ABC of Poisoning

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EMERGENCY DRUGS: AGENTS USED IN THE TREATMENT OF POISONING

The article is based on advice in the appendix to DHSS circular HN (78) 23 *Drugs of Special Value in the Treatment of Poisoning in Accident and Emergency Departments*

A readily available and practical guide to the drugs used in the treatment of poisoning is important, since many of the agents concerned are used infrequently; some can be obtained only from selected poisons treatment centres, and others, although listed in textbooks, are not available in the United Kingdom; still others are now considered obsolete and, in some cases, actually dangerous.

Lists of recommended drugs have been published by the Department of Health and Social Security, most recently as HN(62)13 and HN(78)23. This article is based on these earlier lists, although, necessarily, many more drugs have been included and additional information is given on the indications for use, mode of action, presentation, and dosage. In future this list will be revised as necessary, and copies will be available from the National Poisons Information Service. Agents used for local cleansing, relief of pain, fluid replacement, oxygen, and the more general care of the injured patient are not included. The need for collaboration and discussion between doctors and pharmacists in the preparation of this list is readily apparent and we would welcome comments which may be taken into account in future revisions.

(1) Recommended agents that are readily available

Do not use drugs in the treatment of poisoning without considering the possibility that they may further add to the toxic effects of the poison, eg treating drug induced arrhythmias with antiarrhythmic drugs

The decision to stock individual items will depend on the expected workload of the hospital concerned. It is important, however, to be prepared for the unusual so far as is reasonable. Before any of these drugs are used the evidence for toxicity of the poison concerned should be considered together with the expected efficacy of treatment. For this reason we recommend that the user reads the appropriate article either in this series or in other suitable texts. The need to avoid adding to the toxic effects of a poison cannot be overemphasised.

Drug	Indication	Mode of action	Presentation and supplier	Dose
Readily available agents used as specific antidotes				
Acetylcysteine	Paracetamol Carbon tetrachloride	Restores depleted glutathione stores; protects against renal and hepatic failure	10 ml ampoules of 20% w/v aqueous solution (each containing 2 g). Duncan Flockhart (Parvolex)	150 mg/kg initial dose in 200 ml of 5% dextrose IV over 15 min, followed by an IV infusion of 50 mg/kg in 500 ml of 5% dextrose over 4 h, then 100 mg/kg in 1 litre of 5% dextrose over 16 h. Total dose 300 mg/kg of acetylcysteine in 20 h. Most effective up to 8 h after ingestion. ?Effective after 15 h
Ammonium chloride	Phencyclidine ?Fenfluramine ?Quinine	Forced acid diuresis	Ammonium chloride powder BP. Macarthy's (Vestric)	4 g orally every 2 h preceded by 10 g arginine hydrochloride IV over 30 min
Atropine	Organophosphorus and carbamate insecticides Choline esters, eg carbachol	Competitive inhibition of muscarinic receptors	1 ml ampoules 600 µg/ml. Evans Medical	1-2-2-4 mg IV repeated every 5-10 min until full atropinisation is achieved (dry mouth and pulse rate more than 70/min). Continue for 2-3 days; large quantities may be necessary

