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What's new in toxicology?

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Poisoning in children causes great anxiety in parents and health professionals alike.

Most cases of poisoning involve a child aged 1 - 2 years who has swallowed a small amount of one substance. In adolescence there is a second peak, due to deliberate self-poisoning. This usually involves large quantities of medicines, recreational drugs and ethanol, often taken together.

Accurate data on poisoning are hard to collect and scarce in South Africa. Extrapolation from available figures[1,2] suggests that 200 000 - 300 000 child poisoning incidents occur annually in the country. Less than 1% are fatal. Globally, accidental poisoning causes about 4% of all childhood deaths due to injury.[3] In developing countries the figure is likely to be higher.

Why the evidence base is poor

In toxicology, reliable evidence on which to base decisions is hard to find. Poisoned patients are a mixed group who often have unreliable histories and may have been exposed to many toxins. It is difficult to collect large case series of exposure to similar toxins to yield reliable data with regard to complications or mortality. Randomised comparisons between management regimens need many subjects who have been exposed to the same substance – therefore this is seldom feasible. Hard end-points for comparing treatments, such as death, are rare; consequently, surrogate markers, such as length of hospital stay or administering an antidote, are often used. In some areas, enough evidence has led to changes in treatment.

Gut decontamination

There has been a marked shift away from active gut decontamination, such as induction of vomiting, gastric lavage or administering activated charcoal; more emphasis is now placed on supportive care. In 1997, the combined American and European Academies of Clinical Toxicologists published new guidelines.[4] These emphasise that patients can be managed successfully without aggressive gut decontamination. Emptying the stomach is no longer a routine part of the treatment of poisoning and is currently almost never used in children.

No technique of gut decontamination is risk free and it should be reserved for potentially life-threatening doses and dangerous toxins. Any form of gut decontamination may be unnecessary if the patient has vomited the toxin spontaneously within minutes of taking it. Timing is crucial. Gastric lavage has little effect unless done within an hour of ingestion of the substance. It is invasive and often causes vomiting and, sometimes, aspiration. Before initiating gastric lavage, children have to be sedated and an endotracheal tube has to be inserted.

Activated charcoal reduces the absorption of many organic molecules, but it must be given within one hour to have a significant effect. It is much safer than induction of vomiting or lavage, but does not bind hydrocarbons, such as paraffin, alcohols or metals. It is not used when caustic agents have been ingested, because it may cause vomiting, which is particularly dangerous in such cases, and because it makes endoscopy difficult.

Common childhood poisonings

Most of the agents involved in childhood poisonings are medicines, with antidepressants and analgesics being the most common. Exposure to pesticides and household cleaning agents are increasingly seen. In South Africa, paraffin (kerosene) remains the single most frequent substance in childhood poisoning.[2]

Even though the list of 'one pill can kill' drugs[5] is not new, it is given below:

- oral hypoglycaemics
- beta-blockers
- calcium channel blockers
- tricyclic antidepressants
- alpha adrenergics, such as clonidine and imidazolines
- chloroquine
- opioids, including loperamide/diphenoxylate (Lomotil and Imodium)
- salicylates.

Paraffin

Paraffin causes a chemical pneumonitis due to aspiration, either during ingestion, after vomiting, or silently. These children present with tachypnoea and an inflammatory response, causing a fever and raised white cell count. Chest X-ray findings do not correlate well with clinical signs; therefore management must be based on clinical features. Treatment is usually simple and brief, with supplemental oxygen being the mainstay of supportive care. Gastrointestinal decontamination and activated charcoal are contraindicated. A recent study[6] has shown that prophylactic antibiotics do not alter the outcome and therefore must be reserved for cases of suspected secondary bacterial infection 48 hours after ingestion.

Pesticides

In South African cities there has been a recent upsurge in poisonings from pesticides bought from illegal street vendors. These are often highly toxic organophosphates or carbamates for controlled agricultural use, but sold illegally as cockroach or rat poisons. They are unlabelled and highly dangerous.[7]

Clinicians are familiar with the features of cholinergic stimulation arising from organophosphate poisoning, which can be reversed with atropine. A recent study[8] has highlighted the prevalence of poisoning with amitraz, which is often used as a tick dip for livestock. It gives a similar clinical picture to organophosphate poisoning, but without sweating, excessive secretions, urinary and faecal incontinence or muscle fasciculations. Treatment is symptomatic and supportive.

Paracetamol

Paracetamol poisoning is common. Toxic effects occur when the amount taken exceeds the liver's capacity to metabolise the hepatotoxic metabolite. Poisoning may be from a single dose, but attention has recently focused on the dangers of repeated high doses, given over a number of days, to control pain or fever: so-called repeated supratherapeutic ingestion. This pattern of ingestion is particularly dangerous in adults and children over the age of 6 years with chronic liver disease, malnutrition, and HIV, and in users of enzyme-inducing drugs (e.g. carbamazepine, phenytoin, rifampicin).

