

Poisoning

— antidotes and their use

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Treatment of poisoning mainly involves providing supportive care to the patient, although a number of antidotes are available for certain circumstances. This article, the second in a special feature, describes some of these antidotes and the circumstances in which they may be used



Intravenous infusion of N-acetylcysteine is the treatment of choice for patients with significant paracetamol poisoning

Antidotes play a crucial part in the management of certain poisons, but they are only available for a small number of drugs and chemicals. As pointed out in the previous article (p7), antidotes are only one aspect of the management of a poisoned patient.

Until recently, there were no nationally recognised guidelines for emergency departments on stocking antidotes or on how to access them. In June 2006 the British Association of Emergency Medicine (BAEM) produced the first such guidelines, in conjunction with Guy's & St Thomas' Poisons Unit. These guidelines help hospitals to ensure that appropriate antidotes are held in appropriate areas of the hospital, in sufficient quantities. In the guidelines agents are grouped into four categories depending on the urgency of clinical need. This may be:

- Immediate
- Within one hour
- Within four hours
- Not critically time dependent

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This article will describe the common difficulties encountered in the treatment of poisoning with widely used antidotes, as well as the use of novel or unlicensed drugs.

Paracetamol poisoning

Paracetamol is the most common drug taken in intentional overdose, and the most frequent cause of acute liver failure in the UK. The antidote of choice for significant paracetamol poisoning is intravenous N-acetylcysteine (NAC), often known by its UK trade name Parvolex. An evidence-based flowchart to guide the management of paracetamol poisoning has recently been produced.¹

If administered within the first eight hours of a non-staggered paracetamol overdose, ie, where all the tablets were taken at approximately the same time, NAC is almost 100 per cent effective in preventing paracetamol-related hepatotoxicity and nephrotoxicity. In early paracetamol poisoning (patients presenting within eight to 10 hours of overdose) NAC acts as a glutathione donor. Glutathione conjugates the toxic paracetamol metabolite N-acetyl-P-benzoquinoneimine in the liver, preventing hepatotoxicity. In late paracetamol poisoning the mechanism of action and efficacy of NAC is more controversial, but recent trials have demonstrated that it has some beneficial effect even in patients who present with established acute liver failure.²

In patients presenting with early poisoning the decision to treat with NAC is usually based on plasma concentration of paracetamol. This is a less useful indicator in later presenting patients (over 12–15 hours post-ingestion) but may still be used up to 24 hours post-ingestion. In these patients other factors such as the ingested dose, clinical examination and biochemical/ haematological tests can be used to determine the need for treatment.

More than one course of NAC may be required in patients who develop significant hepatotoxicity. The doses of NAC are shown in Panel 1 (p11).

Intravenous NAC is usually well tolerated, but is associated with a 5–30 per cent incidence of anaphylactoid reactions, most commonly seen during the first or second infusion bag. These reactions are generally mild with effects such as nausea, erythematous or urticarial rash, tachycardia and flushing. Severe systemic anaphylactic reactions (eg, angioedema, hypotension, bronchospasm) are very rare. The anaphylactoid reactions are dose-dependent so it is important that the patient is weighed in

BAEM antidote guidelines

The British Association for Emergency Medicine guidelines on antidote availability and treatment can be accessed at www.medtox.org/info

order to administer the correct dose of NAC. Anaphylactoid reactions are more likely to occur in asthmatic patients and in those who have ingested smaller quantities of paracetamol.³

A recent study suggests that giving the first infusion bag over 60 minutes rather than the usual 15 minutes makes no difference to the incidence of reactions.⁴ Most reactions are short-lived and settle if the infusion is stopped for 15–30 minutes — this is often all that is required. If symptoms persist, an antihistamine such as chlorpheniramine should be given. Once the reaction has settled, NAC should be restarted at the next stage of the infusion regimen.

The complex dosing regimen of NAC can lead to dosing errors. A recent study demonstrated that the administered dose often differs significantly from the intended dose⁵ and pharmacists have an important role in ensuring the dose is correct.

— Opioid poisoning

Naloxone is a widely used, generally well tolerated, competitive antagonist for opioid and opiate drugs such as morphine, heroin, codeine and methadone. It can be administered intramuscularly, intravenously, intranasally, or via an endotracheal tube. Ideally naloxone should be given by IV injection as this allows accurate titration of the dose required to restore adequate respiratory function, while avoiding precipitation of acute withdrawal. Naloxone is indicated in patients with opioid poisoning who have

significant drowsiness associated with respiratory compromise or hypoxia.