Drug	Indication	Mode of action	Presentation and supplier	Dose
Benztropine	Movement disorders or psychotropic effects due to: butyrophenones, eg haloperidol, diphenylbutylpiperidines, eg fluspirilene or pimozide, domperidone, metoclopramide, phenothiazines, thioxanthenes, eg clopenthixol	Competitive inhibition of muscarinic receptors; blocks dopamine reuptake	1 ml ampoules 1 mg/ml. Merck, Sharp, and Dohme (Cogentin)	1-2 mg by IM or IV injection, repeated as necessary
Benzylpenicillin	<i>Amanita phalloides</i>	Displaces toxin from plasma albumin and enhances urinary excretion	300 mg and 600 mg phials. Glaxo (Crystapen)	250 mg/kg IV daily in divided doses
Calcium gluconate	Fluorides Hydrofluoric acid	Binds or precipitates fluoride ions	2.5% gel. Industrial Pharmaceuticals Limited 10 ml ampoules 10% solution (2.25 mmol Ca in 10 ml). Evans	Hydrofluoric acid skin burns: apply gel repeatedly but if pain does not subside inject 10% solution under burn area (0.5 ml/cm ²); 10-20 g in 25 ml water orally followed by 10 ml of 10% solution by IV injection
	Hyperkalaemia Hypermagnesaemia (antacids)	Reverses neuromuscular paralysis due to raised K ⁺ and Mg ⁺⁺	Soluble tablets (Sandocal) containing 10 mol calcium gluconate. Sandoz	Hyperkalaemia and hypermagnesaemia: 10 ml of 10% solution by slow IV injection
Desferrioxamine	Iron	Chelation of ferrous ions	500 mg phials, 5 g non-sterile packs for gastric lavage. Ciba (Desferal)	(1) 2 g in 10 ml sterile water by IM injection (2) Undertake gastric lavage with desferrioxamine solution (2 g in 1 litre of warm water) (3) After gastric lavage leave 5 g (in 50 ml water) in stomach (4) 5 mg/kg/h by slow IV infusion (maximum 80 mg/kg in 24 hours) or 2 g by IM injection 12 hourly
Dextrose	Insulin Oral hypoglycaemic agents	Increases blood sugar	50 ml ampoules 50% solution (25 g). Macarthys	50 ml by IV injection, repeated as necessary
Dicobalt edetate	Cyanide and cyanide derivatives, eg acrylonitrile	Chelates to form non-toxic cobalti- and cobalto-cyanides	20 ml ampoule 300 mg in 20 ml. (Kelocyanor). Mona Cyanide poisoning emergency kit. Cuxson, Gerrard, and Co	600 mg by IV injection over 1 min followed by further 300 mg injection if response does not occur within 1 min
Dimercaprol	Arsenic, copper, gold, lead, mercury	Chelation of metal ions	2 ml ampoules 50 mg/ml in arachis oil. Boots	2.5-5 mg/kg by deep IM injection 4 hourly for 2 days then 2.5 mg/kg twice daily on the 3rd day and once daily thereafter
Ethanol	Ethylene glycol Methyl alcohol (methanol)	Inhibits metabolism of methanol to formaldehyde and formic acid. Inhibits metabolism of ethylene glycol to glycoaldehyde and glycolate	Dehydrated alcohol injection (absolute alcohol). Macarthys	(1) 50 g orally or IV followed by infusion of 10-12 g/h to maintain plasma ethanol level of 1-2 g/l. For induced liver enzymes, eg alcoholism or chronic epilepsy, give ethanol infusion at rate of 12-15 g/h. (2) If haemodialysis is used infusion rate should be increased to 17-22 g/h because ethanol is readily dialysable, or ethanol may be added to peritoneal dialysate fluid at concentration of 1-2 g/l of dialysate
Folinic acid	Folic acid antagonists, eg methotrexate, trimethoprim, pyrimethamine ?Methanol	Bypasses blocked folate metabolism. Stimulation of folate dependent one-carbon pool pathway for methanol metabolism	30 mg/ml ampoules, 30 mg dry powder phials, 15 mg tablets. Lederle (Calcium Leucovorin)	(1) Methotrexate: up to 60 mg twice daily by IV injection followed by 15 mg six hourly by mouth for 5-7 days (2) Trimethoprim: 3-6 mg by IV injection followed by 15 mg daily by mouth for 5-7 days (3) Pyrimethamine: 6-15 mg IV (4) Methanol: 30 mg IV 6 hourly for 2 days
Fuller's earth	Paraquat Diquat	Adsorption of paraquat within gut	60 g sterile Fuller's earth. ICI Plant Protection Division	250 ml of 30% suspension 4 hourly for 24-48 hours. Always given with magnesium sulphate
Glucagon	β Adrenoreceptor blocking drugs	Bypasses blockade of β_1 and β_2 receptors; stimulates cyclic AMP formation with positive inotropic effect	1 mg (1 unit) and 10 mg (10 unit) phials. Eli Lilly, Novo	50-150 μ g/kg IV over one minute followed by infusion of 1-5 mg/h

