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Exposures to traditional automatic dishwashing tablets and a comparison with exposures to soluble film tablets reported to the United Kingdom National Poisons Information Service 2008-2015

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Abstract

Introduction: Traditional automatic dishwashing tablets are contained within an external wrapper that requires removal prior to use.

Objective: To determine the toxicity of traditional tablets and to compare this with our previously reported experience of soluble film dishwashing tablets.

Methods: Telephone enquiries regarding traditional tablets were analysed retrospectively for the period January 2008 to December 2015.

Results: ***Traditional tablets.*** There were 503 enquiries relating to 492 patients who had been exposed to a traditional tablet. Most involved children aged 5 years or less (87.4%). The majority (78.6%) of patients did not develop symptoms after exposure; 21.1% developed minor (PSS 1) symptoms while one patient developed moderate features. Exposure occurred predominantly as a result of ingestion (n=476, 96.7%); the most common feature in symptomatic patients (n=99, 20.8%) was vomiting (70 [14.7%] cases). Significantly ($p<0.0001$) more adults (44.9% of 49 adults; 95% CI = 31.9-58.7) were reported with features than children (18.2% of 434; 95% CI = 14.9-22.1). There were five cases of eye contact which resulted in eye pain in two patients and eye irritation in another. Only one of 11 patients exposed dermally developed features (a rash around the mouth).

Comparison with soluble film exposures: The percentage of patients that were reported with clinical symptoms following ingestion of a soluble film dishwashing tablet (31.7% of 473 patients; 95% CI = 27.7-36.0) was significantly greater ($p<0.0001$) than that for traditional tablet (20.9% of 483 patients; 95% CI = 17.5-24.8). Vomiting was the most commonly reported feature and occurred significantly ($p<0.0001$) more frequently amongst patients who had ingested a soluble film tablet (25.5%; 95% CI = 21.8-29.6) than a traditional tablet (14.7%; 95% CI = 11.8-18.1).

Conclusions: Exposure to both traditional and soluble film tablets only rarely produced clinically significant symptoms (PSS ≥ 2). However, ingestion of a soluble film tablet was significantly more likely to result in clinical features than ingestion of a traditional tablet.

Introduction

Traditional tablets* for automatic dishwashing machines are contained within an external wrapper that requires removal prior to loading the enclosed tablet into the machine. These tablets are still used commonly worldwide. There have been few reports on the toxicity of traditional automatic dishwashing detergents; [1,2,3,4] the most recent report was published 20 years ago and the composition of these older products was different from the current tablets. Some 10 years ago automatic dishwashing tablets* contained within a soluble film became available in the United Kingdom (UK) and are now marketed in many European countries and in North America. We have previously published data on 488 exposures involving soluble film automatic dishwashing tablets. [5]

Soluble films used in this way are claimed to have two main advantages. Firstly, the exact amount of chemicals recommended for the product's intended purpose is delivered once the film dissolves completely in water. Secondly, as there is avoidance of direct contact with the chemicals, products were promoted to improve safety. That being said, the integrity of the soluble film can be compromised and the contents of the tablet can be released prematurely when in contact with moist hands or saliva. [5]

The traditional (wrapper covered) type of tablet consists entirely of a compressed powder, whereas soluble film tablets can also contain liquid and/or gel components. That said, the chemical composition of traditional and soluble film dishwashing tablets is similar. Both types of tablet contain a source of hydrogen peroxide (often as sodium percarbonate ≤ 20%) and non-ionic surfactants ≤ 5%. Other constituents in some formulations include sodium carbonate ≤ 30%, sodium tripolyphosphate ≤ 50%, and sodium silicate ≤ 10%, which reduce water hardness. The tablets have a resulting alkaline pH (generally between 9 and 11 when dissolved in water).

**Tablet is a generic name for the products which, up to a few years ago, largely comprised of compressed powder using the tableting technique. It in fact is a pars pro toto employed by Industry for these products which now include soluble film products.*

As the chemical composition of present day traditional tablets is similar to those enclosed in a soluble film, it would not be anticipated that the toxicity of traditional tablets as reported to the United Kingdom (UK) National Poisons Information Service (NPIS) over the period 2008-2015 would be different from that which we have reported for soluble film automatic dishwashing tablets over the same period. [5] Nonetheless, as the toxicity of present day automatic dishwashing tablets has not been ascertained previously, we have investigated the reported toxicity of these tablets and ascertained whether or not they are more likely to result in clinically important features than those enclosed in a soluble film. In addition, we have compared the toxicity reported in children and adults with both types of tablet.