The dose required can be difficult to predict but in adults it is usual to start with 400µg, given in small IV boluses of 100–200µg every two to three minutes and titrated to achieve an improvement in the level of consciousness (a level of 13–14/15 on the Glasgow Coma Scale), respiratory rate/depth (rate over 10–12/min) and pulse oximetry oxygen saturations (over 92 per cent).⁶ The aim is to improve alertness rather than full arousal of a patient, which may precipitate withdrawal symptoms in addicts or early self-discharge. If given intramuscularly or subcutaneously naloxone has a much less predictable effect and these routes should be avoided unless there is no IV access.

Naloxone can be used as a diagnostic tool in unconscious patients where it is suspected that opioid poisoning may be contributing to central nervous system depression. If there is no response after a total dose of 10mg naloxone has been administered then other diagnoses should be considered. In children, the usual dose is 10µg/kg given as an IV bolus, increased every two to three minutes up to a maximum bolus dose of 100µg/kg.

Given the short duration of action of naloxone (20–90 minutes), compared with the long half-lives of many opioids (particularly oral agents such as methadone) an infusion or repeated doses of naloxone may be required. The hourly rate for a naloxone infusion is calculated as two thirds of the dose required to resuscitate the patient initially (ie, multiply the dose by 0.66). However, this rate may need to be adjusted according to the response. Naloxone is usually diluted in sufficient 5 per cent dextrose or normal saline to provide adequate fluid maintenance for the patient. Patients who have ingested long-acting opioids (eg, methadone or MST) may require naloxone infusions for 24–48 hours or more. Once the infusion has stopped patients should be observed for at least two hours to ensure that there is no further opioid toxicity.

Although naloxone is well tolerated, it may (rarely) precipitate opioid withdrawal in addicts, although but this is less likely if small boluses are titrated to clinical effect. Pulmonary oedema may be seen but this is more likely to be related to the opioid poisoning than to naloxone. Other adverse events are usually related to excessive doses of naloxone, particularly if high doses are administered rapidly.

— Benzodiazepine poisoning

Benzodiazepines, especially diazepam and temazepam, are commonly taken in self-harm attempts. The signs and symptoms of poisoning in lone benzodiazepine ingestion are usually mild and will resolve within 12–24 hours. More significant CNS, respira-

tory or cardiovascular depression may occur in patients who ingest other CNS depressants, including ethanol, and in the elderly or those with hypoxia due to conditions such as chronic obstructive pulmonary disease.

Flumazenil (Anexate) is a competitive benzodiazepine antagonist that acts at the GABA receptor. It is licensed for the complete or partial reversal of the sedative effects of benzodiazepines following anaesthesia or in intensive care. However, it is not recommended as a routine therapeutic or diagnostic agent in poisoned patients. It is contraindicated in mixed overdoses involving benzodiazepines and cardiotoxic or proconvulsant drugs, particularly tricyclic antidepressants, because of the risk of precipitating convulsions or arrhythmias.⁷ It is generally safer to provide supportive care, including airway or ventilatory support if required, until the benzodiazepine toxicity has resolved.

Flumazenil may be considered in patients where there is a high likelihood of lone benzodiazepine ingestion in whom airway or ventilatory support is being considered. In these circumstances flumazenil should be used in small, titrated incremental doses.

— Cyanide poisoning

Although deliberate exposure to cyanide is rarely seen in emergency departments, it may be encountered in work place accidents or as a product of combustion, along with carbon monoxide, in household fires. In these circumstances patients must be thoroughly decontaminated early in their treatment. In a hospital setting, cyanide poisoning may also be encountered as a side effect of sodium nitroprusside infusions.

