

## ORIGINAL RESEARCH

### I Can't Believe It's Not Toothpaste! Poison Control Center Calls Regarding Dental and Oral-Care Products

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#### ABSTRACT

**Background:** A cluster of incidents in which non-toothpaste products were used to brush teeth prompted a review of all calls to one Poison Control Center (PCC) regarding exposures to dental and oral-care products to determine if any resulted in significant toxicity.

**Methods:** Retrospective review of 65,849 calls to one PCC during one calendar year. All inquiries about exposures to substances used as dental or oral-care products were analyzed by a single reviewer for reported adverse effects, including hospital admission or PCC referral for emergent medical evaluation.

**Results:** 798 calls involved exposure to dental or oral-care products, comprising 1.21% of all calls received. Toothbrushing incidents with non-toothpaste products (122 cases) did not result in any significant recognized toxicity. Twenty-four patients were either referred for emergent medical evaluation (14) or were admitted to the hospital (10). In 23 of these patients (96%), the toxic agent was either an over-the-counter analgesic or a local anesthetic used to treat dental pain.

**Conclusions:** Among PCC calls received regarding dental and oral-care products, over-the-counter analgesics and local anesthetics used for dental pain resulted in the most frequent need for emergent medical evaluation or for hospital admission.

#### INTRODUCTION

Poison Control Centers receive many calls regarding personal care products. In 2001, the American Association of Poison Control Centers noted 208,171 exposures to personal care and cosmetic products, including 27,559 exposures to dental care products (denture cleaners, toothpastes, and "other") and 17,965 exposures to mouthwashes.<sup>1</sup> More than 99% of these exposures resulted in minor or no reported adverse effects, because many of the exposures involved trivial amounts of product or because the products were essentially non-toxic as commonly encountered.

During a routine quality assurance review of calls to the Samaritan Regional Poison Center (Phoenix, AZ) in December 1997, an unusual cluster of incidents was noted: three callers in one day reported brushing their teeth with a product that was not toothpaste. This event raised two questions of which products are easily mistaken for toothpaste, and could such exposures result in any significant toxicity.

Early in the course of this review, it became evident that the PCC received a large number of calls about various dental and oral-care products, representing many potential toxicities. The review was then expanded to: 1) characterize the volume and nature of all dental and oral-care product calls, 2) determine how many of these cases resulted in significant toxicity, and 3) discover which non-toothpaste products people inadvertently use to brush their teeth.

#### METHODS

Calls received by the Samaritan Regional Poison Center are concurrently logged into a computerized database; DOTLAB – PCC Patient Management & Data Collection, Version 4.1a was used at the time of this study. The author retrospectively reviewed all calls received during the calendar year 1997. Included cases were those in which the caller reported an ex

posure to, or had a question regarding the use or misuse of any dental or oral-care product. Cases involving the use of analgesics or local anesthetics specifically for dental pain were also included, as were medications prescribed or recommended by a dentist or oral surgeon. Exposure to hydrogen peroxide, if used as a gargle or mouth rinse, and inadvertent or intentional misuse of other substances as dental or oral-care products (e.g. brushing teeth with a non-toothpaste product) were also included.

Standard PCC practice is to perform telephone follow-up in cases when potentially concerning symptoms are reported or when delayed toxic effects may occur. The Certified Specialists in Poison Information (CSPIs) taking calls in the PCC typically follow-up every few hours, depending on the severity of symptoms and estimated risk for morbidity/mortality. Among patients admitted to the hospital who have been stabilized, follow-up may occur less frequently, often once per day. Because the great majority of call reported to PCCs result in very mild or no toxic effects, the need for telephone follow-up is determined by the CSPI on a case-by-case basis.

## RESULTS

Of 65,849 calls logged into the PCC computer database, 798 (1.21%) met inclusion criteria for further analysis. A total of 122 cases involved brushing teeth with a non-toothpaste product (See Table 1). In 115 of these cases the non-toothpaste product was used unintentionally. Generally, the product used in these cases resembled toothpaste, and the brusher assumed it was toothpaste until the mistaken identity was discovered. If the caller reported using a toothbrush that had been contaminated with or previously used with a non-toothpaste product (eight cases), this was also considered unintentional use of a non-toothpaste product. In the remaining seven cases, a product was used intentionally (i.e. the brusher knew it wasn't toothpaste before they started) but the PCC was called regarding actual or potential side effects.

