

# Toxicology Tidbits

## *Single Dose Activated Charcoal*

### *The one-hour myth*



#### **The Myth**

An 80 kg 34-year-old male presents to your emergency department 3 hours after ingesting an unknown amount of his carbamazepine and acetaminophen. He is currently asymptomatic and has normal vitals. You inform your team “We won’t give charcoal because it doesn’t work if given greater than one hour post ingestion”. Is this a true statement?

#### **What is it?**

Activated charcoal is a highly porous inert material that adsorbs most xenobiotics in a non-specific fashion through hydrogen bonding, ion-ion, dipole, and van der Waals forces. It is not absorbed or metabolized in the GI tract.



While most therapeutic ingestions are absorbed within an hour, in overdose, absorption kinetics are altered and often quite delayed in overdose. Many endoscopic and autopsy case series exist demonstrating pill fragments several days post-ingestion.

#### **Indications:**

Generally, activated charcoal is indicated in acute oral toxicologic exposures where there is ongoing absorption of a harmful xenobiotic in the stomach.



Do I think there is ongoing absorption of a harmful drug?

#### **Contraindications:**

1. Altered mental status at risk of aspiration
2. Active vomiting
3. Xenobiotic rapidly absorbed (alcohols/solvents)
4. Potential need for upper endoscopy (caustics)
5. Xenobiotic does not adsorb to charcoal (most heavy metals)
6. High risk for aspiration (Hydrocarbons)
7. Concern for GI perforation

#### **Substances where charcoal is ineffective**

**P**esticides  
**H**heavy metals/Hydrocarbons  
**A**acids/Alkali/Alcohol  
**I**ron  
**L**ead/Lithium  
**S**olvents

Placing an NG in an altered or uncooperative patient without capturing their airway to administer charcoal carries an aspiration risk. Your local poison centre can provide guidance on whether intubation for charcoal administration is indicated.



#### **Dosing:**

- 1 gram of activated charcoal is generally expected to adsorb 10 grams of xenobiotics
- As ingestions often unknown or unreliable: 1 gram/kg to a maximum of 100 grams (70 grams in a 70 kg adult)

#### **Timing:**

A recent systematic review demonstrated consistent evidence for the use of activated charcoal in many xenobiotics out to 4 to 6 hours post ingestion (Hoegberg et al. 2021). The decision to administer charcoal is based on potential toxicity, potential for ongoing absorption, and current symptoms. Information that helps guide this decision includes the formulation of the medication (Extended release), and the general trajectory of symptoms.

### **Back to the case:**

Through discussion with your local poison centre, a single dose of 80 grams of activated charcoal is recommended to limit drug absorption and prevent toxicity due to likelihood that absorption is ongoing. A 4-hour acetaminophen level returns at 700 umol/L (below treatment threshold), and serial carbamazepine levels done every 4 hours peak just above therapeutic range and decline without the development of any symptoms.

### **References:**

1. [https://en.wikipedia.org/wiki/Activated\\_charcoal\\_cleanser#/media/File:Activated\\_charcoal\\_in\\_various\\_forms.jpg](https://en.wikipedia.org/wiki/Activated_charcoal_cleanser#/media/File:Activated_charcoal_in_various_forms.jpg)
2. Otten, Edward J. "Goldfrank's Toxicologic Emergencies, 11th Edition by Lewis S. Nelson, Mary Ann Howland, Neal A. Lewin, Silas W. Smith, Lewis R. Goldfrank, and Robert S. Hoffman. New York, McGraw-Hill Education 2019, 2070 Pages, \$245.79." *Journal of Emergency Medicine* 58.1 (2020): 167-68. Web.
3. Hoegberg, Lotte C. G., Greene Shepherd, David M. Wood, Jami Johnson, Robert S. Hoffman, E. Martin Caravati, Wui Ling Chan, Silas W. Smith, Kent R. Olson, and Sophie Gosselin. "Systematic Review on the Use of Activated Charcoal for Gastrointestinal Decontamination following Acute Oral Overdose." *Clinical Toxicology (Philadelphia, Pa.)* 59.12 (2021): 1196-227. Web.
4. Kimura Y, Kamada Y, Kimura S. A patient with numerous tablets remaining in the stomach even 5 hours after ingestion. *Am J Emerg Med* [Internet]. 2008 Jan [cited 2017 Aug 18];26(1):118.e1-118.e2. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18082814>
5. Adler P, Lynch M, Katz K, Lyons JM, Ochoa J, King C. Hypothermia: An Unusual Indication for Gastric Lavage. *J Emerg Med* [Internet]. 2011 Feb [cited 2017 Aug 18];40(2):176-8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19303240>
6. Miyauchi M, Hayashida M, Yokota H. Evaluation of Residual Toxic Substances in the Stomach Using Upper Gastrointestinal Endoscopy for Management of Patients With Oral Drug Overdose on Admission. *Medicine (Baltimore)* [Internet]. 2015 Jan [cited 2017 Aug 18];94(4):e463. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25634188>

**The Poison and Drug Information Service (PADIS) for Saskatchewan is available 24/7 for questions related to poisoning. Please call 1-866-454-1212 or Canada's new national poison centre number at 1-844-POISON-X (1-844-764-7669).**

**If you have any requests or ideas for future Toxicology Tidbits, please feel free to email me at [riley.hartmann@saskhealthauthority.ca](mailto:riley.hartmann@saskhealthauthority.ca). Previous Toxicology Tidbits are available at <https://skemcollective.ca/resources/>**