

# Comparison of Adsorbents for Development of Disposal kits for Solid Oral Dosage Forms

**Neha Singh<sup>1</sup>**, Anushree Herwadkar<sup>1</sup>, Carter Anderson<sup>2</sup>, Andrew Korey<sup>2</sup>, William Fowler<sup>2</sup> Ajay K Banga<sup>1</sup>

<sup>1</sup> :Mercer University College of Pharmacy and Health Sciences, Atlanta, GA- 30341

<sup>2</sup> : Verde Environmental Technologies Inc, Burnsville MN 55337

## Abstract

**Purpose:** The objective of this study was to compare different adsorption agents for their efficacy to deactivate oral dosage forms.

### Methods:

**Adsorption phase:** Separate pouches containing 45 g each of free carbon, carbon inside perforated bag, cat litter and coffee grounds were used. Dexamethasone tablets (4 mg) and amoxicillin capsules (250 mg) were used as model solid oral dosage forms. Tablets/capsules were added to each pouch containing adsorption agent including a control pouch with no adsorption agent. Tap water was poured into control pouch and pouches containing free carbon and carbon inside perforated bag whereas no water was added to cat litter and coffee grounds in accordance with FDA guidelines. Pouches were shaken and samples taken at end of 7 days.

**Washout phase:** The contents from each pouch were emptied into separate gallon jugs. Distilled water was added to each gallon jug to make up volume to 3800 ml. The containers were placed on the shaker for 4 hours. The gallon jugs were left standing overnight and samples were withdrawn the following morning. All the samples were filtered and analyzed by HPLC.

### Results:

**Adsorption phase:** Free carbon and carbon inside perforated pouches, both showed 100 % deactivation of dexamethasone pills and amoxicillin trihydrate capsules after 7 days of shaking with tap water.

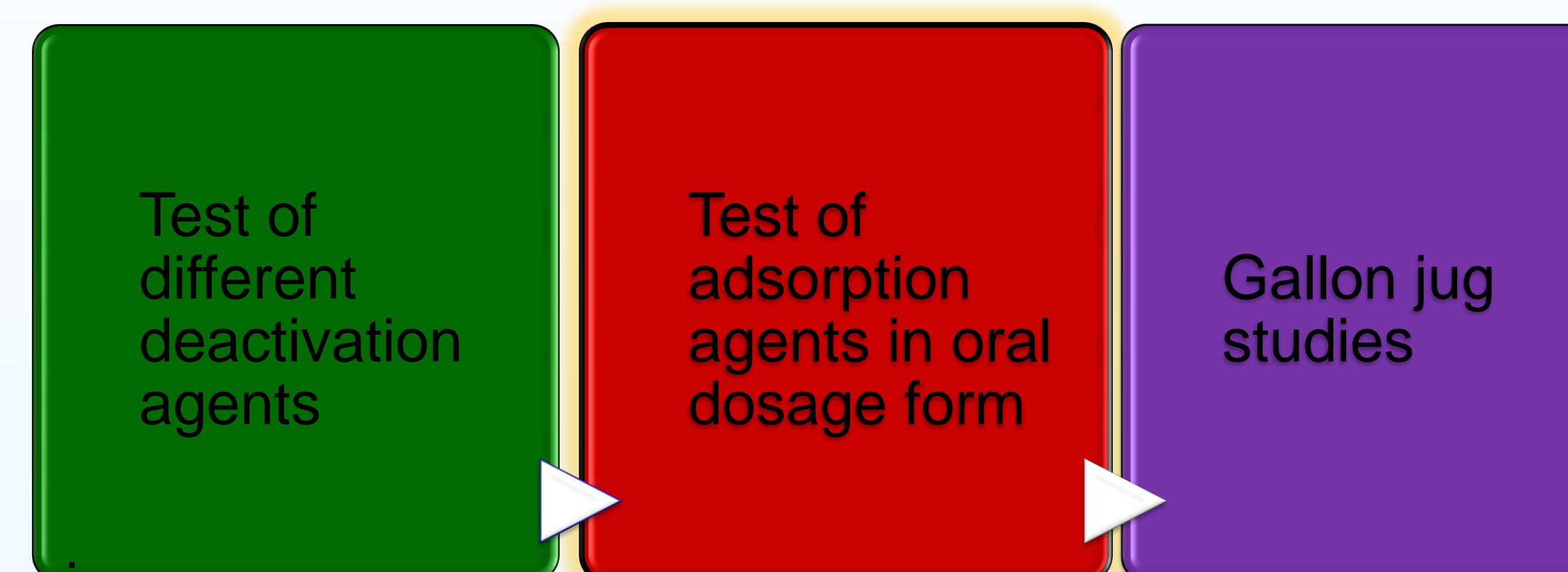
**Washout phase:** This step was performed to assess the possibility of drug desorption from the deactivation agent in a landfill situation. The percentage of drug in control gallon jugs after overnight standing was found to be 114.40 % and 102.42 % for dexamethasone pills and amoxicillin trihydrate capsules respectively. The amount of dexamethasone remaining was 96.93 % and 47.65 % whereas 86.6 % and 93.92% of amoxicillin trihydrate remained intact at end of 7 days when coffee grounds and cat litter were added, respectively. Free carbon and carbon inside perforated bag maintained 100 % deactivation of dexamethasone and amoxicillin trihydrate after washout phase.

