gency situation it may not be medically appropriate to delay the start of treatment until proxy consent can be obtained. Hence, the doctor in charge should take responsibility for entering such patients, just as they would take responsibility for choosing other treatments. Of course, the requirements of the relevant ethics committee should be adhered to at all times.

Numbered drug or placebo packs will be available in each participating emergency department. Randomisation involves giving brief details to a 24 hour free phone service. The call should last only a minute or two, and at the end of it the service will specify to the caller which numbered treatment pack to use. The primary outcome measures are: death from any cause within two weeks of injury and death or dependence at six months. In-hospital deaths, complications, and short term recovery are to be recorded on a single sided outcome form which can be completed entirely from the hospital notes—no extra tests are needed. Long term recovery will be assessed at six months either by a simple postal questionnaire, sent directly to each trial participant from the CRASH Co-ordinating Centre, or by telephone interview and will not involve any additional work for collaborating hospitals.

The CRASH trial aims to be the largest randomised controlled trial in head injury that has ever been conducted. This will only be possible if doctors and nurses world wide can work together to make it a success. Further information about the trial including details about taking part can be obtained from the CRASH Co-ordinating Centre, Institute of Child Health, 30 Guilford Street, London WC1N 1EH (crash@ich.ucl.ac.uk) or by visiting the CRASH web site http://www.crash.ucl.ac.uk.

1 Jennett B, Teasdale G. *Management of head injuries.* Philadelphia: FA Davies, 1981.
2 Jennett B, Bond M. Assessment of outcome after severe brain damage. *Lancet* 1975;i:480–4.
3 Alderson P, Roberts I. Corticosteroids in acute traumatic brain injury: systematic review of randomised controlled trials. *BMJ* 1997;314:1855–9.
4 Bracken MB, Shepard MJ, Collins WF, *et al.* A randomised controlled trial of methylprednisolone or naloxone in the treatment of acute spinal cord injury. *N Engl J Med* 1990;322:1405–11.
5 Otani K, Abe H, Kadoya S, *et al.* Beneficial effect of methylprednisolone sodium succinate in the treatment of acute spinal cord injury (translation of Japanese). *Sekitsui Sekizui J* 1994;7:633–47.

Gastric decontamination—a view for the millennium

D N Bateman

Abstract

The management of acute poisoning remains an important part of accident and emergency (A&E) care. Three gastric decontamination procedures have been widely used: gastric lavage, ipecac, and activated charcoal. Their role has recently been reviewed and position statements developed by working groups of the American Academy of Clinical Toxicology and the European Association of Poisons Centres and Clinical Toxicologists. These have important implications for A&E, as they indicate that activated charcoal is now the agent of choice for most poisons, but that in most situations it is probably only effective if given within an hour of overdose. Ipecac is effectively obsolete and gastric lavage has a narrow range of indications, principally for potentially serious amounts of agents not adsorbed by charcoal. Protocols for care of overdose patients should be modified accordingly.

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Scottish Poisons Information Bureau, Royal Infirmary, Edinburgh

Correspondence to:
Dr D N Bateman, Director, Scottish Poisons Information Bureau, Royal Infirmary of Edinburgh NHS Trust, 1 Lauriston Place, Edinburgh EH3 9YW.

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The practice of medicine changes for a variety of reasons. New treatments are developed and their effect is measured against those of older, established regimens. The buzz words of the 1990s have been "evidence based medicine" and medical practice in many areas is being reassessed in line with this approach. In the management of drug overdoses traditional teaching 20 years ago was that decontamination of the stomach was an important part of management. The approaches used were gastric lavage and syrup of ipecac. At the time of their introduction these treatments were not subjected to formal clinical trial but anecdotal evidence of tablet recovery convinced clinicians that they were doing good. The development of the orally administered binding agent, activated charcoal, lead to the reconsideration of the optimal way of handling drug overdoses. In addition formal clinical studies began to be applied to this area of medical management as clinicians reassessed the evidence for the treatments they had been using.

The theory behind gastric decontamination seems simple. Toxins in the stomach are very poorly absorbed but once they enter the small bowel the large surface area facilitates passive diffusion and absorption is often rapid, particularly for lipid soluble compounds such as drugs. Therefore removal of a toxin from the stomach might decrease the total amount absorbed and hence reduce toxicity.