**Table 1. Non-Toothpaste Products Used to Brush Teeth**

Substance	Number of Cases
<b>Analgesics</b>	
capsaicin	8
local anesthetics / antipruritics	
benzocaine	3
tripelennamine	1
menthol	
menthol + capsaicin	1
menthol + other essential oils	1
methyl salicylate (MeSAL)	
MeSAL + menthol	24
MeSAL + menthol + camphor	3
MeSAL + menthol + other essential oil	2
MeSAL alone	1
triethanolamine salicylate	2
<b>Antibiotics</b>	
antibacterial	
bacitracin	2
gentamicin	1
neomycin / polymyxin / bacitracin	1
antifungal	
clotrimazole	2
miconazole	3
<b>Household Chemicals</b>	
anionic / nonionic detergents	4 (2*)
hydrogen peroxide ( $\leq 3\%$ )	3
isopropanol	1
sodium hypochlorite (bleach)	5 (4*)
soldering flux	1*
water (caller believed was contaminated)	1
<b>Personal Care Products</b>	
dental or oral-care products (other than toothpaste)	
mouthwash	2
sorbitol/propylene glycol (infant tooth & gum cleaner)	1
hair relaxer	1
hemorrhoidal cream	2
skin care products	
benzoyl peroxide cream	1
coal tar extract / allantoin cream	1
diphenhydramine ointment (2%)	1
hand lotion	2
hydrocortisone cream	18
salicylic acid	2
tretinoin (0.25-0.5%)	3
witch hazel	1*
zinc oxide	
diaper rash ointment (40%)	16
skin rash ointment	1

\* = Number of Cases where toothbrush contaminated with or previously used with listed substance

The substances most commonly mistaken for toothpaste were methyl salicylate-containing muscle rubs (30 cases), corticosteroid creams (18), zinc oxide diaper-rash ointments (16), and capsaicin-containing arthritis creams (8). Among 116 cases where the time of a single, acute exposure was reported, distribution was generally bimodal with respect to the time of day: the larger peak occurred between 6-8 a.m. and the second peak between 8-10 p.m. There was no evident clustering by time of year, with a range of 4-14 cases per month. Out of 118 cases where the age of the toothbrusher was reported, 61 (52%) occurred in children aged six years or less.

A minority of callers reported adverse effects that were recorded in the database. Adverse effects assessed as likely to be related to the exposure included transient mucous membrane irritation, bad taste, nausea,

vomiting, and anxiety. Gingival blisters were reported in one patient who repeatedly used 3% hydrogen peroxide to brush their teeth. Effects assessed as unlikely to be related to the exposure included diarrhea, headache, peripheral numbness and tingling, and decreased appetite.

Only one recommendation for emergent medical evaluation was made by the PCC after toothbrushing with a non-toothpaste product. In this case, a three-year-old child smeared her skin with, brushed her teeth with, and possibly ingested the contents of two tubes of methyl salicylate (MeSAL) cream, one tube containing 30% MeSAL and the other 10% MeSAL. The maximum potential ingestion of salicylate was 6545 mg (436 mg/kg), which could be expected to cause serious toxicity. Despite the PCC's recommendation for acute evaluation in an Emergency Department, the parent declined to transport the child, citing both a lack of insurance and lack of symptoms

Table 2. Other Poison Center Calls Regarding Dental or Oral-Care Products

<b>Class of Substances</b>	<b>Number of Calls</b>
Toothpaste	166
Mouthwash	111
Local anesthetics	70
Home dental rinses with fluoride	49
Analgesics for odontalgia	48
Fluoride supplements	36
Dentures and denture-related products	30
Teething rings	25
Teething medications	24
Hydrogen peroxide	23
Medications prescribed or used by dentist (already included above: 7 analgesics, 3 local anesthetics)	14
Breath fresheners	14
Oral thrush medications	14
Carbamide peroxide	9
Mistaken product identity (excluding products mistaken for toothpaste)	9
Swallowed tooth, filling, or dental prosthesis	6
Question regarding health risks of mercury amalgam	3
Question regarding bleach rinse by dentist	3
Other questions / exposures	22

in the child. A follow-up call 2 hours later found that the child remained asymptomatic, and it was felt that this child had absorbed considerably less salicylate than calculated in the "worst case scenario".

The remaining 676 calls regarding other dental and oral-care products represented 1.02% of all calls received (See Table 2). The most common products involved were toothpaste (166 calls), mouthwash (111), local anesthetics (70), household fluoride rinses (49), analgesics for odontalgia (48), and oral fluoride supplements (36). The vast majority of these calls resulted in no reported adverse effects.