Cyanide inhibits cellular respiration by binding reversibly to cytochrome oxidase, so its clinical features are due to tissue hypoxia. It is important to ensure that a patient exposed to cyanide receives oxygen as soon as possible. General supportive measures such as fluid resuscitation and correction of metabolic acidosis are also important. In addition, a variety of antidotes are available, which have been reviewed in detail in a World Health Organization International Programme on Chemical Safety (IPCS) monograph.⁸

Cyanide antidotes can broadly be divided into cobalt compounds (eg, dicobalt edetate, hydroxocobalamin), sulphur donors (eg, sodium thiosulphate) or methaemaglobinaemia formers (eg, sodium nitrite). The agent used depends on the severity of the exposure, which is most accurately assessed by blood cyanide concentration. In reality such a test is rarely available quickly enough to guide decision making, so treatment tends to be based on the clinical condition of the patient. In particular, the level of conscious-

Panel 1: N-acetylcysteine dosing

Adult The initial dose of N-acetylcysteine (NAC) is 150mg/kg body weight, given in 200ml 5 per cent dextrose, by slow intravenous infusion over 15 minutes. Following this, 50mg/kg in 500ml dextrose is administered over four hours. Finally, 100mg/kg in 1L dextrose is given over the next 16 hours.

Child (weighing over 20kg) Initially NAC 150mg/kg in 100ml dextrose is given by slow IV infusion over 15 minutes. Then 50mg/kg in 250ml dextrose is administered over four hours. Finally, 100mg/kg in 500ml dextrose is given over the next 16 hours.

Child (weighing less than 20kg) Initially NAC 150mg/kg in 3ml/kg dextrose is given by slow IV infusion over 15 minutes. Then 50mg/kg in 7ml/kg dextrose is administered over four hours. Finally 100mg/kg in 14ml/kg dextrose is given over the next 16 hours. Paracetamol poisoning is uncommon in young children.

Panel 2: Summary of the characteristics of cyanide toxicity and recommended antidotes

■ Severe toxicity

Symptoms: severe metabolic acidosis, coma, hypotension

Antidotes: oxygen, hydroxocobalamin (if available). Otherwise, dicobalt edetate may be used, but only if the diagnosis is certain, or sodium nitrite with sodium thiosulphate

■ Moderate toxicity

Symptoms: short-lived drowsiness, vomiting, mild metabolic acidosis

Antidotes: oxygen, sodium thiosulphate

■ Mild toxicity

Symptoms: asymptomatic or mild dizziness, nausea, no metabolic acidosis

Antidotes: none, unless clinical deterioration

ness, degree of lactic acidosis and presence of cardiovascular instability all need to be considered when deciding on the most appropriate management, as well as any pre-hospital use of an antidote (eg, in an ambulance).

Dicobalt edetate Dicobalt edetate is a cobalt compound which combines with cyanide to form the less toxic cobaltocyanide and cobaltcyanide ions. Dicobalt edetate is usually used only in patients with severe toxicity because there is a risk of serious adverse effects if it is given in the absence of cyanide or if it is injected too rapidly. These effects include bronchospasm, chest pain, tachycardia, hypotension, periorbital and upper airway oedema and convulsions.

The dose of dicobalt edetate is 20ml of a 1.5 per cent solution (ie, 300mg) given intravenously over one minute, followed immediately by 50ml of 50 per cent dextrose, which is thought to reduce the toxicity of the antidote. No more than two doses of dicobalt edetate should be used.

Hydroxocobalamin Another cobalt compound used in the treatment of cyanide poisoning is hydroxocobalamin (Cyanokit). It is unlicensed in the UK although widely used in France. The dose used to treat cyanide poisoning is 70mg/kg and therefore the 1mg/ml preparation used in pernicious anaemia is not suitable. In contrast to dicobalt edetate, this product is well tolerated (even in the absence of cyanide) with the most common side effects being orange-red discoloration of the skin, mucous membranes and urine.

Sodium nitrite The methaemoglobinemia (MetHb) inducing agent, sodium nitrite, may be used in cases of moderate to severe cyanide poisoning. MetHb combines with cyanide to form the inert compound cyanmethaemoglobin. Amyl nitrite acts in the same way and has been used as a pre-hospital first aid measure although this is no longer recommended. The dose of sodium nitrite used in cyanide poisoning is 10ml of a 3 per cent solution (ie, 300mg) given intravenously over five to 20 minutes, usually followed by sodium thiosulphate (see below). Adverse effects include headache, hypotension and the risk of excessive MetHb (which can be a problem in patients who already have tissue hypoxia related to their cyanide poisoning).

Sodium thiosulphate Sodium thiosulphate acts as a source of sulphane sulphur for conversion of cyanide to the less toxic thiocyanate. However, because this reaction is relatively slow and of low magnitude, this antidote is generally used in cases of moderate toxicity or as an adjunct to other agents in patients with severe poisoning. The dose of sodium thiosulphate is 50ml of a 25 per cent solution (ie, 12.5g) given intravenously over 10 minutes. It tends to cause minimal side effects.

