SUBSTANCES OF LOW TOXICITY BY INGESTION

VANESSA BARA provides a list of substances of low toxicity which children commonly ingest. Carers of children who have ingested these substances are reassured and warned of the possible effects.

Each year, the London Centre of the National Poisons Information Service receives many thousands of enquiries about children, aged five years or less, who have eaten something inappropriate. This is a particular problem in two year olds, an age where children become more mobile and are keen to explore their environment. This exploration includes putting things in their mouth (Tempowski 1997).

Some of the most commonly ingested substances include paracetamol, ibuprofen and white spirit, all of which are potentially toxic; but fortunately most things taken by children are of low toxicity. This article concerns the acute ingestion of substances known to be of very low toxicity, which, if eaten, are not expected to cause effects requiring hospitalisation. It is important to emphasise that the information relates only to acute exposures, not repeated ingestions, and only to ingestion. Some of these substances may be harmful by another route (for example, in the eye, or by inhalation) but these effects are not considered here.

ACUTE INGESTION OUTCOME

Acute ingestion by a child of the substances described here is unlikely to result in toxicity, even if a large quantity has been taken. Minor discomfort such as irritation to the mouth, nausea, and possibly vomiting and/or diarrhoea may occur. These effects are likely to be self-limiting. Management involves no more than giving a glass of milk or water. For the vast majority of exposures to these substances there will be few effects, and therefore attendance at and observation in hospital are not required. Carers should be reassured that toxicity is unlikely, and advised to attend hospital only if severe or unexpected effects develop. Detergent-containing products carry a very small risk in that they may produce foam which could be aspirated into the lungs leading to the development of an aspiration pneumonia. In practice this is very rare, but if aspiration is suspected (for example coughing or breathing difficulties are noted) the lung sounds should be checked. If any abnormalities are present a chest X-ray should be performed, with supportive management as required. In the unlikely event of severe gastrointestinal effects, fluid loss and electrolyte imbalance may develop which should be corrected as usual.

Substances of low toxicity can be divided in convenient groups which are outlined below.

HOUSEHOLD CLEANERS

Many household cleaners are simple detergent products, described on the label as anionic and/or non-ionic surfactants. Examples include hand dishwashing liquid (not liquids for machine dishwashing, which are much more irritant and some are corrosive), fabric washing products (liquids, powders, tablets or liquid-filled capsules), fabric conditioners and carpet cleaners. The label on the containers of these products will not have an orange square warning symbol. The ingredient list on a container may also mention Bitrex®. Bitrex is not an active ingredient, but a very bitter substance added to many products to discourage ingestion. Bitrex is of low toxicity in the concentrations found in commercial products (Rodgers and Tenenbein 1994). Anionic and non-ionic surfactants are irritant to the gastrointestinal tract and can cause diarrhoea and vomiting, with a risk of foam aspiration, as mentioned above.

PAPER, PENS AND RELATED ITEMS

Older children often chew the end of their pens and consequently may find themselves with an ink-stained mouth. Fortunately, ball point pens, felt-tip pens and gel pens do not
Pencil ‘leads’ are made from graphite, not lead. Graphite is a form of carbon, as are activated charcoal and diamonds, and is not toxic by ingestion. There is absolutely no risk of a child developing lead toxicity from swallowing a pencil lead.

Wax crayons contain wax and pigments. Products from the UK will not result in toxicity. Lead poisoning has been reported in a child in America following chronic ingestion of crayons imported from China (Wilks et al 1994), because of the presence of lead in the pigment. If the crayons are a reputable brand, for example Crayola®, Early Learning Centre®, and designed for children they will not be hazardous. If a large amount has been ingested there is a theoretical risk of obstruction.

Chalk is mainly calcium carbonate, an insoluble calcium salt (also found in some antacids). Acute ingestion may cause some gastrointestinal disturbances, but other effects such as hypercalcaemia would not be expected. Lead toxicity in a child has been reported from chronic ingestion of snooker cue chalk (Dargan et al 2000).

Paper. All types of paper are non-toxic, though people are often concerned as the dye may stain the child’s hands, face and mouth; this is a particular problem with crepe paper. However, the quantity of dye is small and no clinical effects would be expected from eating paper.

Blu Tack® and similar adhesive ‘gums’ are not toxic, and can be considered as a foreign body.