Methods

The UK NPIS (www.npis.org) provides information and evidence-based management advice about individual substances through its online database TOXBASE® and its 24-hour telephone advice service, staffed by information scientists and supported by a rota of consultant clinical toxicologists. The UK NPIS takes telephone enquiries from NHS healthcare professionals.

A retrospective analysis of telephone enquiries to the UK NPIS from across the UK regarding automatic dishwashing tablets was undertaken for the period 1 January 2008 to 31 December 2015. The NPIS UKPID (United Kingdom Poisons Information Database) central database was searched for enquiries involving all types of automatic dishwashing products and each exposure to a tablet was categorized as being of the traditional or soluble film type. The data relating to the traditional type of tablets were analyzed and their toxicity then compared to that of soluble film tablets. [5] Confidence intervals were calculated and a two-sample Chi-squared test was performed using GraphPad Prism Version 7.01 to determine whether there were significant differences between exposures to traditional and soluble film tablets and between children and adults.

Enquiries received from outside the UK were excluded from this study. Data (both from the text narrative as well as discrete data fields) extracted from the enquiries included: age of patient; route(s) of exposure; source of enquiry; location where exposure occurred; circumstances of exposure; product information; features reported at the time of enquiry and the assigned World Health Organisation

/International Programme on Chemical Safety /European Commission /European Association of Poison Centres and Clinical Toxicologists (WHO/IPCS/EC/EAPCCT) Poisoning Severity Score (PSS). [6] Data on composition were obtained from the NPIS Product Data Centre which contains safety datasheets (SDS) on products marketed in the UK.

This study did not require approval by a UK Research Ethics Committee as the UK Health Research Authority has declared that ethical approval is not needed for research studies that use information collected routinely in any UK administration (England, Wales, Scotland, Northern Ireland) as part of usual clinical care, provided this information is passed to the researchers in a fully anonymised format.

Results

There were 1290 enquiries (1266 exposures) involving automatic dishwashing tablets over the period of 2008 to 2015. There were 503 enquiries (492 exposures) about the traditional type, 498 enquiries (488 exposures) about the soluble film type and 289 enquiries (286 exposures) regarding an automatic dishwashing tablet which could not be identified due to incomplete information relating to the product being available to the enquirer.

Traditional tablets

Over half of 503 enquiries (n=266, 52.9%) were received from NHS (National Health Service) Direct and NHS 24 [Scotland]. NHS Direct closed on March 31 2014 in England (though not in Wales) and was replaced by NHS 111. These services provide the public with advice on health issues. Enquiries from general practices, including out-of-hours services (n=146; 29.0%), hospitals (n=65; 12.9%), ambulance services (n=24, 4.8%) and walk-in centres (n=2, 0.4%) accounted for the remainder of the enquiries.

The majority (n=440, 89.4%) of the 492 exposures involved children (<18 years); most were aged 5 years or less (n=430, 87.4%) but there were also two cases where the age of the child was not known. Of the remaining 52 adult cases, the adult age group most frequently reported to have been exposed to traditional dishwashing tablets were those aged 70 years or greater (n=19, 36.5%). In two adult exposures cases, the exact patient age was not known.

Exposure occurred at home in the majority of cases (n=483, 98.2%). The other nine cases (1.8%) occurred in a nursing/care home.

Ingestion *alone* accounted for most exposures (n=476, 96.7%). There were 11 other cases of ingestion which also involved other exposure routes, most commonly skin contact (n=10, 2.0%); the eye was also involved in one case (0.2%). The remaining 5 cases comprised eye contact *alone* (n=4, 0.8%) and skin contact *alone* (n=1, 0.2%).

Information was available to permit product identification and, therefore, determination of the composition in 411 of the 492 cases (83.5%) (Table 1).

