



Supporting Documentation
On Gastric Lavage

**GASTRIC DECONTAMINATION: Resolving the Controversies
Emesis vs Gastric Lavage vs Activated Charcoal**

- Edward P. Krenzelok

Clinical Toxicology Forum



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Current and Practical Information
on the Management of Poisoning
and Overdose Emergencies

GASTRIC DECONTAMINATION: Resolving the Controversies Emesis vs Gastric Lavage vs Activated Charcoal

By: Edward P. Krenzelok, PharmD

The basic management of poisoning emergencies focuses upon providing good supportive care and preventing further absorption of the ingested toxin. Antidotes, extracorporeal removal of toxins via hemodialysis or hemoperfusion, and the use of ion-trapping and forced diuresis have limited applications and their use is reserved for serious and often recalcitrant poisoning cases. Until the last decade the cornerstone of poison management involved the use of either ipecac-induced emesis or gastric lavage (depending upon the patient's level of consciousness) to accomplish gastric emptying, followed by the use of activated charcoal and a cathartic, when convenient. The early part of the 1980's saw this trend continue but with more aggressive use of syrup of ipecac in larger doses with less reliance upon gastric lavage. Furthermore, activated charcoal and the concurrent use of cathartics emerged from being a treatment adjunct to the status of being a mandated treatment modality in most poisoning ingestions. Now those basic cornerstones are being challenged again and questions have arisen concerning the role of gastric emptying and whether activated charcoal administration should replace emesis and lavage.

EMESIS

Syrup of ipecac is the only predictable and acceptable agent to produce emesis in the poisoned patient and is customarily used in the home in pediatric poisoning emergencies. The traditional dose is 15 ml

for children (ages 1-12) and 30 ml for adolescents and adults. Some studies have indicated that the use of 30 ml in all individuals greater than one year of age will produce emesis more rapidly and with a lower failure rate than the traditional 15 ml dosage.^{1,2} The standard contraindications of not inducing emesis in postictal patients or those with a decreased level of consciousness, in patients who have ingested potentially corrosive substances, and in some hydrocarbon ingestions are still accepted. However, the controversy which exists centers upon whether ipecac emesis is truly more effective than gastric lavage as the early literature indicates.

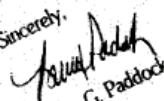
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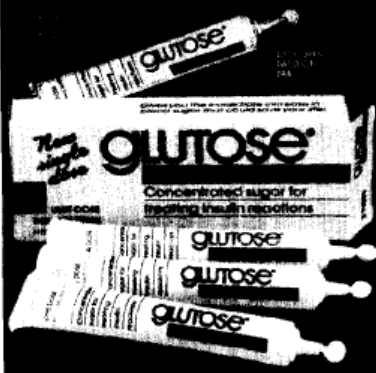
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Edward P. Krenzelok, PharmD is director of the Pittsburgh Poison Center, Children's Hospital of Pittsburgh, and associate professor in the Schools of Pharmacy and Medicine, University of Pittsburgh.

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EMESIS VS GASTRIC LAVAGE

The early research conducted by Arnold (1959), Abdallah (1967), Corby (1967), and Boxer (1969) demonstrated that emesis was superior to lavage.^{3,4,5,6} However, those studies were confusing and fraught with interpretative problems, most notably the size of the gastric lavage tube was extremely small (16 French) by today's standard (34-40 French). The early studies undoubtedly made an impact on the way that gastric emptying was performed until recently and accounts for the extensive use of syrup of ipecac since the research supported its superiority to lavage.

Recent research actually indicates that gastric lavage is in fact more effective in removing the gastric contents than the traditional standard, syrup of ipecac. A study by Auerbach demonstrated that lavage was superior to ipecac emesis (90% vs 50% recovery) in removing a marker drug (thiamine) which was administered to actual overdose victims prior to the gastric emptying procedure.⁷ Tandberg et al. administered cyanocobalamin as a marker drug to volunteers and then compared the recovery of the drug in the lavage and emesis groups, finding that lavage removed approximately 50% more of the marker (45% vs 28%).⁸

Gastric lavage is a more effective intervention than ipecac-induced emesis if properly performed. A large bore lavage tube must be used (children 24-28 Fr and adults 34-40 Fr), the lavage should be aggressive using large volumes of lavage fluid appropriate for the age and condition of the patient, and the lavage tube should be frequently repositioned during the procedure. However, lavage does not replace ipecac in all poisoning emergencies. Syrup of ipecac plays an important role in the home management of pediatric poisonings and in nonobtunded patients being treated in emergency departments for ingested toxins with a high therapeutic index. Although it would appear that syrup of ipecac is not necessarily the best gastric emptying procedure, practical necessity, convenience, and personal preference will perpetuate its use. Lavage should be reserved for serious poisonings where the patient's level of consciousness is compromised or may be as in the case of a tricyclic antidepressant overdose and in poisonings where extensive and rapid gastric emptying is essential. Neither of these interventions completely removes the ingested toxin, which necessitates the use of activated charcoal to bind unabsorbed toxin and therefore, prevent toxin absorption.

ACTIVATED CHARCOAL

During the last decade activated charcoal has emerged from being a mere adjunct in the management of poisoning emergencies to the stature of being a standard of care. Not only have the indications for its use expanded, but in some cases it is also recommended as a replacement for the traditional gastric emptying procedures!