Do-it-yourself products

Emulsion paints are water-based. Examples include vinyl silk emulsion and matt emulsion. These paints are used to paint interior walls and ceilings, and are of very low toxicity. Ingestion may cause mild vomiting. Beware of gloss paint, which may be white spirit based and potentially toxic. A useful guide is to check the instructions for cleaning the brushes given on the paint tin. If brushes are to be cleaned in water then the paint is water-based and hence of low toxicity.

PVA (polyvinyl acetate) glue is used in some children’s glues, and as a wood glue or primer when mixed with water-based paints. It is a water-based glue, and so does not smell ‘solventy’. It is of very low toxicity, and ingestion would not be expected to cause problems.

Superglues do not contain solvents, but are composed of alkyl (usually methyl and ethyl) esters of cyanoacrylic acid, usually described on the label as cyanoacrylates. Effects other than adhesion to mucous membranes or teeth are unlikely. Saliva will remove solidified glue within 12-48 hours. Gentle use of a toothbrush may hasten the process. Rarely, the mouth may be glued shut, but application of swabs soaked in normal saline for at least 30 minutes may facilitate removal of glue (Cousin 1990). If superglue is swallowed it is a foreign body and will not result in toxicity.

Wallpaper paste contains starches (for example potato starch derivatives), polyvinyl acetate (PVA, see above), fungicides (to inhibit mould growth, often captan or a triazine), and water (in ready-to-use pastes). The fungicides are of low human toxicity, and potato starch derivatives are, as the name suggests, derived from potatoes, so are not toxic.

Wallpaper stripper is composed of detergents in a water solution, and is similar to washing-up liquid. It is therefore of low toxicity from ingestion, although there may be a risk of aspiration if the product foams. It is important to differentiate wallpaper stripper from paint stripper as this usually contains toxic chemicals such as sodium hydroxide, dichloromethane, and sometimes methanol.

Putty, used to fix window panes in place, contains a mixture of chalk with linseed oil, and possibly pigments. As stated above, chalk is of low toxicity. The linseed oil may have a laxative effective.

In the garden

Earth, soil and compost are not inherently toxic, but there may be a risk of bacterial or
parasitic infection. Garden creatures such as slugs, snails, worms, woodlice and tadpoles are not toxic from ingestion.

PLANTS
There are many plants that are of low toxicity, although as most of these are non-food plants ingestion may result in gastric upset. Box 1 lists the plants about which the National Poisons Information Service receives the most enquiries, and which you are probably most likely to encounter. The list is not exhaustive, and there are other more rarely encountered plants of low toxicity. All parts of the plants listed here are of low toxicity, including the berries, leaves and flowers.

Part of the difficulty in dealing with plant ingestions is the problem of identifying the plant involved, this is not something that can be done safely over the telephone. Staff at the Royal Botanic Gardens, Kew, and the National Poisons Information Service (London) have collaborated to produce a CD-ROM to tackle this problem. If you have part of the plant in A&E, you can work through a series of questions, with illustrations to help you, until you are left with five or fewer ‘suspect’ plants. At that point you can look at photographs of these suspects to confirm identification. Alternatively, if the plant material is from a named plant, you can go directly to photographs of that plant to confirm this. The CD-ROM Poisonous Plants in Britain and Ireland costs £39.95; for details contact Kew Scientific Publishing Sales on 020 8332 5219 or fax 020 8332 5646.

PLANT FOOD
Cut flower food, the sachet of white powder sometimes present when you buy a bunch of flowers, is mainly sugar, typically 95 per cent. The remainder may include citric acid, biocides and salts. Ingestion of cut flower food is not expected to result in any clinical effects. Accidental ingestion of houseplant food, for example Phostrogen®, is unlikely to cause more than mild gastrointestinal irritation.

ANIMAL FEED PRODUCTS
Fish food is generally cereal. Birdseed contains protein, fibre and often vitamins. Cat and dog food contain meat and meat-related products, as well as vitamins. However, the quantity of vitamins in these foods is too small to be of concern.

COSMETICS AND TOILETRIES
Solid cosmetics, such as lipstick, eye shadow or blusher, are not toxic and are likely only to cause gastric upset if ingested. Moisturising creams and lotions may have a laxative effect if ingested, but other effects are unlikely. Consumption of stick and cream deodorants

Children...are keen to explore their environment
may cause gastric upset but toxicity is not expected from the small volumes available in these containers.

**Nail glue**, for fixing artificial nails, contains cyanoacrylates; ingestions should be managed as for superglue (see above).