Ten patients, however, were admitted to the hospital: four for salicylate intoxication occurring as a therapeutic misadventure (one patient underwent hemodialysis for coma and seizures), four for *N*-acetylcysteine treatment after acetaminophen overdose, one for seizures from prilocaine and lidocaine injected by the dentist, and one for unresponsiveness following use of methamphetamine and cinnamon oil for odontalgia. Fourteen additional cases were referred for emergent medical evaluation by the PCC but were not admitted: six for benzocaine ingestions, three for aspirin overdose, two for acetaminophen overdose, and one each for ingestion of eugenol, camphor/phenol local anesthetic, and toothpaste. These 24 cases of actual or potential serious toxicity comprised 3.6% of all PCC calls regarding dental or oral-care products. Twenty-three of these cases (96%) resulted from exposure to analgesics or local anesthetics: 14 were accidental overdoses of medications taken for dental pain, eight were pediatric ingestions of local anesthetics, and one was iatrogenic. The remaining case occurred in an apparently psychotic caller who could not reliably quantify how much toothpaste he had ingested, and was therefore referred for evaluation of potential fluoride toxicosis.

## DISCUSSION

Most previous studies regarding dental and oral-care product poisoning have focused on one specific toxic effect from a narrow range of products, such as fluoride toxicity from toothpaste,<sup>2,3</sup> dietary supplements, or home dental rinses,<sup>3,4</sup> or ethanol poisoning from mouthwash ingestions.<sup>5</sup> Case reports of other dentally-related poisonings include an anticholinergic toxidrome from *Datura*-containing homemade toothpaste<sup>6</sup> and methemoglobinemia from local anesthetics.<sup>7</sup>

Our review of exposures to dental and oral-care products confirms the expectation that the majority of cases will not result in any significant toxicity.<sup>1</sup> Although toothpaste and mouthwash were the subjects of most prior investigations and resulted in the highest number of calls in this review, only one referral for medical evaluation was made for an exposure to either of these two products. This lone referral was made because of an unreliable history of toothpaste ingestion.

Over-the-counter (OTC) analgesics and local anesthetics used for odontalgia appear to pose the greatest risk for toxicity from dental and oral-care products. Analgesics, particularly OTC aspirin and acetaminophen, caused 80% of the serious poisonings necessitating admission and 35.7% of cases referred for emergent medical evaluation found in this review. Furthermore, the number of patients reported in this review is likely to underestimate the true number poisoned, because cases of analgesic toxicity or exposure were included only if the record specifically mentioned their use for dental pain. Because of the potential for methemoglobinemia with benzocaine and for central nervous toxicity with essential oils, oral exposure to these local anesthetics commonly prescribed in patient referral for medical evaluation.

The toxic risks from these products might be reduced by easier access to emergency dental care, increased public awareness of toxicities through dental society and/or PCC education programs, or revision of consumer product warning labels. Emergency physicians prevent patient toxicity from dental analgesics and local anesthetics by providing adequate pain relief, appropriate discharge counseling and referrals.

Toothbrushing with non-toothpaste products accounted for 15.3% of all calls included for study. It is expected that this study underestimates the incidence, since most persons brushing their teeth with a non-toothpaste product probably appropriately assess their exposure as non-toxic and do not call the PCC. Packaging issues likely lead to more exposures. The four most common substances mistaken for toothpaste are all marketed in tubes with screw-on caps, promoting misidentification for those who are not paying careful attention. MeSAL-containing creams are most commonly mistaken for toothpaste, perhaps because their sweet, minty smell and taste fail to provide any warning, and therefore the mistake is not noted until mucous membrane irritation ensues. The bimodal time-of-day distribution of these incidents, with early morning and late evening peaks, probably reflects the normal distribution of time when people brush their teeth. This observational study suggests that, barring very unusual circumstances, emergency physicians may safely discharge patients presenting for evaluation after brushing their teeth with a non-toothpaste product.

## CONSLUSIONS

Toothbrushing with non-toothpaste products did not result in significant recognized toxicity. However, the

potential for serious toxicity exists when non-trivial amounts of MeSAL-containing creams are mistakenly ingested. Among calls to PCCs regarding dental and oral-care products, OTC analgesics and local anesthetics used for dental pain resulted in the greatest number of patients referred for emergent medical evaluation and hospital admission.

## REFERENCES

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