



Danger in unlabeled bottles: Analysis of corrosive substances

To the Editor,

The accidental ingestion of cleaning substances (CS), also called "corrosive substances," may lead to severe tissue injury, based on the type, content, quantity of CS, and exposure time (1-3). Accidental ingestion of CS that was stored in food or drink bottles in easily accessible places is common, especially in children under 5 years of age. We performed an in vitro study to examine the contents of commercially available labeled and unlabeled CS.

Samples from 20 labeled or unlabeled CS, including bleach (n=9) and detergents (n=11) were collected. The pH values, sodium hydroxide (NaOH) level, and hydrochloric acid (HCl) level were measured in each sample (4 mL; mM). NaOH and HCl levels were measured by titrating the samples with solutions of a known concentration. The pH values were measured by pH meter (HI 2211 pH/ORP meter, Hanna Instruments, GmbH, Kehl, Germany). The results are listed in Table 1. Three of the bleaches were labeled with appropriate stickers, whereas 6 were unlabeled. The pH value of all the bleaches

Table 1. The results of biochemical analysis of bleaches and other detergents

Label	Sticker	Concentration on the sticker	NaOH (mmol)	HCl (mmol)	pH
Bleach	Suitable	4.6% sodium hypochloride	-	-	12.95
Bleach	Suitable	<5% non-ionic active substance + sodium hydroxide	-	-	12.35
Bleach	Not Suitable	>30% hypochloride acid	0.01714	-	12.15
Bleach	Not Suitable	>50% sodium hydroxide	0.010713	-	12.35
Bleach	Absent	Not written	0.05142	-	12.2
Bleach	Suitable	<5% non-ionic active substance	0.038565	-	12.25
Bleach	Absent	Not written	0.06856	-	12.6
Bleach	Absent	Not written	0.01714	-	12.6
Bleach	Absent	Not written	0.014998	-	12.85
Glass-cleaner	Absent	Not written	0.422073	-	11.26
Glass-cleaner	Absent	Not written	-	0.0119	5.9
Descaling agent	Absent	Not written	-	4.20784	0.5
Carpet shampoo	Absent	Not written	-	0.045696	4.95
Muriatic acid	Absent	Not written	-	3.4153	0.5
Drain opener	Absent	Not written	-	2.75842	1
Degreaser agent	Absent	Not written	1.313353	-	13.6
Degreaser agent	Absent	Not written	0.05142	-	12.3
Surface cleaner	Absent	Not written	-	1.073856	0.5
Surface cleaner	Absent	Not written	-	0.00833	6.3
Surface cleaner	Absent	Not written	-	0.00952	6.1

NaOH: sodium hydroxide; HCl: Hydrochloride

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was over 12. All of the other detergents were unlabeled. The pH values and content of these samples varied.

The relationship between content and injury is well known. A pH value higher than 12 increases the possibility of injury, because the critical cut-off pH for esophageal ulceration is 12.5 (4). Previous work has shown that 3.8% NaOH causes mucosal-submucosal esophageal burn, 10.7% NaOH causes muscular layer injury, and 22.5% NaOH causes full-thickness injury (1,5). In the present study, all of the bleaches had a pH value higher than 12, and 4 were above 12.5. In addition, some of the drain openers and surface cleaners were acidic, although they were supposed to be alkali, revealing that the content of CS within unlabeled bottles cannot be predicted. A study revealed that 72% of corrosive ingestions resulting in injury are caused due to the absence of warning labels, and that 92% of injuries are due to the absence of a child-protective cover (6). The production and distribution of highly caustic solutions is forbidden in some countries (5). In our country, these chemicals are controlled by law through the "Turkish Regulations on Hazardous Chemicals" and the "Turkish Regulations on Detergent Contents" (7). However, illegal production and distribution is still problem in our country.

In conclusion, the most effective way to prevent corrosive injuries is through a combination of education and control of the production and distribution of these dangerous chemicals.

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REFERENCES

1. Dolgun G. Corrosive injuries in children: review. *Turkiye Klinikleri J Pediatr* 2009; 18: 297-304.
2. Tanyel FC. Çocuklarda sık görülen cerrahi hastalıklar. In: Kale G, Senocak ME (Ed). *Katkı Pediatri Dergisi*, Ankara, Turkey, Alp Ofset, 2004, 669-73.
3. Doğan Y, Erkan T, Cokuğras FC, Kutlu T. Caustic gastroesophageal lesions in childhood: an analysis of 473 cases. *Clin Pediatr (Phila)* 2006; 45: 435-8. [\[CrossRef\]](#)
4. Vancura EM, Clinton JE, Ruiz E, Krenzelok EP. Toxicity of alkaline solutions. *Ann Emerg Med* 1980; 9: 118-22. [\[CrossRef\]](#)
5. Mamede RCM, de Mello Filho FV. Ingestion of caustic substances and its complications. *Sao Paulo Med J* 2001; 119: 10-5. [\[CrossRef\]](#)
6. Sanchez-Ramirez CA, Larrosa-Haro A, Vasquez-Garibay EM, Macias-Rosales R. Socio-demographic factors associated with caustic substance ingestion in children and adolescents. *Int J Pediatr Otorhinolaryngol* 2012; 76: 253-6. [\[CrossRef\]](#)
7. The regulations of The Ministry of The Environment 1993, 'Turkish Regulations on Hazardous Chemicals', Pub. L. No. 21634 (July 11th 1993) and regulations of The Ministry of Health 2010, 'Turkish Regulations on Detergent Contents', Pub. L. No. 27794 (December 23rd 2010).