<i>Drug</i>	<i>Indication</i>	<i>Mode of action</i>	<i>Presentation and supplier</i>	<i>Dose</i>
Heparin	Ergotamine (chronic poisoning) Aminocaproic acid Tranexamic acid	Reverses hypercoagulable state	1000U/ml } 5 ml 5000U/ml } multidose 25 000U/ml } phials Leo, CP Pharmaceuticals, Burgess	30 000-50 000 units daily by IV infusion
Hydrocortisone	?Prevention of stricture formation due to acid ingestion	Anti-inflammatory agent	Injection of hydrocortisone sodium succinate equivalent to 100 mg hydrocortisone base. Organon, Glaxo, Upjohn	200 mg 6 hourly by IV injection initially, followed by reducing doses as the clinical state permits
	Hypercalcaemia due to alfalcidol and vitamin D	Decreases gut absorption and increases renal excretion of calcium		
Magnesium sulphate	Paraquat Diquat Delayed release preparations	Osmotic purgative to assist passage of delayed release preparations through gastrointestinal tract	Mixture BP (4 g in 10 ml)	100 ml of mixture in 250 ml of water, repeated every 2 h until diarrhoea occurs
Methionine	Paracetamol	Restores depleted glutathione stores; protects against renal and hepatic failure	250 mg tablets. Evans	2.5 g initially then 2.5 g 4 hourly for 3 doses (10 g over 12 hours). Most effective up to 8 h after ingestion. ?Effective after 15 h
Methylene blue	Chemicals causing methaemoglobinemia, eg cetrinide, cresols, dapsone, nitrates, paradichlorobenzene, phenols, primaquine	Promotes conversion of methaemoglobin to haemoglobin	10 ml ampoules of 1% methylene blue injection. Macarthy's	1-2 mg/kg (0.1 ml of 1% solution per kg) by slow IV infusion. In patients with glucose phosphate dehydrogenase deficiency use ascorbic acid 1 g IV slowly or 200 mg orally three times daily as methylene blue causes haemolysis
Naloxone	Narcotics	Competitive inhibitor at opiate receptor sites	1 ml ampoules 0.4 mg/ml. Dupont (Narcan)	0.4-2.4 mg initially IV repeated every 2-3 min up to 10 mg. May also be given as an infusion
Neostigmine	Anticholinergic drugs	Anticholinesterase which causes accumulation of acetylcholine at cholinergic receptor sites	1 ml ampoules 2.5 mg/ml. Roche (Prostigmin)	0.25 mg subcutaneously reverses peripheral but not central effects
Penicillamine	Copper Gold Lead Mercury Zinc	Chelation of metal ions	50 mg, 125 mg, and 250 mg tablets. Dista, E Merck (Distamine, Pendramine)	250 mg-2 g orally daily
Phenoxybenzamine	Severe hypertension due to clonidine methylphenindate, methysergide, monoamine oxidase inhibitors, oxedrine, and phenylephrine	Long acting α adrenoceptor antagonist causes peripheral vasodilatation	2 ml ampoules 50 mg/ml. Hospital only. Smith, Kline, and French (Dibenyline)	1 mg/kg diluted in 250 to 500 ml 5% dextrose and infused IV over 60 min
Phentolamine	Severe hypertension due to clonidine, methylphenindate, methysergide, monoamine oxidase inhibitors, oxedrine, and phenylephrine	Short acting α adrenoceptor antagonist causes peripheral vasodilatation	1 ml ampoules 10 mg in 1 ml. 5 ml ampoules 50 mg in 5 ml. Ciba (Rogitine)	5-60 mg IV (over 10-30 min), repeated as necessary
Prenalterol	β Adrenoceptor blocking agents	Cardioselective β adrenoceptor partial agonist	5 ml ampoules 1 mg/ml. Ciba, Astra (Varbian, Hyprenan)	2-15 mg by slow IV injection. Repeat as necessary
Propranolol	β_2 Adrenoceptor stimulant drugs, eg salbutamol Ephedrine Theophylline Thyroxine	Non-selective β adrenoceptor blocking drug. Suppresses sympathetic overactivity and rate related myocardial ischaemia Reverses hypokalaemia due to β adrenoceptor stimulants and theophylline	1 ml ampoule, 1 mg/ml. 40 mg tablet. ICI (Inderal)	1-2 mg IV over 1 min initially. Repeat every min up to 5-10 mg or 40 mg orally 6-8 hourly NB: Atropine 0.6-1.2 mg IV should be given before propranolol injection
Sodium bicarbonate	Used for alkalinisation in forced alkaline diuresis, to prevent crystallisation of sulphonamides in renal tubules, and to correct metabolic acidosis	Alkalinisation and enhanced excretion of bicarbonate ions in the urine	Variety of sterile solutions available. Boots	Dose according to urinary pH or severity of metabolic acidosis
Sodium calcium edetate	Lead	Chelation of lead ions	5 ml ampoules, 1 g in 5 ml. Sinclair	50-75 mg/kg by IV infusion over 1 h for 5 days (every 2 g of EDTA should be diluted with 200 ml normal saline). NB: There is evidence that the addition of dimercaprol 5 mg/kg by deep IM injection 4 hourly for 24 h adds to effectiveness of EDTA regimen