Gastric lavage involves administering fluid into the stomach via a wide bore tube. This process is not without hazard. It is associated with transient hypoxia in patients who are

obtunded, and may result in aspiration.[1] Furthermore introduction of a large volume of fluid into the stomach may actually wash tablets from the stomach into the small bowel. Thus rather than reducing the amount of drug absorbed this process may actually increase the rate of drug absorption, a process associated with rapid onset of symptoms. This hypothesis was proposed in the 1970s by Blake and Bramble who observed toxicity after gastric lavage in tricyclic poisoning.[2] It is important to remember that the toxicity of a drug may not necessarily relate to the total quantity absorbed, but more often to the peak plasma concentration and especially the speed at which that peak is reached.

Syrup of ipecac works as an emetic by stimulating the chemoreceptor trigger zone, which lies outside the blood-brain barrier in the floor of the fourth ventricle. There is variation in individual susceptibility to this agent, and it is therefore not a reliable emetic. To be active ipecac has itself to be absorbed, hence a delay between administration and vomiting. Thus after administration of ipecac absorption of the toxin continues to occur in the interval between the administration and its effect. Delay in vomiting after administration may cause uncertainty about whether the appropriate dose has been given. Furthermore nausea and vomiting may be important signs of toxicity from the ingested poison, for example in iron poisoning, and administration may result in potential confusion in the interpretation of clinical signs.

Activated charcoal acts by binding drugs non-specifically. It is not universally effective in that it does not bind ions such as iron or lithium. The charcoal has to come into physical contact with the toxin, and only binds about one tenth of its weight (that is 5 g with the standard 50 g dose). Nevertheless of the three potential gastric decontamination procedures available it is the least likely to produce an adverse response and relatively easy to administer. It has thus gained popularity. For A&E consultants the question is then which treatment to advise for which patient in their A&E department.

This topic has also been taxing the minds of clinical toxicologists, and has resulted in a series of meetings organised jointly between the American Academy of Clinical Toxicology and the European Association of Poisons Centres and Clinical Toxicologists. Their position statements were recently published.[3-5]

These publications are position statements and cannot be regarded as "tablets of stone". There is still a dearth of scientific evidence in some areas on which to base advice. Nevertheless there are some important messages that arise from this very valuable work of the two organisations. These findings have been discussed by the directors of the National Poisons Information Service (NPIS) in the UK and will be used to modify advice coming from the NPIS centres to A&E departments, via the TOXBASE system.

The conclusions of the working parties illustrate the difficulties that a group of professionals has in agreeing policy when there are gaps in knowledge. Changing old habits can be hard, no matter how illogical they are. However the recommendations can be summarised as follows.

Ipecac

The position statement indicates that ipecac should not be administered routinely in the management of poisoned patients.[3] The evidence to support this conclusion is that in experimental studies the amount of marker removed in volunteers by ipecac is highly variable and diminishes if administration of ipecac is delayed. Studies in both volunteers and poisoned patients given markers with the ipecac were reviewed. Effects of ipecac, although sometimes statistically significant, are in general relatively small in clinical terms. The studies of most relevance might be considered those in poisoned patients, but here, use of the marker magnesium hydroxide in children showed that it had a poor recovery (28%±7%, range 0%–78%).[6] When thiamine was administered with ipecac on average only 50% of the administered dose was recovered.[7] Saetta *et al*, in a UK study, used barium impregnated polyethylene pellets given with ipecac in 20 patients.[8] Abdominal radiography was performed at a mean of 47.2 minutes after the ingestion of the pellets. In the ipecac group 39.3% of the pellets had moved into the small bowel compared with 16.3% of those in the control group. The authors concluded that in some situations ipecac enhances gastric emptying facilitating drug absorption, at the same time as producing vomiting.

Clinical studies have failed to show benefit of ipecac given alone even when administered less than 60 minutes after poison ingestion. Although there are occasional case reports indicating that ipecac produces what appears to be impressive vomiting, there are insufficient data to demonstrate any benefit on outcome. In this circumstance therefore the UK poisons directors are of the view that it should no longer be used. Since ipecac may interfere with the action of other, more effective treatments, such as activated charcoal, and as activated charcoal will itself bind to ipecac reducing its efficacy, this treatment now seems effectively obsolete.