**Toiletries containing detergents**, including shampoo, hair conditioner, shower gel, bubble bath and liquid soap, are of low systemic toxicity. The detergents used in these products are usually anionic surfactants, such as sodium laureth sulphate and may cause mild irritation. The only complication from ingestion of detergent-containing toiletries is the possibility of foam aspiration if the product foams. Some toiletry ranges are promoted as aromatherapy products containing essential oils. Pure essential oils can be toxic from ingestion, but when used in a product such as a shower gel they are only present in a very low concentration. The essential oil content in these products would not be expected to affect the toxicity. It should be noted, however, that medicated shampoos e.g. for head lice, may contain ingredients that could cause toxicity from ingestion of the shampoo, and are therefore not considered as low toxicity products.

**Baby products**

**Nappy rash creams**, such as Sudocrem®, contain zinc oxide which is of low toxicity, but may cause mild gastrointestinal irritation. Baby oil contains mineral oil, and is likely to lead to diarrhoea if ingested.

**Baby wipes** contain mineral oils and emollients, but should not contain alcohol. Ingestion of the liquid may cause diarrhoea but other effects are not expected. The wipe itself is a foreign body.

**Nappies** contain soft polypropylene inner and outer layers, and polymer beads that expand on wetting. The beads are combined with cellulose to distribute fluid throughout the nappy. The polymer beads are often sodium polyacrylate, which can absorb up to 100 times its weight in fluid, including urine. Children may get hold of new or soiled nappies and eat the nappy itself, with the contents if it is soiled. Neither the nappy nor its contents are toxic from ingestion. Ingestion of a very large amount of nappy could cause obstruction, but this is rare.

**Medicinal products**

**Female sex hormones** are available in oral contraceptives (an oestrogen and a progestogen in the combined oral contraceptives, just progestogen in the progestogen-only or mini-pill), and in hormone replacement therapy (HRT) preparations. Some preparations may also have ‘inactive’ tablets for hormone-free days. The hormones used are derived from endogenous hormones, and those found in products available in the UK are listed in Box 2. Other synthetic oestrogens and progestogens may be used in HRT patches, and although these are rarely ingested, the advice would be the same as for tablets. Ingestion of even several packets of female sex hormones by a child is unlikely to cause more than vomiting, although in girls there is the slight possibility of a vaginal bleed after one to three days.
Folic acid is not acutely toxic by ingestion and clinical effects would not be expected. Water-soluble vitamins, including Vitamin C (ascorbic acid), Vitamin B1 (thiamine) and Vitamin B12 (cyanocobalamin) are not acutely toxic by ingestion, however, a large quantity of Vitamin C may result in diarrhoea. It is good practice to check that the preparation involved does not contain iron, which can cause serious toxicity in overdose. Iron is often perceived as non-toxic and ‘good for you’ and many people do not realise the potential severity of iron overdose. Evening primrose oil is extracted from the seeds of the plant *Oenothera biennis*. Its main constituent is the fatty acid gamma linolenic acid, which is converted in the body to prostaglandin E1. The only effect likely from acute ingestion is diarrhoea.

**Box 2. Oestrogens and progestogens used in the UK in oral contraceptives and oral hormone replacement therapy preparations**

<table>
<thead>
<tr>
<th>PROGESTOGENS</th>
<th>OESTROGENS</th>
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<tbody>
<tr>
<td>Norethisterone/norethisterone acetate (COC, POP, HRT)</td>
<td>Ethinylestradiol (COC)</td>
</tr>
<tr>
<td>Levonorgestrel (COC, POP, HRT)</td>
<td>Mestranol (COC)</td>
</tr>
<tr>
<td>Norgestrel (POP, HRT)</td>
<td>Conjugated equine oestrogens (HRT)</td>
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<tr>
<td>Etynodiol diacetate (POP)</td>
<td>Estradiol/estriadiol valerate (HRT)</td>
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<tr>
<td>Desogestrel (COC)</td>
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<tr>
<td>Gestodene (COC)</td>
<td></td>
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<tr>
<td>Norgestimate (COC)</td>
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<tr>
<td>Medroxyprogesterone acetate (HRT)</td>
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<tr>
<td>Dydrogesterone (HRT)</td>
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<td>Estriol (HRT)</td>
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<td>Estrone (HRT)</td>
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<td>Estropipate (HRT)</td>
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Key: COC combined oral contraceptive; POP progestogen-only pill; HRT hormone replacement therapy

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Evening primrose oil is extracted from the seeds of the plant *Oenothera biennis*. Its main constituent is the fatty acid gamma linolenic acid, which is converted in the body to prostaglandin E1. The only effect likely from acute ingestion is diarrhoea.