Drug	Indication	Mode of action	Presentation and supplier	Dose
Sodium chloride	Silver nitrate Bromides	Precipitates silver as silver chloride. Specifically enhances urinary excretion of bromide ions	Readily available as sodium chloride <i>BP</i> . Macarthy's	10 g/l orally repeated as necessary to precipitate silver ions or to produce sodium chloride diuresis for bromide toxicity
Sodium nitrite	Cyanide and cyanide derivatives, eg acrylonitrile Hydrogen sulphide	Produces methaemoglobinaemia which has special affinity for CN- and HS- ions to form cyan-methaemoglobin and sulph-methaemoglobin	300 mg in 10 ml (3%). Macarthy's	10 ml of 3% solution IV over 3 min followed, in poisoning from cyanide and derivatives, by 25 ml of 50% sodium thiosulphate over 10 min
Sodium nitroprusside	Severe hypertension due to ergotamine and methysergide	Peripheral vasodilator reversing vasoconstriction and severe hypertension	50 mg dry powder ampoules. Roche (Nipride)	50-400 µg/min by IV infusion. Adjust doses to patient's response. Do not continue for longer than 48 h
Sodium thiosulphate	Cyanide and cyanide derivatives, eg acrylonitrile	Replenishes depleted thiosulphate stores necessary for the conversion of CN- to thiocyanate	50 ml ampoules of 50% sodium thiosulphate. Macarthy's	25 ml of 50% sodium thiosulphate over 10 min preceded by 10 ml of 3% sodium nitrate solution IV over 3 min
Sulphadimidine	<i>Amanita phalloides</i>	Displaces toxin from plasma albumin and enhances urinary excretion	3 ml ampoule 1 g/3 ml. ICI (Sulpamethazine)	3 g initially then 1.5 g 6 hourly by slow IV or deep IM injection
Vitamin C	Chemicals causing methaemoglobinaemia; use in patients with G6PD deficiency instead of methylene blue	Promotes conversion of methaemoglobin to haemoglobin	200 mg tablets. 5 ml ampoules 500 mg/5 ml. Evans	1 g slowly by IV injection or 200 mg orally three times daily
Vitamin K	Coumarin and indanedione anti-coagulants	Bypasses inhibition of Vitamin K epoxide reductase enzyme	Injection 10 mg in 1 ml. Roche (Konakion)	10-20 mg by slow IV injection repeated as necessary