**Conclusions:** Free carbon and carbon inside perforated bag completely deactivated both the drugs and prevented their release back into the solution. These agents can be used for safe disposal of oral medications.

## Background

USA is considered as the largest pharmaceutical market in the world and sale of prescription drugs was registered to be \$320 billion in the year 2011. Prescribed medications can remain unused, some of these can have severe resulting implications like abuse of prescription drugs or accidental intake of drug by children. The objective of this study was to develop a drug disposal method that can be safe, environment friendly and convenient for consumers.

## Methods



### Deactivation agents :

- Free carbon
- Carbon in pouch

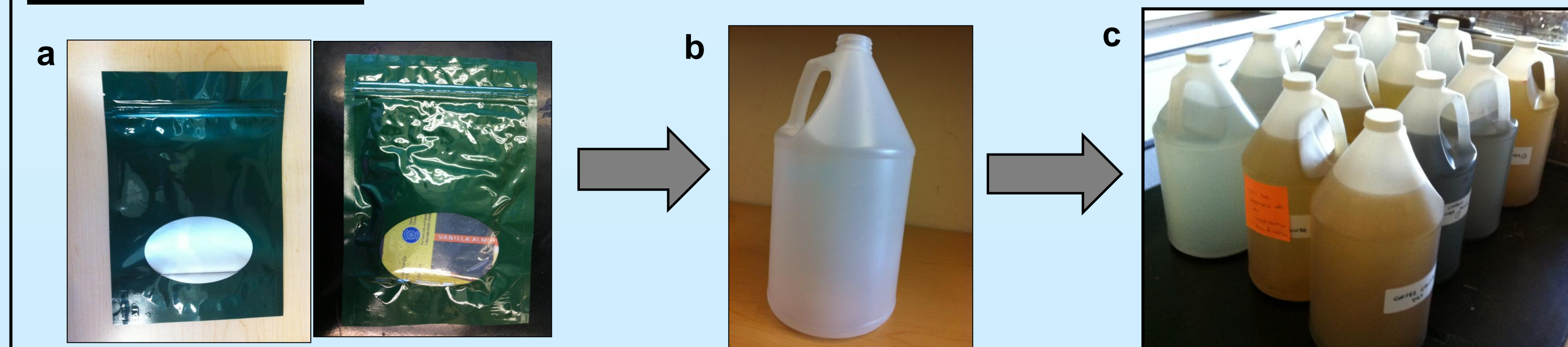
### Comparison agents:

- Coffee grounds
- Cat litter

### Adsorption phase

Adsorption agent	Amount added (gm)	Amount of drug added (mg)	
		Dexamethasone pills (4 mg)	Amoxicillin capsules (250 mg)
Control	0	20	1250
Cat litter	45	120	7500
Coffee grounds	45	120	7500
Free carbon	45	120	7500
Carbon in pouch	45	120	7500

