contacting the local poison hotline for initial advice. After stabilizing the airway, breathing, and circulation, the child should be evaluated in an emergency department. Eyes should be irrigated early if exposed, as delayed irrigation has been found to be associated with less favourable outcomes such as burns.^{2,12} Contaminated clothing should be removed and irrigation of the site of exposure with water is indicated.¹³ Activated charcoal is not indicated in the treatment of ingestion of alkaline substances such as detergents.¹⁴

Many interventions have been described in the literature, including intravenous dexamethasone, epinephrine, nasogastric feeding, intubation, and ventilation.⁵ In a UK case series examining 5 children younger than 2 years of age who presented with stridor and drooling, 1 child was treated with steroids and antibiotics alone, 3 children required intubation and were given antibiotics and steroids, and 1 child had a failed balloon dilation of subglottic stenosis followed by a cricotracheal splint.³ All 5 children were discharged from hospital with no long-term complications. The Centers for Disease Control and Prevention reported on 2 patients who had swallowing dysfunction and required nasogastric feeding.⁷ To date, no persisting complications of LDC exposure in a pediatric population have been described in the literature. Keratitis and conjunctivitis resulting from eye exposure resolved within 7 to 10 days.¹

Changing landscape

As a result of the growing awareness of LDC poisoning, certain companies in North America have committed to changing LDC packaging to make it less appealing to children.¹⁵ Nevertheless, children are still at risk, and the American Association of Poison Control Centers recommends advising parents to keep detergents locked away and out of reach of children.¹⁵ This is particularly relevant, as one American study showed that only 11% of parents store poisons safely.¹⁶ Health Canada has further advised that it is collaborating with the Canadian Association of Poison Control Centres to collect data, and that the products involved are being reviewed.¹⁷

The current studies had several limitations, such as including a small number of cases, lacking follow-up,

and relying on voluntary case reporting. Further research is required to assess the reasons for serious injury from LDC exposure compared with other detergents, as well as the long-term effects of LDC poisoning in children. 🌿

Competing interests

None declared

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Child Health Update is produced by the Pediatric Research in Emergency Therapeutics (PRETx) program (www.pretx.org) at the BC Children's Hospital in Vancouver, BC.

Ms Bonney and Dr Mazor are members and Dr Goldman is Director of the PRETx program. The mission of the PRETx program is to promote child health through evidence-based research in therapeutics in pediatric emergency medicine.

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