Poisoning — an overview of treatment

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Poisoning, either accidental or intentional, is a common cause of attendance at accident and emergency departments. This article describes the general management of poisoned patients the role of the pharmacist.

Poisoning is a common cause of attendance at accident and emergency departments and resulted in over 100,000 admissions to hospitals in England in 2004/05.¹ Over 65 per cent of enquiries to poisons units involve drugs.²

The treatment of a poisoned patient will depend on a variety of factors, such as the identity of the poison involved (if this is known) and the timing and extent of its absorption. Some sources of information on the toxicity of agents and how to manage incidences of poisoning are set out in Panel 1(p8).

--- General treatment

The mainstay of management for poisoned patients is providing symptomatic and supportive care. Antidotes for specific poisoning agents will also be used where appropriate. As for any seriously ill patient, a systematic and thorough approach to treatment is required, including the following aspects of care:

- Initial “ABC” (airway, breathing, circulation) assessment and resuscitation if necessary
- A secondary survey for infection or trauma (of the head and cervical spine if a patient’s mental status is abnormal) and metabolic derangements
- Supportive care with continuous assessment and monitoring
- Case-specific management such as preventing further absorption, using antidotes or enhancing the elimination of the toxic agent

Because of the serious nature of some poisonings, early treatment and supportive care may often proceed without extensive investigations being carried out or an apparent diagnosis being made. Attention must be given to assessing a patient’s vital signs and to providing immediate treatment of life-threatening conditions such as hypotension, hypertension, bradycardia, tachycardia, cardiac arrhythmias, hyperthermia, hypothermia and respiratory depression.

Arrhythmias and conduction defects require cardiac monitoring and prompt treatment. Arterial blood gas measurements can be useful to assess ventilation and oxygenation and also to identify metabolic derangements (eg, metabolic acidosis caused by toxic alcohols such as ethylene glycol or in salicylate poisoning). Where appropriate, blood samples should be sent for a full blood count, and to measure hepatic and renal function, electrolytes and blood glucose (relevant if a patient has collapsed or is confused). Additionally, in suicidal patients, it is prudent to check plasma concentrations of paracetamol, as well as those of other medicines suggested by the patient’s drug history (eg, salicylate, iron, lithium, digoxin).³

After resuscitation and stabilisation, attention can turn to identifying the agents ingested using data from the history and physical examination. Although it is unlikely that a single abnormality detected on examination will help differentiate poisoning from other causes of illness, or indicate a specific toxin, a cluster of symptoms and signs in the same patient, known as a toxidrome, may be of considerable value in helping to identify a toxic agent. For example, an opioid toxidrome is characterised by impaired consciousness and, although a number of agents are associated with depressed consciousness, when this symptom is coupled with pinpoint pupils, hypotension and respiratory depression, opioid poisoning is the most likely cause. The anticholinergic toxidrome (found with poisoning from drugs such as tricyclic antidepressants and antihistamines) includes tachycardia, dilated pupils, dry, warm skin, dry mucous membranes and urinary retention. Conversely, the cholinergic toxidrome, found after exposure to organophosphate and carbamate insecticides or nerve agents, includes salivation, lacrimation, urinary and faecal incontinence, emesis, abdominal pain, diaphoresis and small pupils. Assessing patients symptoms in the light of known toxidromes can therefore

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help identify the likely toxic agent and its subsequent effects, whether evident or expected.

**Gut decontamination** There is no evidence that inducing vomiting with syrup of ipecacuanha (or “ipecac”) or performing a gastric lavage (ie, stomach washout), has any sent. MDAC has also been used for provided a patient’s bowel sounds are pre-

activated charcoal (MDAC) may be used, except for metals (eg, iron and lithium), acids because it prevents the ionised drug from the body. These will generally take place in an intensive care unit.

Activated charcoal (AC) acts by adsorbing ingested substances and preventing their absorption from the gut into the systemic circulation. It is generally most effective if administered within one, or perhaps two, hours of ingestion. For overdoses of drugs that enter the enterohepatic circulation, such as carbamazepine, phenobarbitone, theo-

phylline, quinine or dapsone, multiple doses of AC may be given more frequently if necessary. There are a variety of AC preparations available, including a sweetened version, but unfortunately none is able to prevent AC being a particularly unpleasant substance to drink. This makes its use, especially in paediatrics, difficult. It is best to avoid mixing AC with food, such as ice cream, to try to improve its palatability as this can reduce its adsorbent capacity. AC has a good adsorptive capacity for most drugs and chemicals, except for metals (eg, iron and lithium), acids because it prevents the ionised drug being reabsorbed in the renal tubules. It is most commonly used in patients with moderate to severe aspirin poisoning. In adults, the dose of sodium bicarbonate used is usually 1L of isotonic fluid (ie, 1.26 per cent or 1.4 per cent) given intravenously over four hours. Alternatively, 50mL boluses of hypertonic (8.4 per cent) sodium bicarbonate can be given, but this should ideally be adminis-

tered via a central line, given the irritant nature of this preparation. In practice, a combi-

nation of the two regimens is often necessary to achieve adequate urinary alka-

linisation. The bicarbonate dose, regimen and dose-timing should be titrated to

**Panel 1: Some sources of information about poisons**

- Poisons unit — such as the Guy’s and St Thomas’ Poisons Unit on 0870 243 2241
- TOXBASE — an internet database, available at [www.spib.axl.co.uk](http://www.spib.axl.co.uk)

overdoses of sustained release preparations. The main risk with AC is aspiration if a patient has an unprotected airway. If this occurs, administration of AC via a nasogas-

tric tube, after the patient has been intubated, is indicated.