Readily available agents used in supportive therapy

Activated charcoal	Non-specific adsorbent of particular use when a low dose of poison is associated with serious toxicity, eg methylxanthines, paraquat, tricyclic antidepressants	Adsorption of drug in gastrointestinal tract and interruption of enterohepatic cycle	Medicoal: 5 g sachets. Lundbeck Limited Carbomix: 50 g single dose plastic bottle of colloidal suspension. Penn Pharmaceuticals Ltd	Medicoal: 1-2 sachets initially repeated every 20 min up to maximum of 50 g. Carbomix: One bottle
Adrenaline	Inotropic agent used to treat anaphylaxis and to reverse asystole	Stimulation of α and β adrenoceptors	1 ml ampoules 1 in 1000 (1 mg/ml), or 10 ml ampoules 1 in 10 000 (1 mg/10 ml). Antigen, Evans	Anaphylaxis: 200-500 µg by SC or IM injection, repeated as necessary. Asystole: 1 mg IV or intracardiac, repeated as necessary
Aminophylline	Bronchospasm	Phosphodiesterase inhibitor	10 ml ampoule 250 mg/10 ml. Antigen	Up to 5 mg/kg by slow IV injection over 10-15 min (usually 250-350 mg)
Chlormethiazole	Anticonvulsant agent used to treat drug induced convulsions when diazepam is ineffective or inappropriate	Anticonvulsant	500 ml infusion bottle 8 mg/ml chlormethiazole edisylate. Astra (Heminevrin)	Use minimum effective dose by IV infusion; beware of respiratory depression
Chlorpheniramine	Acute drug induced hypersensitivity reactions in overdose	H ₁ receptor antagonist	1 ml ampoules, 10 mg in 1 ml. 4 mg tablets. Allen and Hanbury (Piriton)	10-20 mg by IV injection (mix with 5-10 ml blood before injection), 2-4 mg orally 6 hourly as necessary
Chlorpromazine	Neuroleptic agent used to treat drug-induced excitement and mania	Major tranquilliser	1 ml and 2 ml ampoules 25 mg/ml. May and Baker (Largactil). Antigen	25-75 mg IM, repeated as necessary
Cimetidine	Prevention of stress ulceration during assisted ventilation	H ₂ receptor antagonist	2 ml ampoules, 200 mg in 2 ml. Smith, Kline, and French (Tagamet)	200 mg by slow (10 min) IV injection 4-6 hourly
Diazepam	Convulsions	Anticonvulsant	2 ml ampoules 10 mg in 2 ml. Kabivitrum (Diazemuls), Roche (Valium)	5-10 mg IV, repeated, as necessary