Panel 2 outlines the characteristics of cyanide poisoning and the respective antidotes. The decision of which antidote to use for the treatment of cyanide poisoning is not straightforward and, as mentioned above, will depend on the clinical condition of the patient and the history available. In a review for the Department of Health, the Expert Group on the Management of Chemical Casualties caused by Terrorist Activity concluded that the choice of antidote is the responsibility of the clinician treating the patient. In a guidance document for the European Medicines Agency on the use of

medicinal products in the treatment of patients exposed to terrorist attacks by chemical agents, hydroxocobalamin is the treatment of choice, if it is available.

Dicobalt edetate is available in the DoH "pods" to be used in the event of a large-scale chemical incident, and patient group directions for dicobalt edetate and glucose injection 50 per cent are available on the DoH website.

— Toxic alcohols

Intentional overdoses of ethylene glycol (EG) and methanol (the former a common constituent of antifreeze and the latter of model engine fuel) can be highly dangerous and difficult to manage. However, because it is the metabolites that cause toxicity rather than the parent compound, prompt treatment with an antidote can prevent significant toxicity.

Both are metabolised by the enzyme alcohol dehydrogenase (ADH). EG is metabolised to glycolic acid, which causes a severe metabolic acidosis, and finally oxalic acid, which may lead to hypocalcaemia. Methanol is metabolised to formic acid, which causes metabolic and lactic acidosis. Antidotal treatment involves blocking the action of ADH by giving the patient either ethanol, the preferred substrate, or fomepizole, a competitive inhibitor of ADH, so that EG or methanol are excreted unchanged by the kidneys.

The decision on whether antidotal treatment is indicated may be difficult because a limited number of laboratories can determine EG or methanol blood concentration. Proxy measures, such as the osmolal gap (the difference between the laboratory measured serum osmolality and the calculated serum osmolality), are used. If raised, this may indicate the presence of EG or methanol. The patient's clinical condition, especially the degree of acidosis and impaired renal func-

Panel 3: Dosing of ethanol to treat poisoning with toxic alcohols

Loading dose

7.5 ml/kg of 10 per cent ethanol in water given intravenously over 30 minutes. Solutions stronger than 10 per cent should not be used for parenteral administration.

or

1ml/kg 100 per cent ethanol (suitably diluted) given orally over 15–30 minutes

or

2.5 ml/kg of 40 per cent ethanol (most spirits eg, vodka, whisky, gin) diluted in orange squash (or similar) given orally over 15–30 minutes

Infusion (these doses can also be given orally)

Adjusted to achieve a blood ethanol concentration of 1–1.5g/L. Intravenous infusions should be diluted with 5 per cent dextrose (also compatible with 0.9 per cent saline).

For a non-drinker or a child the ethanol dose is 66mg/kg/h, equivalent to 0.825 ml/kg/h 10 per cent ethanol.

For an average adult the ethanol dose is 110mg/kg/h, equivalent to 1.38ml/kg/h 10 per cent ethanol.

For a chronic drinker the ethanol dose is 153.78mg/kg/h, equivalent to 1.95ml/kg/h 10 per cent ethanol.

tion, and the history available are also determinants of treatment.

For many years ethanol has been used and given orally or intravenously to achieve a blood concentration of 1–1.5g/L and the dosing regimen depends on the patient's tolerance of ethanol (see Panel 3, p12). Because of the unpredictable kinetics of ethanol it is essential that blood ethanol concentrations are monitored frequently, initially every one to two hours. This can often be difficult, particularly out of hours. Preparing and administering ethanol infusions involves considerable nursing time and a blood ethanol concentration of 1g/L can cause significant drowsiness or agitation, which may make the patient difficult to manage. However, ethanol is cheap and widely available.

Fomepizole is another option, although it is expensive and unlicensed in the UK. It is licensed in the US and several European countries. Fomepizole is well tolerated and is given intravenously at 12 hourly intervals, as shown in Panel 4. Since it has predictable kinetics, monitoring of fomepizole blood concentrations are not required. Therefore, when all aspects of managing a patient with EG or methanol poisoning are considered, fomepizole can in fact be the cheaper⁹ and less complicated treatment. Since it is safe to switch between antidotes, a loading dose of ethanol can be given while a supply of fomepizole is located.