A Poisoning Severity Score (PSS) was calculated at the time of the telephone enquiry in 487 (99.0%) of the 492 exposures (Table 2); insufficient details were given in the remaining 5 cases to determine the PSS. Most patients (n=383; 78.6%) had not developed any symptoms (PSS 0) at the time the enquiry was made. One hundred and three patients (21.1%) developed minor symptoms (PSS 1), and the remaining case was graded as moderate (PSS 2) toxicity due to prolonged vomiting for over 24 hours. There were no reports of any patient developing severe features of toxicity (PSS 3), nor were there any reported deaths.

Ingestion

Four hundred and eighty-seven patients were reported to have been exposed to some part of a tablet by ingestion (either *alone* or with eye or skin contact). The majority of the 487 cases of ingestion occurred in children (n=438, 89.9%) and predominantly involved those aged 5 years or less (n=429, 97.9%). Of the 438 pediatric (<18 years) exposures, 18.2% (n=79) of children developed features (in 4 cases the features were not known). Vomiting (n=63) was the most commonly reported feature followed by nausea (n=4), coughing (n=4) or skin rash (n=4) but various other features including diarrhea, foaming at the mouth and increased salivation were reported (Table 3).

Forty-eight of 438 children were reported to have ingested at least half a tablet (35.4% developed features), 264 ingested a small amount of a tablet (14.4% developed features) and 46 children ingested only tablet residue (15.2% developed features). The amount of tablet ingested was unknown in the remaining 80 cases, of whom 21.3% developed features.

Of the 49 adults, 22 (44.9%; 95% CI = 31.9-58.7) were reported to have developed features. Hence, among this cohort of traditional tablet exposures reported to the UK NPIS, significantly more ($p<0.0001$) adults developed features than children (18.2%; 95% CI = 14.9-22.1). Eight of these 49 adults had a history of dementia, 8 of learning difficulties, 1 a psychiatric history of ingesting items for self-harm; 6 occurred within a nursing or care home (although no medical history was provided for these patients) and 5 were aged 80 years or above. Fourteen of these 28 patients had reportedly eaten between three quarters of a tablet and up to two tablets and features developed in 11 of these 28 patients (39.3%).

In 9 other cases, patients had accidentally ingested residue from crockery in 9 separate incidents; this had been left due to a fault with the dishwashing machine following the washing cycle. Five of these 9 patients (55.6%) developed features.

There were 3 cases of substantial ingestion: one (a 22-year-old) had ingested 11 dishwashing tablets and developed pharyngitis and a skin rash; the second (a 36-year-old) had been eating dishwashing tablets for the previous 12 months and reported abdominal pain; the third patient (a 92-year-old) had ingested 4 tablets over the course of 2 hours but remained well.

In 4 of the 487 cases involving ingestion, a PSS could not be assigned because of insufficient clinical data; all 4 were pediatric cases. Three hundred and eighty-two of the remaining 483 (79.1%) exposures cases were graded as PSS 0 (asymptomatic). Minor features of toxicity developed in 100 patients (20.7%) and moderate features in only one patient (0.2%). A comprehensive list of the features that developed following ingestion is shown in Table 3.

Eye exposure

There were 5 cases of eye contact. In one case (involving an adult) the features were unknown and a PSS could not be assigned. Of the remaining 4 cases (Table 4), 2 patients (aged 70 and 72 years of age) reported eye pain, 1 patient developed eye irritation (a 2-year-old child) and the fourth case involved a baby of 10 months who was thought to have been exposed by ingestion and eye contact; the child remained well.

Dermal exposure

Eleven cases involved dermal contact; all but one case also involved ingestion. All of the 11 were children aged 4 years or less and only one child developed dermal features (a rash around the mouth).

Traditional tablet exposures versus soluble film tablet exposures

The WHO/IPCS/EC/EAPCCT Poisoning Severity Scores (PSS) for both traditional and soluble film types of tablet exposure are shown in Table 2. A significantly ($p<0.0001$) greater proportion of those exposed to a traditional tablet were asymptomatic (n=383; 78.6%; 95% CI = 74.8-82.1), compared with those exposed to a soluble film tablet (n=325; 67.4%; 95% CI = 63.1-71.5).