<i>Drug</i>	<i>Indication</i>	<i>Mode of action</i>	<i>Presentation and supplier</i>	<i>Dose</i>
Dobutamine	Inotropic agent used to treat severe hypotension refractory to use of plasma expanders	Stimulation of α_1 , β_1 , and β_2 adrenoceptors	250 mg dry powder phials. Eli Lilly (Dobutrex)	2-40 $\mu\text{g/kg/min}$ by IV infusion
Dopamine	Inotropic agent used to treat severe hypotension refractory to use of plasma expanders and, in low doses, to increase renal blood flow and glomerular filtration rate	Stimulation of dopaminergic receptors and α_1 , β_1 , and β_2 adrenoceptors	5 ml ampoules 40 mg/ml 160 mg/ml. American Hospital Supply (UK) (Intropin)	Inotropic dose: 0.5-20 $\mu\text{g/kg/min}$ by IV infusion Renal dose: 2.5 $\mu\text{g/kg/min}$ by IV infusion
Frusemide	Forced diuresis	Loop diuretic	2 ml ampoules 20 mg. Hoechst. Berk (Lasix, Dryptal)	Bolus injection of 20 mg IV, repeated as necessary, to initiate and maintain adequate urine flow
Isoprenaline	Inotropic agent used to treat severe hypotension refractory to use of plasma expanders, especially when accompanied by bradycardia, eg poisoning due to β adrenoceptor blocking drugs, disopyramide nifedipine, verapamil	Stimulation of β_1 and β_2 receptors	2 ml ampoule 1 mg/ml. Pharmax (Saventrine) 1 ml ampoules 200 $\mu\text{g/ml}$. Winthrop (Isuprel)	0.02-0.8 $\mu\text{g/kg/min}$ by IV infusion
Lignocaine	Antiarrhythmic agent used to treat ventricular tachyarrhythmias	Membrane stabilisation	5 ml ampoules 2% solution (100 mg in 5 ml). 500 ml infusion bag 0.2% in 5% dextrose (2 mg/ml). 0.4% in 5% dextrose (4 mg/ml). Antigen, Boots, Travenol, Astra	100 mg bolus over 1 min followed by 2-4 mg/min by IV infusion; gradually reduce rate to 1-2 mg/min; continue as needed but monitor for lignocaine toxicity
Noradrenaline	Inotropic agent used to treat severe hypotension resistant to use of plasma expanders and dopamine and/or dobutamine, eg adrenoceptor blocking drug poisoning	Stimulation of α and β adrenoceptors	2 ml and 4 ml ampoules 2 mg/ml noradrenaline acid tartrate. Winthrop (Levophed) 2 ml ampoules 200 $\mu\text{g/ml}$ noradrenaline acid tartrate. Winthrop (Levophed Special)	2.5-10 $\mu\text{g/min}$ by IV infusion
Paraldehyde	Anticonvulsant agent used when IV administration of diazepam or chlormethiazole is not possible	Anticonvulsant	5 ml ampoules. Evans	5-10 ml by deep IM injection repeated as necessary. Must be given in glass syringe
Potassium chloride	Agents associated with hypokalaemia, eg theophylline, salbutamol. Potassium replacement in forced diuresis	Provides K^+ ions	Strong potassium chloride injection 20 mmol potassium in 10 mls. Antigen	20-40 mmol in 100 ml 5% dextrose or saline over 1-2 hours by IV infusion or added to forced diuresis fluid regimen
Ranitidine	Prevention of stress ulceration during assisted ventilation	H_2 receptor antagonist	2 ml ampoules 50 mg/2 ml. Glaxo (Zantac)	50 mg 6-8 hourly by slow IV injection
Salbutamol	Agents causing bronchospasm, eg β adrenoceptor blocking drugs, irritant fumes and gases	Stimulation of β_1 and β_2 adrenoceptors causing bronchodilation	5 mg/ml nebuliser solution (20 ml), 5 ml ampoules 50 $\mu\text{g/ml}$ 1 ml ampoules 500 $\mu\text{g/ml}$. Allen and Hanbury (Ventolin)	Nebuliser: 1-2 ml diluted to a total volume of 4 ml with normal saline via nebuliser Injection: 4 $\mu\text{g/kg}$ IV slowly, repeated as necessary
Syrup of ipecacuanha	Method of choice for emptying the stomach in children. May also be used in adults. Check specific indications and precautions	Orally active emetic agent acting both centrally and locally	Ipecacuanha emetic mixture paediatric BNF, ipecacuanha syrup USP	10-15 ml of syrup or draught for children, 30 ml for adults, followed by 200 ml of water, repeated once if necessary after 20-30 min

(2) Agents held only at selected centres or not available in the United Kingdom

For reasons of supply, infrequency of use, or cost it is impractical for these agents to be held at all centres. Where possible, selected holding centres have been designated and supplies are available for transport to emergency centres. Information on holding centres and arrangements for transport is available through drug information services and the National Poisons Information Service. Certain other agents are not currently available in the United Kingdom but may be in use abroad. The National Poisons Information Service will be pleased to advise on the latest status of these agents, both in respect of efficacy and availability.