Emollient creams, such as E45®, petroleum jelly and aqueous cream, may have a laxative effect if ingested. Calamine lotion, sometimes ingested by adults in mistake for kaolin and morphine, or accidentally given to children instead of applied to their skin, is irritant to the gastro-intestinal tract and may produce vomiting and diarrhoea. The same applies to zinc oxide creams or lotions.

Steroid creams ingestion of steroid creams containing, for example, hydrocortisone, would be expected to cause mild vomiting and diarrhoea only. Although steroids can cause toxicity from chronic use, acutely they are of very low toxicity.

Miscellaneous substances

Mercury Some readers might be surprised to discover that ingestion of mercury from a thermometer is not expected to cause mercury toxicity. In a thermometer, mercury is in its metallic form – the silvery liquid – and this type of mercury ( unlike organic or inorganic mercury salts) is very poorly absorbed via the gut. The mercury simply passes through the gut. There is a risk of physical damage from the cut glass.

Silica gel is contained in sachets and is typically found in new handbags or trainers, or packed with cameras. Silica gel is used as a desiccant, that is to keep moisture away from the product. The sachet often looks similar to a sachet of sugar, but may have a picture of a skull and crossbones or be labelled ‘Do not eat’. This is not because silica gel is harmful, but because it is not a foodstuff and therefore is not edible. The crystals are completely inert and no adverse effects are expected to occur from ingestion.

Coal is carbon, and is completely inert. Ingestion of artificial coal is also not expected to cause toxicity.

Candles are made of wax, and ingestion may have a laxative effect. Consumption of a large quantity may result in obstruction.

Matches comprise a stick of wood with a head containing potassium chlorate, colouring and abrasives. In safety matches the side of the matchbox is coated with red phosphorus and an abrasive, and when the match is rubbed against this ignition occurs due to a chemical reaction between the two substances (potassium chlorate is an oxidiser and red phosphorus is a reducer). Potassium chlorate is a potentially toxic chemical, but is present in only very small quantities in a match head, so matches (both safety and ordinary) are not considered to be toxic.

Ice-packs are blocks, often blue, used to help keep food and drink cool when in a cool box...
or cool bag. The blocks are frozen before use, then put into the cool box/bag when required. The fluid in these ice-packs is usually methylcellulose. If the block leaks or breaks and the fluid is ingested, it may have a laxative effect.

**GLOW STICKS** During the summer at music festivals, and at the beginning of November at Guy Fawkes celebrations ‘glow sticks’ are a common sight. These plastic tubes glow in the dark, and are available in other forms such as necklaces. The liquid inside the tube contains alkyl phthalates, which are irritant chemicals. Children often manage to break into the tubes and ingest some of the contents. Ingestion of the liquid may cause irritation in the mouth, vomiting and diarrhoea, but severe effects are not expected.

**EXPANDED POLYSTYRENE,** used as protective packaging and for cups in fast-food outlets, is inert and can be considered as a foreign body; this is also true for other types of plastic, such as plastic sweet wrappers and lumps of plastic broken from toys.

**PLASTICINE®** is a foreign body, but is of very low toxicity from ingestion.

**ARTIFICIAL SWEETENERS** Following acute ingestion of even large quantities of artificial sweeteners, mild gastric irritation is the only likely effect.

**CHEWING GUM/BUBBLE GUM,** contrary to what we were told as children, are not harmful if you swallow them. The National Poisons Information Service (London) still receives enquiries about children swallowing them, but even if several sticks are eaten there is no risk of toxicity, and treatment should be as for a foreign body ingestion.

**CONCLUSION**

Many of the substances that children ingest acutely are of low toxicity so observation in hospital is not usually required even following ingestion of large amounts (see summary, Box 3). The most likely effects are self-limiting gastrointestinal disturbances, and the most appropriate management following ingestion is to give a oral fluids. Detergent-containing products, such as some toiletries and household cleaners, may foam with the potential for foam aspiration, however in practice this is rare. Carers of children who have ingested the substances outlined here should be reassured and warned of the possible effects. They should be informed that further medical advice is only necessary if unexpected or severe effects develop, or if there are signs of foam aspiration, however in practice this is rare. A poster listing the substances described in this article is available free of charge to health professionals from the National Poisons Information Service (London).

A new edition will be available in the autumn.

### References