Activated charcoal will avidly adsorb toxins which fall in the molecular weight range of 100-1000 daltons. This includes the majority of common toxins with a few notable exceptions—iron and other elemental metals, alcohols, ~~some~~ pesticides, etc. Contrary to popular belief, activated charcoal does not appear to interfere with the emetic effect of syrup of ipecac.⁹

Several activated charcoal dosage and administration regimens have been recommended. The generally accepted doses are infants 1 gm/kg, children 25-50 gm, and adults 50-100 gm. These doses may be administered via the lavage tube before and after the lavage procedure, as a single dose after gastric emptying has been completed, or in a multiple dose regimen at intervals of 2-6 hours.

Cathartics have been customarily used in conjunction with activated charcoal to enhance elimination of the toxin: activated charcoal complex. Research has neither conclusively supported nor refuted the benefit of cathartics in the treatment of poisoning emergencies but the general standard of care dictates the use of cathartics with activated charcoal. Sorbitol is the most effective cathartic followed by magnesium citrate.¹⁰ Magnesium sulfate is not as effective as sorbitol and magnesium citrate. Care should be exercised in the use of cathartics. Sorbitol should be used cautiously in pediatric patients and in multiple dose activated charcoal regimens.¹¹ Excessive magnesium absorption has been reported following the use of magnesium-containing cathartics.¹²

EMESIS VS LAVAGE VS ACTIVATED CHARCOAL

Recent literature reports have suggested the abandonment of conventional gastric emptying techniques in favor of the sole use of activated charcoal. This has created considerable anxiety among clinicians since it suggests a significant change in the standard of care which favors the use of gastric emptying.

A study by Neuvonen et al. indicated that activated charcoal alone was superior to ipecac-induced emesis in preventing drug absorption.¹³ This difference was even more significant when there was a delay of 30 minutes between the ingestion of the study drug and administration of the charcoal or ipecac. Important to this study is the effectiveness of charcoal even after a delay in its administration. The classic study actually compared a large group of patients who had gastric emptying performed followed by the administration of activated charcoal to a group who received activated charcoal alone.¹⁴ There was no difference between the outcomes of these groups with the exception of the group which was lavaged and received activated charcoal within the first 60 minutes postingestion. Once again reinforcing the element of time and the importance of initiating treatment as soon as possible. Other studies both support and refute the claim that activated charcoal

is superior to gastric emptying.^{15, 16}

These latest findings certainly provoke a number of questions about the gastric emptying techniques which have been held so sacred. However, this search is merely a beginning and does not constitute a justification to abandon the accepted gastric emptying techniques. Instead it provides compromise and provides guidance regarding situations when it may be appropriate to utilize activated charcoal as the sole intervention to prevent absorption of a toxin.

From both a medical and legal perspective it would be prudent to utilize a gastric emptying technique if the ingestion has occurred recently. Defining "recent" is the most difficult aspect of resolving this dilemma and it will depend upon the history of the ingestion, the nature of the toxin, whether bezoar formation may occur, when the last meal occurred, etc. The research on this problem clearly demonstrates that gastric emptying, and especially lavage, in conjunction with activated charcoal is as effective if not more effective than the use of activated charcoal alone and especially when the temporal period between the ingestion and treatment is relatively short. If the history of the exposure is certain regarding the time when the exposure actually occurred and if there is a several hour hiatus between the ingestion and treatment, the sole use of activated charcoal may be a reasonable approach. An additional application of sole activated charcoal use may be in patients who are unstable and in need of emergent life support measures such as the tricyclic antidepressant overdose patient. It is more prudent to address basic life support than it is to perform gastric lavage until the patient has been stabilized.

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POISON INFORMATION CONSULTATIONS

A Contemporary Problem In Clinical Toxicology:

"This is the poison information center, how may I help you?"

Q: "I am treating a 26 year old female who ingested a large amount of acetaminophen. Emesis was successfully induced with syrup of ipecac and I administered aqueous activated charcoal 50 gm. Her acetaminophen serum level is in the range known to produce hepatotoxicity. Will the activated charcoal interfere with the absorption of n-acetylcysteine (Mucomyst®), the oral antidote for acetaminophen poisoning?"

A: Theoretically, since n-acetylcysteine has a molecular weight of 163.2 t should be adsorbed by activated charcoal; thereby interfering with its absorption and the resultant antidotal effects. *In vitro* research suggests that n-acetylcysteine absorption is compromised by activated charcoal.^{1, 2} However, three studies conducted in human subjects demonstrate that the absorption of n-acetylcysteine is not significantly influenced by the concurrent use of activated charcoal.^{3, 4, 5}

The early administration of activated charcoal may prevent acetaminophen absorption and be especially valuable in overdoses involving multiple substances which are adsorbed by activated charcoal. Although some toxicology references advise against activated charcoal use in acetaminophen overdoses due to its postulated effects on inhibiting n-acetylcysteine absorption, activated charcoal use is not absolutely contraindicated in acetaminophen overdoses. A single dose of activated charcoal should not negatively influence patient outcome. The effect of multiple dose activated charcoal administration on n-acetylcysteine has not been studied and cannot therefore, be recommended at this time.

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