The decision to give the very effective antidote N-acetylcysteine (NAC) is based on a serum paracetamol level measured 4 hours after the ingestion of solid preparations (2 hours after liquid preparations) and plotted on a treatment nomogram. Clinicians who are familiar with the double parallel line Rumack-Matthew nomogram will be pleased to know that it has been simplified to a single curved line devised by a consensus panel of Australasian toxicologists.[9]

Corrosives

Corrosive household products such as bleaches and drain cleaners can cause significant injury. A recently highlighted concern relates to the use of 'laundry pods' – packages of detergent intended for one cycle of a washing machine or dishwasher, often highly coloured and resembling a large sweetie. Several incidents of serious poisoning have been reported.[10]

Poison information

Clinicians who need help and advice on treating poisoning can phone a Poison Centre (see the list below) or access the UCT Poisons Information System (recently rebranded as AfriTox), available in the Emergency Units of many hospitals countrywide. Doctors can access AfriTox directly on computers or smart phones and obtain information on the toxicity of chemicals, medicines, commercial products and poisonous plants and animals, what symptoms or signs to expect, and view detailed treatment protocols.

- Red Cross Children's Hospital Poisons Information Centre, tel. (021) 689-5227
- Tygerberg Poisons Information Centre, tel. (021) 931-6129
- Information on subscribing to AfriTox by e-mail: poisonsinformation@uct.ac.za

Summary

- It is estimated that 200 000 - 300 000 child poisoning incidents occur annually in South Africa. Most cases involve a child less than 2 years of age who has swallowed a small amount of one substance. Clinicians should be aware of the 'one pill can kill' medicines.
- Emptying the stomach is no longer a routine part of treating poisoning and is currently almost never used in children. In life-threatening poisonings, activated charcoal is safer than emesis or lavage, but is usually only effective if given within one hour of ingestion.
- Paraffin ingestion is still common in children. Treatment is based on clinical features rather than the chest radiograph. Activated charcoal is contraindicated and prophylactic antibiotics do not alter the outcome.
- Unlabelled rat and cockroach poisons sold on the streets contain highly toxic organophosphates and carbamates. Poisoning with amitraz may present similarly to organophosphates, but is treated symptomatically.
- Liver damage may follow repeated doses of paracetamol given over days to treat fever at slightly above the recommended dose or at shortened intervals.
- Information on the treatment of poisoning is available on the telephone from poisons centres or by accessing the web-based AfriTox Poisons Information System.

References available at www.cmej.org.za

References

1. Matzopoulos R, Carolissen G. Estimating the incidence of paraffin ingestion. African Safety Promotion: a Journal of Injury and Violence Prevention 2006;3:4-14.
2. Balme K, Roberts JC, Glasstone M, Curling L, Mann MD. The changing trends of childhood poisoning at a tertiary children's hospital in South Africa. S Afr Med J 2012;102:142-146.
3. World Health Organization (WHO)/ UNICEF. World Report on Child Injury Prevention, 2008. http://whqlibdoc.who.int/publications/2008/9789241563574_eng.pdf (accessed 14 December 2012).
4. American Academy of Clinical Toxicology; European Association of Poisons Centres and Clinical Toxicologists. Position statements: ipecac syrup, gastric lavage, single dose activated charcoal, cathartics. J Toxicol Clin Toxicol 1997;35:699-752.
5. Michael JB, Sztajnkrycer MD. Deadly pediatric poisons: nine common agents that kill at low doses. Emerg Med Clin NA 2004;22(4):1019-1050.
6. Balme KH, Zar HJ, Mann MD. The efficacy of prophylactic antibiotics in the management of pneumonitis following paraffin (kerosene) ingestion in children. Unpublished thesis, University of Cape Town.
7. Balme KH, Roberts JC, Glasstone M, et al. Pesticide poisonings at a tertiary children's hospital in South Africa: an increasing problem. Clin Toxicol (Phila) 2010;48:928-934.
8. Veale DJ, Wium CA, Muller GJ. Amitraz poisoning in South Africa: A two year survey (2008 - 2009). Clin Toxicol (Phila) 2011;49:40-43.
9. Daly FFS, Fountain JS, Murray L, Graudins A, Buckley NA, Panel of Australian and New Zealand clinical toxicologists. Guidelines for the management of paracetamol poisoning in Australia and New Zealand – explanation and elaboration. A consensus statement from clinical toxicologists consulting to the Australasian poisons information centres. Med J Aust 2008;188(5):296-301.
10. Schaman EJ. Liquid laundry pods: a missed global toxicosurveillance opportunity. Clin Toxicol (Phila) 2012;50(8):725-726.