The percentage of children (<18 years) exposed by ingestion to traditional tablets (n=438; 89.9%; 95% CI = 86.9-92.3) was significantly lower ($p<0.0001$) than the percentage of ingestions involving soluble film tablets (n=464; 96.9%; 95% CI = 94.9-98.1). In the case of ingestions involving children aged 5 years or less, the percentage amongst the traditional tablet group (n=429; 88.1%; 95% CI = 84.9-90.7) was significantly lower ($p=0.0009$), compared to the percentage for the soluble film group (n=451; 94.2%; 95% CI = 91.7-95.9). Conversely, a significantly higher ($p=0.0001$) percentage of adults ingested a traditional tablet (n=49; 10.1%; 95% CI = 7.7-13.1) than a soluble film tablet (n=15; 3.1%; 95% CI = 1.9-5.1).

The overall percentage of patients that became symptomatic following ingestion of a traditional tablet (20.9% of 483 patients; 95% CI = 17.5-24.8) was significantly lower ($p=0.0001$) than that for soluble film tablets (31.7 % of 473 patients; 95% CI = 27.7-36.0). Significantly ($p<0.0001$) fewer children (<18 years) developed features following ingestion of a traditional tablet type (18.2% of 434 patients; 95% CI = 14.9-22.1) compared to children who had eaten a soluble film tablet (32.1% of 461 patients; 95% CI = 28.0-36.5). However, the percentage of adults that became symptomatic following ingestion of a traditional tablet (44.9% of 49 patients) was higher when compared with those that ingested a soluble film tablet (16.7% of 12 patients), but this difference was not statistically significant.

Vomiting was the most commonly reported feature irrespective of the tablet type (Table 3) and occurred significantly ($p<0.0001$) more frequently amongst patients that had ingested a soluble film tablet (25.5%; 95% CI = 21.8-29.6) than a traditional tablet (14.7%; 95% CI = 11.8-18.1). Interestingly, vomiting was not

reported in adults following ingestion of a soluble film tablet, whereas it occurred in 8 of 49 patients who ingested a traditional tablet (non-significant difference).

Ocular toxicity developed in a similar proportion of patients (non-significant difference) exposed to traditional (75.0% of 4 cases; 95% CI = 30.1-98.7) and soluble film tablets (70.0% of 10 cases; 95% CI = 39.7-89.2). Eye pain was reported by 2 patients from each group, though conjunctivitis or blurred vision was only reported by those exposed to a soluble film tablet (Table 4). Eye irritation developed in one patient exposed to a traditional tablet.

Dermal exposure involved a traditional tablet in 11 instances and a soluble film tablet in 8. All 19 cases involved children (all but one child was ≤ 2 years) and 18 also involved ingestion. Only one patient was reported to have developed dermal features (a skin rash around the mouth) following contact with a traditional tablet.

Toxicity of unknown group of tablet exposures

We did not consider it appropriate to analyze all the data on the 286 exposures where the precise identity of the tablet was not known, as this could introduce substantial bias. We have included data on the PSS of these patients in Table 2, which indicates that in all probability this unknown group consists of roughly equal numbers of exposures to both types of tablets.

Discussion

Our study shows that the ingestion of traditional automatic dishwashing tablets resulted only rarely in moderate (PSS 2) toxicity. Features occurred in 20.9% of all ingestions; only 1 of 483 patients developed moderate features of toxicity. Vomiting was the only consequence in the majority (14.7% of all cases; 70.3% of those symptomatic). This is surprising given the potential for toxicity of the major active ingredients, sodium percarbonate (a source of hydrogen peroxide) and non-ionic surfactants, and of sodium carbonate, sodium tripolyphosphate and sodium silicate present in some products to reduce water hardness.

Toxicity from hydrogen peroxide occurs as a result of its corrosive effects and release of oxygen causing embolism. [7] Ingestion of hydrogen peroxide may cause irritation of the gastrointestinal tract with nausea, vomiting, foaming at the mouth and hematemesis. [8] The foam may then obstruct the respiratory tract [9] or result in

pulmonary aspiration. As the estimated maximal amount of hydrogen peroxide liberated from a typical dishwashing tablet (all the powder swallowed, completely dissolved and hydrogen peroxide fully released) is less than 1.3 g, it would not be anticipated that the more severe features reported after exposure to high strength hydrogen peroxide solutions would occur, unless several tablets were ingested deliberately. In our study nausea and vomiting, foaming at the mouth, blistering in the mouth, burning sensation in the mouth, painful swallowing, burns on lip and tongue, ulcer on lip, swollen lips, abdominal pain, laryngitis, and pharyngitis could have been hydrogen peroxide-induced.