Gastric lavage

Gastric lavage has been in use in medicine for over 150 years, but the position statement indicates that gastric lavage should not now be used routinely in the management of poisoned patients.[4] Studies of the amount of marker removed by gastric lavage show this to be highly variable and, in common with ipecac, diminish with time. In addition there is no certain evidence that clinical outcome is improved. What evidence there is in favour of gastric lavage indicates that it is only of benefit if undertaken within 60 minutes of toxin ingestion. The position statement suggests that it should only be considered then in a patient who has ingested a potentially life threatening amount of poison. In patients who have central

nervous system depression the procedure is obviously contraindicated unless the airway can be protected. It is also contraindicated in the situation of hydrocarbon or corrosive ingestion. The strongest data available to support this position statement are those from Pond *et al* in a prospective randomised control trial involving 876 patients who had ingested an overdose less than 12 hours previously.[9] The conclusions of this study were that gastric emptying could be omitted from the treatment regimen of adults who have had acute oral overdose, including those who present within 60 minutes of overdose, providing they are given activated charcoal.

In determining the future role of gastric lavage in the management of poisoning, a balance needs to be struck between situations where it is of no value (late presentations, non-hazardous overdoses) and those where the role is unclear because studies have not fully addressed particular aspects. There are two obvious examples of the latter. The first is a large overdose of aspirin, which is known to delay gastric emptying, and which may remain in the stomach for many hours. The second is for a large overdose of compounds not adsorbed by charcoal, such as lithium and iron.

For both of these the issue is the time beyond which intervention is unlikely to be of benefit, and this is a judgment. Further studies may help to clarify this.

Activated charcoal

The position statement is in favour of single dose activated charcoal but stresses that it should not be administered *routinely* in the management of poisoned patients.[5] Volunteer studies indicate that the efficacy of this treatment decreases with time, and the greatest benefit is within one hour of toxin ingestion. Administration of activated charcoal should be considered if a patient has ingested a potentially toxic amount of poison known to be adsorbed on the charcoal up to one hour previously.

In some specific situations there are insufficient data to support such a clear cut off time for its use. For example upper time limits for agents which delay gastric motility and gastric emptying, such as salicylate, opiates or tricyclic antidepressants, are unknown. A two hour cut off seems a reasonable compromise in most cases, bearing in mind the uncertainty of time between admission and presentation in many patients.

Constipation, a problem with repeat doses of charcoal, for which there are specific indications to increase toxin elimination, is not seen with single dose charcoal. Routine use of osmotic laxatives such as lactulose or mannitol is therefore not required.

Special cases

Slow release products are absorbed more slowly, but pass through the bowel during the absorption process. While charcoal may reduce absorption from such formulations the effect in individual cases is unpredictable, as it depends on direct contact between the charcoal and the tablet.

Some agents are not adsorbed by charcoal, for example iron and lithium. In others, because charcoal binds only 10% of its own weight the amount of toxin ingested may make charcoal relatively ineffective. This might, for example, apply in severe ibuprofen or aspirin poisoning. The use of gastric lavage in such circumstances may therefore be justified, but should be followed by charcoal. Such issues obviously caused difficulties for the groups producing the position statements and some have not been dealt with head on. It is important to know what the limits of knowledge are. It is therefore not a weakness that these difficulties have been acknowledged and may now be firmly placed on the research agenda. For the meantime, however, for the vast majority of poisoned patients activated charcoal by mouth is the preferred, safe, option.

1 Thompson AM, Robins JB, Prescott LF. Changes in cardiorespiratory function during gastric lavage for drug overdose. *Hum Toxicol* 1987;**6**:215–18.
2 Blake DR, Bramble MG. Is there excessive use of gastric lavage in the treatment of self-poisoning. *Lancet* 1978;**ii**: 1362–4.
3 Anonymous. Position statement: ipecac syrup. *Clinical Toxicology* 1997;**35**:699–709.
4 Anonymous. Position statement: gastric lavage. *Clinical Toxicology* 1997;**35**:711–19.
5 Anonymous. Position statement: single-dose activated charcoal. *Clinical Toxicology* 1997;**35**:721–41.
6 Corby DG, Decker WJ, Moran MJ, *et al.* Clinical comparison of pharmacologic emetics in children. *Pediatrics* 1968;**42**:361–4.
7 Auerbach PS, Osterloh J, Braun O, *et al.* Efficacy of gastric emptying: gastric lavage versus emesis induced with ipecac. *Ann Emerg Med* 1986;**15**:692–8.
8 Saetta JP, March S, Gaunt ME, *et al.* Gastric emptying procedures in the self-poisoned patient: are we forcing gastric content beyond the pylorus? *J R Soc Med* 1991;**84**:274–6.
9 Pond SM, Lewis-Driver DJ, Williams GM, *et al.* Gastric emptying in acute overdose: a prospective randomised controlled trial. *Med J Aust* 1995;**163**:345–9.