In severely poisoned patients haemodialysis may be indicated and in these cases the dose of the antidote must be altered.

— Cardiac drugs

Calcium channel blockers When taken in overdose calcium channel blockers, such as verapamil, diltiazem and nifedipine, cause severe cardiovascular toxicity due to a combination of peripheral vasodilation, myocardial depression and arrhythmias (most commonly bradyarrhythmias). Patients develop profound hypotension, which can be resistant to treatment. Toxicity from overdose of sustained release preparations may be delayed and prolonged.

The first-line treatment of hypotension is a fluid resuscitation followed by administration of calcium salts. Calcium chloride is preferred to calcium gluconate as it has a higher ionised calcium content. The initial dose is 10ml of 10 per cent calcium chloride which can be repeated three or four times over a 15–20 minute period. Calcium salts are thought to act by increasing intracellular calcium, but the effect is often short-lived and only a proportion of patients will respond. A calcium infusion may be used in those who do not respond and in these cases it is important to monitor the serum calcium concentration.

In patients unresponsive to an adequate fluid challenge and calcium, a high dose

insulin-dextrose infusion (insulin euglycaemia) may be indicated. Calcium channel blockers decrease pancreatic insulin release as well as myocardial glucose utilisation and increase myocardial resistance to insulin. The myocardium generally relies on fatty acids for its energy supply but, when a patient is in shock, glucose is the main substrate. Administration of insulin-dextrose therefore supplies adequate glucose (substrate) together with insulin to overcome myocardial insulin resistance. In addition, at these doses insulin has directly positive inotropic effects.

A loading dose of 1 unit/kg of a short-acting insulin (usually Actrapid) is given intravenously, followed by 25–50ml 50 per cent dextrose. An infusion of 0.5–2 units/kg/h of a short-acting insulin with sufficient dextrose (10 per cent) is then administered to maintain euglycaemia. Blood glucose must be checked every 15 minutes for the first hour and then every 30–60 minutes. Serum potassium must also be monitored every one to two hours and, where necessary, potassium replacement should be given to maintain a normal serum potassium concentration.

Because this regimen requires such a large dose of insulin, clinicians are often concerned about this therapy or are reluctant to initiate it. However, there is an increasing number of reports that demonstrate its success.¹⁰ Furthermore, these reports have demonstrated that the glucose and potassium requirements are generally low, which probably reflects the significant insulin resistance in these patients, and that this therapy is well tolerated.

Patients with significant calcium channel blocker poisoning tend to be relatively resistant to conventional inotropes and, although these may be required in those with severe, resistant hypotension, our experience has been that using insulin-dextrose can reduce the need for these agents. Glucagon may also be considered in patients with resistant hypotension due to calcium channel blocker poisoning and this is discussed in more detail below.

Beta-blockers Overdoses of beta-blockers, such as propranolol and atenolol, cause hypotension and bradycardia, which may not respond to a fluid challenge or atropine. In such cases glucagon is the recommended antidote. It exerts a positive inotropic effect by stimulating adenylate cyclase independently of beta-receptors.

A bolus dose of 10mg is recommended, given intravenously over 5–10 minutes. This can be repeated as necessary, titrated against the patient's blood pressure, or given as an infusion of 1–10mg/h depending on the response.¹¹ The effects are seen within a few minutes and last for up to 15 minutes. The side effect of nausea usually indicates that an adequate trial dose of glucagon has been given, regardless of haemodynamic response.

Panel 4: Dosing of fomepizole

Fomepizole is available as Antizol 1g/ml (1.5ml vials) and Fomepizole OPi 5mg/ml (20ml ampoules). It is given by slow intravenous infusion over 30–45 minutes. Each whole dose (not vial) should be diluted in 100–250ml 0.9 per cent saline or 5 per cent dextrose.

Loading dose	15 mg/kg
2nd dose (12 hours)	10 mg/kg
3rd dose (24 hours)	10 mg/kg
4th dose (36 hours)	10 mg/kg
5th dose (48 hours)	7.5–15mg/kg
6th dose (60 hours)	5–15 mg/kg

Occasionally an anti-emetic is required, and because of the potential risk of hyperglycaemia with a large dose of glucagon, blood glucose should be monitored. Glucagon should be reconstituted and administered in 5 per cent dextrose or normal saline. Some patients require over 50mg which may exhaust the hospital's entire stock. For children the dose is 50µg/kg, repeated every three minutes up to a dose of 150µg/kg, at an infusion rate of 50µg/kg/h.