Drug	Indication	Mode of action	Presentation and supplier	Dose
Arginine hydrochloride	Phencyclidine ? Fenfluramine ? Quinine	Forced acid diuresis	50 ml phials 10 g in 50 ml. Supply via NPIS centres, may be prepared locally	10 g IV over 30 min followed by ammonium chloride 4 g orally every 2 h
Berlin blue/ Prussian blue (potassium ferric hexacyanoferrate)	Thallium	Thallium exchanged for potassium in the molecular lattice and excreted in faeces	Lamers and Indemans BV Parallel Weg 151A Postbus 274 5201 AG's-Hertogenbasch Germany. Can be obtained via NPIS	10 g twice daily orally or through a stomach tube
DMSA (Succimer)	Lead Mercury	Chelation of metal ions	Not marketed yet as the chemical dimercapto succinic acid. Still under study	NPIS will advise on use
DMPS	Arsenic Chromium Lead Mercury	Chelation of metal ions	100 mg sodium (2,3)-dimercaptopropan (1)-sulphonate. Heyl (E Germany). Contact NPIS	100 mg orally three times daily. Higher doses have been used, but little published human experience
Digoxin specific antibody fragments	Severe digoxin poisoning	Forms complexes with digoxin which are excreted in urine	40 mg phials Wellcome Research Laboratories (supply via NPIS London centre)	NPIS will advise on use when supply dispatched
Obidoxime chloride (Toxigonin)	Organophosphorus compounds	Reactivates cholinesterases; no advantages over pralidoxime in practice	250 mg/ml injection. From E Germany via E Merck	250 mg IV or IM
Pralidoxime	Some cholinesterase inhibitors eg organophosphorus insecticides	Reactivates cholinesterases	5 ml ampoules 1 g/5 ml supplied from designated holding centres.*	30 mg/kg by IV or IM injection, 4 hourly for 24 h (do not exceed 500 mg/min). NPIS will advise on use and availability
Pyridoxine	Isoniazid	Reversal of acute pyridoxine deficiency	Concentrated injection made by Macarthys. Available through NPIS	5 g IV over 3-4 min repeated as necessary. NPIS will advise on use
Snake anti-venom	(1) British— <i>Vipera berus</i> (adder) (2) Foreign snakes	Used for snake bites when envenomation has occurred	(1) Zagreb antivenom (monovalent) should be held in all health regions (2) Antivenoms (polyvalent) are stocked in pharmacy at Walton Hospital, Liverpool, 051-525 3611, and NPIS (01-635 9191)	Advice on management from: NPIS or Liverpool School of Tropical Medicine (051-708 9393) or tropical consultant on duty, Royal Liverpool Hospital (051-709 0141)
Thioctic acid (Lipoic acid)	<i>Amanita phalloides</i>	Coenzyme to pyruvate dehydrogenase and oxoglutarate	500 mg injection. Homberg, Germany	125 mg in 1 litre 5% dextrose by IV injection every 6 h for up to 1 week

* These are listed in: *Poisonous Chemicals in Homes and Gardens: Notes for Guidance of Medical Practitioners* (HMSO); *Chemist and Druggist Directory* (BEN Publications, Ltd)

(3) Agents considered obsolete

Drug	Indication	Why no longer used
Amyl nitrite	Cyanide poisoning	Achieves inadequate levels of methaemoglobin
Cysteamine	Paracetamol poisoning	More toxic than acetylcysteine or methionine
Dextrose	With dicobalt edetate injection for cyanide poisoning	Not needed
Levallorphan Nalorphine	Opioid poisoning	Naloxone more effective
Metaraminol	Hypotension	No advantages over dopamine, dobutamine, noradrenaline
Physostigmine	Anticholinergic poisoning	Response very varied and unpredictable. Its cholinergic effects can be hazardous, including convulsions. Risks outweigh the benefits
Apomorphine Copper sulphate Sodium chloride	Emesis	Less or no more effective than ipecacuanha with greater risk of toxicity
Sodium thiosulphate oral solution	Bleach ingestion	Not needed
Universal antidote	Universal (!)	Newer agents more effective. Can produce toxicity from tannic acid content

Drugs may become obsolete because they are replaced by more effective agents, or because they have been shown to be ineffective or too toxic to justify their use. For one or more of these reasons these drugs are no longer recommended.

Current controversies

Evaluation of the efficacy of treatments for poisoning is difficult since many forms of poisoning occur only infrequently, many patients are poisoned by more than one agent, and there may be considerable variation in the time between exposure and treatment. Not surprisingly, therefore, some of the treatments listed here are not universally accepted. In some cases further data have been gathered or the original data have been re-examined and found to be inconclusive—for example, hydrocortisone to prevent oesophageal stricture formation after ingestion of strong acids or alkalis, ammonium chloride or arginine hydrochloride to produce an acid urine and enhance excretion of fenfluramine and quinine. In other cases, while there are good theoretical grounds for using agents there is as yet no conclusive evidence on their value in practice—for example, acetylcysteine for carbon tetrachloride; folinic acid for methanol; and benzylpenicillin, sulphonamides, and thioctic acid for *Amanita phalloides*.

Local practice will also influence the choice of specific treatments, and there is considerable variation between centres in the type of supportive measures used—for example, activated charcoal, anticonvulsants, and bronchodilators. It would be inappropriate to try to resolve these issues in this article, but we hope that we have stimulated further interests and that research will produce results that will simplify the task of revising this list.

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