

# Dimenhydrinate use for children with vomiting

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## Abstract

**Question** Dimenhydrinate is an over-the-counter drug that is commonly used for the treatment of nausea and vomiting. Many of my adult patients use it, but is it safe and useful in the pediatric population?

**Answer** Dimenhydrinate appears to be safe for use in the pediatric population. While little literature has been published about adverse effects of this medication, family physicians need to identify the cause of the vomiting before considering if the drug will be effective and need to ensure that patients safely use the medication and avoid potential interaction of the drug with other products.

## Résumé

**Question** Le dimenhydrinate est un médicament en vente libre communément utilisé pour traiter la nausée et les vomissements. Beaucoup de mes patients adultes l'utilisent, mais est-il sûr et efficace pour les enfants?

**Réponse** L'utilisation du dimenhydrinate semble sécuritaire pour la population pédiatrique. Même s'il y a peu d'ouvrages médicaux publiés sur les effets indésirables de ce médicament, les médecins de famille doivent d'abord identifier la cause des vomissements avant de pouvoir déterminer si ce médicament sera efficace et doivent s'assurer que les patients l'utilisent de manière sécuritaire et évitent des interactions possibles du médicament avec d'autres produits.

Dimenhydrinate is a nonprescription ethanolamine, consisting of 53% to 56% diphenhydramine and 44% to 47% 8-chlorotheophylline.<sup>1</sup> The main indication for dimenhydrinate is nausea, vomiting, or dizziness due to motion sickness, but it is commonly used to relieve nausea and vomiting from a variety of conditions. Health Canada's current labeling includes over-the-counter use for those older than 2 years of age and use in those younger than 2 as directed by a physician.<sup>2</sup> Health Canada recommends standard pediatric dosing based on age and not weight. The drug is commonly used by parents and children and, with its over-the-counter status, is believed to be safe for use.

## Safety profile

Despite dimenhydrinate's widespread use, evidence of its safety is lacking. A search of PubMed MEDLINE, using the terms *Gravol* or *dimenhydrinate* revealed 495 papers, only 95 of which examined subjects 0 to 18 years of age. Evidence of complications associated with dimenhydrinate is scarce. It is unclear if adverse events are infrequent or if reporting by consumers and health care providers is lacking. While dimenhydrinate overdose has been reported to cause central nervous system and anticholinergic symptoms (eg, mild tachycardia and tachypnea, visual hallucinations, confusion, ataxia, slurred speech),<sup>3</sup> little has been reported on toxicity due to medicinal use.

In 2006, the American Association of Poison Control Centers published consensus guidelines on dimenhydrinate and diphenhydramine poisoning.<sup>1</sup> These found no reports of adverse events following acute therapeutic exposures to

dimenhydrinate in children older than 6 years of age. All adverse events after acute exposures to dimenhydrinate in children younger than age 6 were reported in case reports, case series, or personal communications.<sup>1</sup> All but one of these reports were of children receiving doses exceeding the therapeutic recommendation. The child receiving the recommended dose was a 2-month-old infant who was reported to have apnea following an 8-mg rectal dose. The authors noted this was a personal communication with many important details missing.<sup>1</sup>

For chronic therapeutic exposure, only 3 cases were reported in children younger than 6 years old, all based on personal communication not further delineated in the paper.<sup>1,4</sup> While reports of toxicity (including drowsiness, malaise, palpitations, cardiovascular collapse, disorientation, excitation, visual disturbance, vasculitis, and toxic encephalitis) have been reported in adults with chronic exposure to therapeutic doses, no reports were found for children older than 6 years of age.<sup>1</sup>

Many practitioners are unaware that dimenhydrinate contains a caffeine derivative (8-chlorotheophylline) and a 5-mg/kg dose of dimenhydrinate includes 2.2 to 2.4 mg/kg of 8-chlorotheophylline. In a 30-kg child, the amount of 8-chlorotheophylline can reach 66 to 71 mg. By comparison, a 355-mL can of Coca-Cola or 240 mL of coffee contains 104 to 192 mg of caffeine.<sup>5</sup> Whether

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the effects of 8-chlorotheophylline are similar to those of theophylline has not been studied.<sup>1</sup>

Another consideration before recommending dimenhydrinate is its potential interaction with other products metabolized through the cytochrome P450 pathway. Caffeine is metabolized by the cytochrome P450 1A2 enzyme, and therefore it is possible that 8-chlorotheophylline might inhibit or potentiate the response of common medications such as diltiazem, verapamil, olanzapine, oral contraceptives, and omeprazole.<sup>6</sup>

### Acute gastroenteritis and motion sickness

While considered safe in recommended dosages, what are the indications for dimenhydrinate? Although vomiting can be associated with many conditions in children, it is recommended that dimenhydrinate be used only in conditions with no other definitive treatment. One retrospective study of 148 children from an emergency department and a provincial poison information centre in Ontario suggested that children with conditions such as meningitis, appendicitis, asthma, pneumonia, migraine, pelvic inflammatory disease, and urinary tract infections were significantly more likely to have a delayed diagnosis of 12 hours or more when dimenhydrinate was used (14 of 21 [67%] children receiving dimenhydrinate vs 43 of 127 [34%] children not receiving dimenhydrinate,  $P < .01$ ).<sup>7</sup>


Acute viral gastroenteritis and nausea or vomiting associated with motion sickness are common in children. Because acute viral gastroenteritis is self-limiting, oral rehydration therapy, rather than medications, is recommended.<sup>8-10</sup> Similarly, children with severe illnesses will likely need admission to hospital and intravenous hydration, with a limited role for dimenhydrinate.<sup>10</sup>

In a prospective, double-blind, randomized controlled trial of 237 children aged 6 months to 6 years with mild gastroenteritis (weight loss  $< 5\%$ , no bloody stools, no acidosis, and not requiring intravenous hydration) from an emergency department and outpatient pediatric practice in Germany, the children received rectal dimenhydrinate or placebo.<sup>11</sup> Dimenhydrinate did not improve the rate of oral rehydration measured as weight loss at follow-up visits ( $P = .452$ ), but the rate of vomiting significantly decreased by 0.72 vomits daily (95% confidence interval  $-1.16$  to  $-0.29$  vomits daily). Duration of vomiting, regardless of which arm of the study the children were in, was less than 1 day and less than 2 vomits per day and the lack of effect on hydration might have been related to the extent of diarrhea. Hence, dimenhydrinate is effective in reducing vomiting, but this might not translate into improved hydration. This should be considered when prescribing the drug in order to avoid false reassurance of caregivers.

For vomiting secondary to motion sickness,<sup>2</sup> no evidence suggests efficacy for dimenhydrinate in children. In adults, dimenhydrinate is more effective than placebo but

carries a risk of adverse events, such as a decreased sense of well-being and decreased psychomotor alertness.<sup>12,13</sup>

### Conclusion

Dimenhydrinate is a commonly used over-the-counter antiemetic. A paucity of data exists with regard to adverse events related to its use. Given the length of time this drug has been on the market with minimal documented complications, it would appear that it is generally safe for use in the pediatric population. Before use it is important to find a treatable cause of the vomiting, and to consider the potential for drug interactions and the drug's effectiveness for the presenting symptoms. Further research needs to be done to ascertain which illnesses can be effectively treated with dimenhydrinate. 

#### Competing interests

None declared

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