Sodium carbonate ingestion in humans has led to stridor, drooling, coughing, and oedematous lips. [10] Hence, coughing and swollen lips in our study might have developed in part due to sodium carbonate.

While ophthalmic damage can be caused by non-ionic surfactants, [11] other experimental studies [12] have shown that sodium carbonate causes conjunctivitis, corneal opacities and chronic superficial keratitis. Sodium silicate has also been shown to cause conjunctivitis, iritis and corneal opacity experimentally, [13] but is unlikely to do so at the concentrations present in most tablets. Thus, eye pain and eye irritation reported in our study could have been caused by non-ionic surfactants and/or sodium carbonate and/or sodium silicate.

Dermal exposure from sodium tripolyphosphate and sodium carbonate has resulted in erythema and oedema and a severe vesicular reaction on abraded skin; [14] sodium silicate is non-irritating to the skin at the concentration usually present in the tablets. [13] Only one patient developed a rash following dermal contact in our series.

We compared these results with those we published recently on soluble film automatic dishwashing tablets. [5] Overall, there were a similar number of cases involving ingestion of a dishwashing tablet reported for the traditional (n=488) and the soluble film types (n=479). The percentage of children (<18 years) exposed by ingestion to traditional tablets (89.9%) was significantly lower ($p<0.0001$) than the percentage of children ingesting soluble film tablets (96.9%). This was true also of ingestions involving children aged 5 years or less (88.1% vs. 94.2%; $p=0.0009$), which may relate to the appearance of the soluble film tablets.

Conversely, a significantly higher ($p<0.0001$) percentage of adults ingested a traditional tablet (10.1%) than a soluble film tablet (3.1%), presumably reflecting use and availability. The percentage of patients that became symptomatic following ingestion of a traditional tablet (20.9%) was significantly lower ($p<0.0001$) than that for soluble film tablets (31.7%). Furthermore, significantly more ($p<0.0001$) adults developed features than children after traditional tablet ingestion.

Cases involving eye exposure to traditional tablets (n=5) were fewer than those to soluble film tablets (n=10) whereas the number of dermal exposures was similar (n=11 vs. n=8, for traditional and soluble film tablets, respectively). However, the number of cases for these exposure routes was small precluding meaningful interpretation.

What are the potential reasons for these results? Our understanding is that the hardness of the traditional tablets was set so that a young child could not easily bite a chunk off. We believe adults are more likely than young children to be able to bite into a hard tablet and consume the powder. In contrast, soluble film tablets have a loose powder held together by the external wrapper. As a consequence, it is possible that the disintegration of a soluble film tablet may result in a larger dose of ingredients being involved in the exposure. Moreover, some soluble film products have a liquid component which may be ingested more easily compared to the powder-only products. We are not aware of any data on the public's risk perceptions of the two forms of tablet. We find these explanations for these apparent differences more convincing than reporting bias, but this cannot be excluded.

Vomiting was the most commonly reported feature irrespective of the type of tablet and occurred significantly ($p<0.0001$) more frequently amongst patients who had ingested a soluble film tablet (25.5%) than a traditional tablet (14.7%). The possible reasons are explained above, though it should be stressed that the majority (traditional 79.1%; soluble film 68.3%) of patients who ingested either type of tablet remained asymptomatic and when symptoms developed they were of a minor kind.

Historically, automatic dishwashing products were formulated as liquids, powders or granules and had different compositions from those marketed today, which must be recognized when interpreting the previously published literature. Our study related to present day traditional tablets rather than these older formulations. Krenzelok [2] reported the outcome in 192 exposures involving a liquid automatic

dishwashing detergent. 99.3% of 146 ingestions either did not result in features (n=133) or only minor features (n=12). In contrast, 91.3% of 23 patients exposed ophthalmically developed mild or moderate symptoms; conjunctivitis and corneal lesions were reported most commonly but no patient had permanent sequelae. In another series, [3] 12 of 18 children were admitted to hospital after exposure to an automatic dishwashing product (granular form). Features included crying, drooling, vomiting, coughing and stridor in combination with oropharyngeal burns. Fourteen of the 18 children underwent endoscopy and 11 had evidence of oesophageal injury.