The usual dose of AC is 50g in adults and 1g/kg body weight for children under 12 years. When using MDAC, these doses are repeated four hourly, although smaller doses may be given more frequently if necessary. There are a variety of AC preparations avail-

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Enhanced elimination of toxins Severely poisoned patients are likely to require meth-

ods to increase the elimination of the toxin from the body. These will generally take place in an intensive care unit.

Urinary alkalinisation with sodium bicar-

bonate can increase the elimination of weak acids because it prevents the ionised drug being reabsorbed in the renal tubules. It is most commonly used in patients with moderate to severe aspirin poisoning. In adults, the dose of sodium bicarbonate used is usually 1L of isotonic fluid (ie, 1.26 per cent or 1.4 per cent) given intravenously over four hours. Alternatively, 50mL boluses of hypertonic (8.4 per cent) sodium bicarbonate can be given, but this should ideally be adminis-

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**Panel 2: Core aspects of safe medicine use**

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<th>Core aspect</th>
<th>Outcome</th>
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| Patient information  | Reduction of unintentional overdoses | ■ Ensure patients understand the dose of medicines and the maximum daily dose, especially for certain analgesics  
  ■ Advise patients to review the contents of their home medicines cupboards |
| Product storage      | Safe use and storage of medicines     | ■ Advise patients to dispose of expired and unused medicines via their community pharmacy 
  ■ Advise patients about the safe storage of medicines and hazardous substances (eg, caustics) — keep out of reach of children and in original containers  
  ■ Use child-resistant packs (eg, reducing methadone overdose in children)  
  ■ Reinforce warnings to store medicines prone to harmful degradation in the refrigerator (eg, some liquid antibiotics) |
| Clinical pharmacy    | An accurate drug history and         | ■ Ensure prompt identification of tablets and constituent ingredients 
  appropriate treatment of overdose Safe and effective use of drugs with a narrow therapeutic index |
| Strategic planning   | Co-ordination of antidote stocks     | ■ Avoid gentamicin toxicity by increasing dosing intervals for patients with renal failure 
  Major incident plan incorporates antidotes |
| Product changes      | Reduction in the number and          | ■ Review antidotes held for chemical, biological, radiological and nuclear incidents 
  complexity of overdoses Removal of counterfeit or contaminated products  
  Ensure quality of imported products |
| Quality control      |                                        | ■ Ensure effective departmental planning, including patient group directions |

Examples of how to achieve outcome
achieve a urine pH of 7.5–8.5. The urine pH should be checked at least hourly and patients should also have their blood gases monitored regularly to ensure that systemic alkalisation is not occurring. It is also important to monitor the serum potassium concentration closely and titrate potassium replacement accordingly — hypokalaemia will make it difficult to achieve alkalisation. Once alkalisation is achieved, the serum potassium is likely to fall in response to an increase in urinary potassium excretion.

Extracorporeal procedures such as haemodialysis and haemoperfusion are only used in patients who have been severely poisoned with a limited subset of drugs and chemicals — treatment of such patients should always be discussed with a poisons unit. Haemodialysis may be required in patients with severe aspirin, lithium, ethylene glycol or methanol poisoning. There are limited data on the use of haemofiltration as a method for toxin removal in the poisoned patient, but it may be required in patients with renal failure or a severe metabolic acidosis. Charcoal haemoperfusion may be used in patients with severe theophylline or carbamazepine poisoning, although drug clearance is similar to that with MDAC and so haemoperfusion is generally reserved for patients with life-threatening toxicity.

Antidotes Antidotes will be discussed in more detail in the next article in this special feature (p10). Some general aspects of antidote use include the importance of documenting a patient’s weight to ensure that a correct dose is used for dose-adjusted treatments such as N-acetylcysteine for paracetamol poisoning. Studies have shown that clinicians are poor at estimating patient’s body weight.14 A chart is available to support health care staff in the prescribing and administration of N-acetylcysteine.15

In addition, prescriptions for antidotes should be written using generic names, which helps avoid errors such as Parvolex (acetylcysteine) being read as Pabrinex (thiamine).

### Role of pharmacists

Pharmacists have a key role in ensuring the timely availability of any antidote that might be indicated and giving advice on treatment regimens and possible complications. Guidelines have recently been produced by the British Association of Emergency Medicine (BAEM) and the Guy’s and St Thomas’ Poisons Unit, which group the availability of antidotes by the urgency of clinical need.13 The antidotes held at each health care facility should be assessed to ensure that stock levels are appropriate when taking into account the epidemiology of poisoning in their local area. Regular expiry date checks should be carried out. The “Rarely used medicines” database run by London, Eastern and South East Specialist Pharmacy Services is a resource supporting pharmacy staff to obtain medicines quickly and easily, including antidotes, that are only stocked in small numbers of trusts across the area.14 There is also scope strategically to plan and rationalise antidote availability at a national level.

Pharmacists working in emergency care need to be familiar with the management of common poisonings such as those caused by overdoses of paracetamol, antidepressants and hypnotics (eg, benzodiazepines). Key aspects of good patient management include:

- Establishing a patient’s drug history from his or her medical notes, or from the patient (if appropriate), including over-the-counter medicines
- Ensuring the appropriate prescribing of, and availability of, antidotes
- Providing patient information
- Supporting the continuity of medicine supply on discharge, where appropriate

Assisting medical teams in identifying the constituent ingredients of poisonous products and unidentified medicines is another main role for pharmacists. The TICTAC database is a useful resource for the latter.15

Importantly, pharmacists have a key role in preventing unintentional drug poisoning. Panel 2 (p8) shows the core aspects of safe medicine use that should be adhered to help prevent poisoning. Case studies highlighting the need to provide clear patient information on the safe and appropriate use of medicines are set out in Panel 3.

### References

2. Annual report, Guy’s and St Thomas’ Poisons Unit. Available at www.medtox.org/info/default.asp (accessed 5 December 2006).