Insulin-dextrose has also been used for beta-blocker poisoning although the evidence for its use is largely based on animal studies and uncontrolled case reports.

— Sulphonylureas

In overdose sulphonylureas, such as glibenclamide and gliclazide, cause severe and potentially prolonged hypoglycaemia by increasing the release of preformed insulin from pancreatic beta-cells. Treatment of sulphonylurea-related hypoglycaemia involves the administration of intravenous dextrose (10 per cent or 20 per cent and, if necessary, 50 per cent) at a rate titrated against blood glucose measurements to maintain euglycaemia and prevent hypoglycaemia. However, the problem with glucose administration is that it acts as a further stimulus for pancreatic insulin release that can potentially result in recurrent and prolonged hypoglycaemia. Furthermore, administration of large volumes of dextrose can result in fluid and electrolyte imbalance. There has therefore been interest in using agents that directly inhibit pancreatic insulin release. Diazoxide has been used but is of limited efficacy and can cause sodium retention and hypotension, so it is not generally recommended.

Octreotide is a long-acting somatostatin analogue which inhibits pancreatic insulin release. The evidence for the use of octreotide in sulphonylurea poisoning is based on a volunteer study and case reports. The volunteer study demonstrated that octreotide effectively suppressed insulin concentrations and was superior to diazox-

Panel 5: Example of sulphonylurea overdose¹⁷

A 15-year-old girl presented at a remote community hospital in Western Australia four hours after taking an overdose comprising 375mg glipizide and 14.5g metformin (her father's medicines). She was vomiting, slightly sweaty and had a Glasgow Coma Score of 14/15. Her pulse was 90 beats/minute, her blood pressure was 110/75 mmHg, her respiratory rate was 18 breaths/minute and her temperature was 36.8°C. She was hypoglycaemic with a blood sugar level of 3.0 mmol/L.

She was given a bolus dose of 50ml 50 per cent dextrose and started on an infusion of 10 per cent dextrose at 100ml/h, titrated to maintain her serum glucose at 5–8mmol/L. The patient needed to be transferred by air to the regional hospital. While awaiting transfer she had another episode of hypoglycaemia and was treated with a further bolus dose of 50ml 50 per cent dextrose and the infusion rate of 10 per cent dextrose was increased.

She was given a bolus of 50µg octreotide before transfer. On arrival at the regional hospital (a two-hour flight) an infusion of octreotide 25µg/h was started and the dextrose infusion stopped. She remained euglycaemic and the octreotide infusion was stopped the following morning. She remained euglycaemic over the next 24 hours and was discharged for a mental health assessment.

ide and dextrose in preventing hypoglycaemia after administration of 1.45mg/kg glipizide.¹² In one study of nine patients with sulphonylurea poisoning octreotide administration was associated with stabilisation of blood glucose concentrations and a decrease in the number of hypoglycaemic episodes.¹³

Although the optimal dosing regimen has not been determined, current recommenda-

tions are that it should be considered at a dose of 50µg in adults, given subcutaneously or intravenously (1µg/kg in children), which may be repeated every 8–12 hours if required, in patients with sulphonylurea poisoning who develop hypoglycaemia requiring dextrose administration. Close monitoring of blood glucose should continue after octreotide administration and dextrose may still be required if hypogly-

caemia develops. Octreotide is generally well tolerated although stinging at the injection site has been reported, as have gastrointestinal effects such as nausea, vomiting, diarrhoea, steatorrhoea and abdominal pain. An example of a case of sulphonylurea overdose appears in Panel 5.¹⁴

Conclusion

As the previous sections on glucagon and octreotide illustrate, the use of antidotes in a poisoned patient is often an unlicensed indication. Clinical toxicology is hampered by the difficulty in performing randomised clinical trials and therefore experience with many drugs used as antidotes is based on case reports and anecdotal evidence.

The management of most cases of poisoning is supportive and guided by the patient's clinical condition. In a minority of cases, an antidote may be indicated and in these situations the pharmacist plays a key role in ensuring the timely provision and adequate supply of the drug. The guideline produced by BAEM and Guy's and St Thomas' Poisons Unit has been designed to assist this process. Information on the use of antidotes is available 24 hours a day from a poisons unit such as Guy's and St Thomas' (on 0870 2432241) or the internet database TOXBASE (www.spib.axl.co.uk).

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