In a third study, [4] 3 of 61 children were reported to have required admission to hospital after exposure to a traditional automatic dishwashing product (liquid, powder or granular product). One was admitted for 9 days, and 3 esophagoscopies were performed as the child had been unable to swallow; the patient was discharged for weekly oesophageal dilation. A second child required two esophagoscopies during a two-day admission. A third child was transferred to the intensive care unit, underwent esophagoscopy, and required follow-up oesophageal dilation.

Our results are limited by factors inherent to poison centre data. Firstly, the data included in this study relate to exposures that were reported voluntarily to the UK NPIS. Although it is impossible to quantify accurately the total number of exposures occurring in the UK, it is probable the total number is higher than that reported here. A second limitation is incomplete data reporting and the lack of follow-up data until complete recovery. For example, an exact product name was not always available to the enquirer, and the circumstances and dose were not always known (as the incident was unwitnessed) or disclosed. Thirdly, there may also have been selection bias towards less severe cases, as 52.9% of exposures were notified to the NPIS by public NHS services. Fourthly, given the relatively small number of enquiries from hospitals, it is possible that the clinicians managing the patient did not consider it necessary to seek the advice of the NPIS even in more severe cases. Finally, although it is true that there may be bias in the reporting of enquiries regarding automatic dishwashing products to the UK NPIS, this is likely to be similar for both traditional and soluble film tablets. Hence, we believe our conclusions remain valid.

The reasons for the difference in frequency of symptoms after ingestion of soluble film tablets and traditional tablets are not known with certainty but may relate

to the relative hardness of traditional tablets which children may find difficult to bite. In addition, soluble film tablets containing a liquid may result in greater ingestion of material.

Conclusions

Most patients (78.6%) did not develop symptoms after exposure to a traditional automatic dishwashing tablet. Of the remaining patients who did develop symptoms, all were of a minor nature except in 1 case. Although exposure to both traditional and soluble film automatic dishwashing tablets rarely produced clinically significant symptoms (PSS ≥ 2), the proportion of patients that became symptomatic following ingestion of a traditional tablet was significantly lower than that for soluble film tablets. Vomiting occurred significantly ($p<0.0001$) more frequently amongst patients who had ingested a soluble film tablet than a traditional tablet.

Declarations of interest

The UK NPIS has received two unrestricted educational grants from the UK Cleaning Products Industry Association (UKCPI) over recent years to undertake studies on the toxicity of household products.

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Table 1. Identity, composition* and number of exposures to traditional automatic dishwashing tablets in the study.

Manufacturer	Product Name	Composition*	Exposures n=
Reckitt Benckiser	Finish™	5-30% Sodium percarbonate 5-30% Sodium carbonate 30-60% Sodium tripolyphosphate <5% Sodium silicate	220
McBride	Supermarket (own brands)	1-30% Sodium percarbonate 1-25% Sodium carbonate 30-100% Sodium tripolyphosphate 0-30% Sodium silicate	91
McBride/Thurn Produkte GmbH†	Supermarket (own brands)	10-25% Sodium percarbonate 10-50% Sodium carbonate 15-30% Sodium tripolyphosphate 0-2.5% Sodium silicate	34
McBride/Budich International†	Supermarket (own brands)	5-25% Sodium percarbonate 10-25% Sodium carbonate 0-10% Sodium silicate	19
Dicom-Dali UK Limited	Supermarket (own brands)	0-30% Sodium percarbonate 0-22% Sodium carbonate 30-100% Sodium tripolyphosphate 0-9% Sodium silicate	11

Ecover	Ecover™	15-30% Sodium percarbonate 5-15% Sodium carbonate 5-15% Sodium silicate	11
Thurn Produkte GmbH	Supermarket (own brands)	10-25% Sodium percarbonate 10-50% Sodium carbonate	6
Budich International	Supermarket (own brands)	5-15% Sodium percarbonate >20% Sodium carbonate	4
Chemolux S.à r. l	Supermarket (own brands)	5-15% Sodium percarbonate 15-20% Sodium carbonate	4
Evans Vanodine International	Glaze™	10-20% Sodium percarbonate 20-25% Sodium carbonate 10-20% Sodium silicate	3
The London Oil Refining Company Limited	Astonish™	5-25% Sodium percarbonate >25% Sodium carbonate 1-5% Sodium silicate	3
JohnsonDiversey UK Limited	Bryta™	15-30% Sodium percarbonate 5-15% Sodium carbonate 5-15% Sodium silicate	2
WIN Cosmetic GmbH & Co. KG	Supermarket (own brands)	5-15% Sodium percarbonate 15-30% Sodium carbonate	2
Ecozone Ltd	Ecozone™	15-30% Sodium percarbonate >30% Sodium carbonate <5% Sodium silicate	1

* The composition of some products has changed over the course of the study, so a composite for the manufacturer has been given, which is representative.
† For 53 of the 411 products (12.9%), two manufacturers are shown as there were two manufacturers and two separate safety datasheets pertaining to the same product name during the period of the study.

Table 2. Poisoning Severity Score (PSS) [6] following exposure via all routes to traditional or soluble film tablets and tablets of an unknown type.

PSS		Traditional tablets (n=487)*		Soluble film tablets (n=482)*		Unknown tablet type (n=279)*	
		n	%	n	%	n	%
None	(PPS 0)	383	78.6	325	67.4	198	71.0
Minor	(PSS 1)	103	21.1	155	32.2	80	28.7
Moderate	(PSS 2)	1	0.2	2	0.4	1	0.4
Severe	(PSS 3)	0	0.0	0	0.0	0	0.0

* Excludes from total the five cases (traditional tablet exposures), six cases (soluble film tablet exposures) and seven cases (tablets of unknown type) where features were not known.

Table 3. Reported features following ingestion (alone or in conjunction with other routes) of either traditional or soluble film tablets.

Feature	Traditional tablets (n=483)*		Soluble film tablets (n=474)*	
	n	%	n	%
Vomiting	71	14.7	121	25.5
Nausea	6	1.2	8	1.7
Skin rash	5	1.0	5	1.0
Coughing	4	0.8	6	1.3
Burning sensation in the mouth	2	0.4	0	0.0
Diarrhea	2	0.4	2	0.4
Foaming at the mouth	2	0.4	1	0.2
Pharyngitis	2	0.4	1	0.2
Taste perversion	2	0.4	0	0.0
Abdominal pain	1	0.2	2	0.4
Blistering/ulcer in the mouth	1	0.2	1	0.2
Cold extremities	1	0.0	0	0.0
Cyanosis	1	0.2	0	0.0
Dyspnea	1	0.2	1	0.2
Increased salivation	1	0.2	0	0.0
Laryngitis	1	0.2	2	0.4
Painful swallowing	1	0.2	0	0.0
Red saliva	1	0.2	0	0.0
Burns on lips and tongue	1	0.2	0	0.0
Ulcer on lip	1	0.2	0	0.0
Swollen lips	1	0.2	0	0.0
Stomatitis	0	0.0	3	0.6
Fever	0	0.0	2	0.4
Mouth bleeding	0	0.0	2	0.4
Agitation	0	0.0	1	0.2
Anxiety	0	0.0	1	0.2
Bronchospasm/wheeze	0	0.0	1	0.2
Dyspepsia	0	0.0	1	0.2
Dysphagia	0	0.0	1	0.2
Eye irritation	0	0.0	1	0.2
Flatulence	0	0.0	1	0.2
Hiccup	0	0.0	1	0.2
Lacrimation	0	0.0	1	0.2
Lip irritation	0	0.0	1	0.2
Malaise	0	0.0	1	0.2
Paresthesia around the mouth	0	0.0	1	0.2
Stridor	0	0.0	1	0.2
No features	382	79.3	323	68.1

* Excludes from total the four cases (traditional) and five cases (soluble film) where features were not known.

Table 4. Ocular features present following eye contact (alone or in conjunction with other routes) with either traditional or soluble film tablets.

Feature	Traditional tablets (n=4)*		Soluble film tablets (n=10)	
	n	%	n	%
Eye pain	2	50.0	2	20.0
Conjunctivitis	0	0.0	3	30.0
Blurred vision	0	0.0	2	20.0
Eye irritation	1	25.0	0	0.0
None	1	25.0	3	30.0

* Excludes from total one case (traditional tablet) where features were not known.