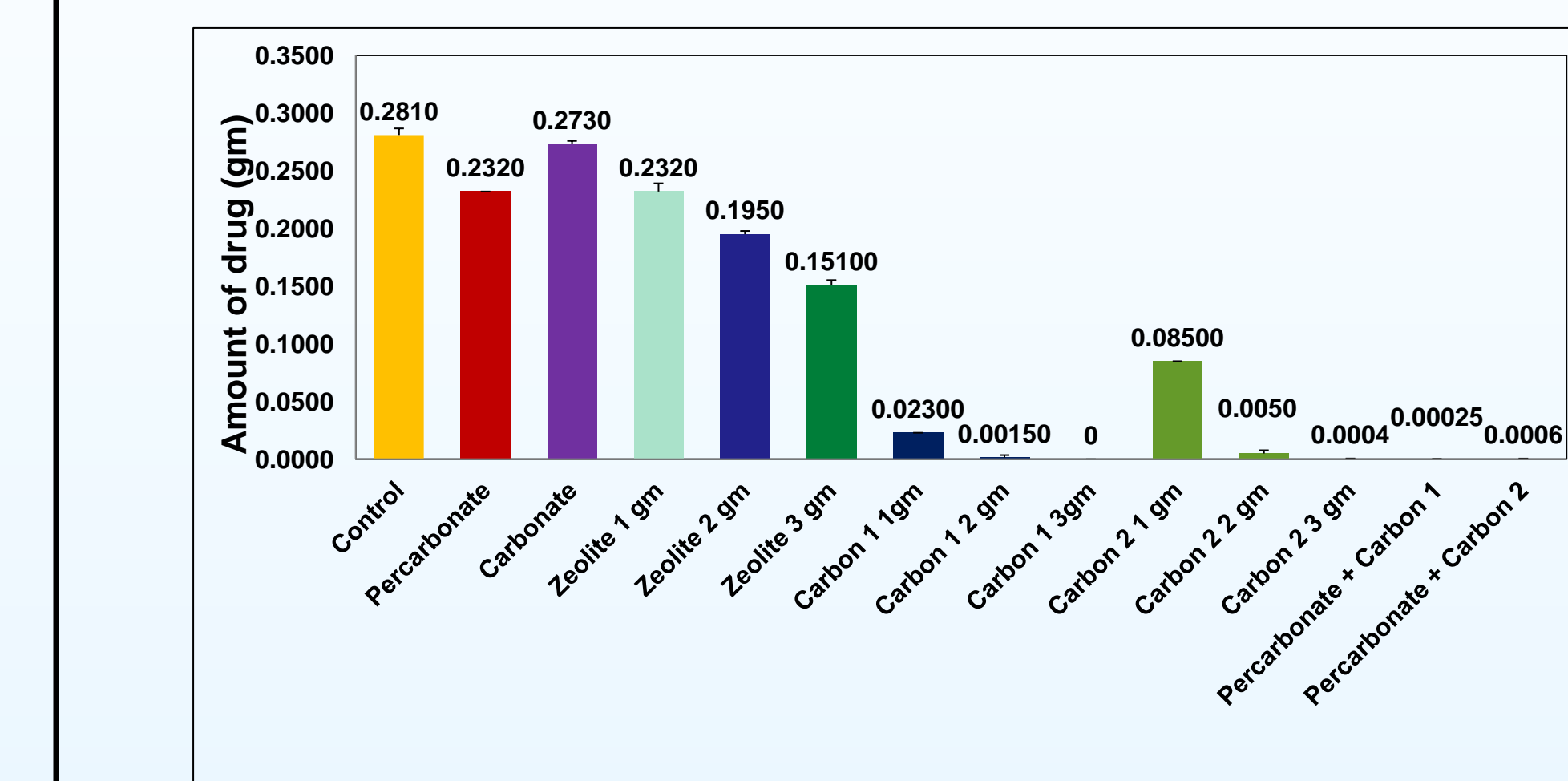
### Washout phase



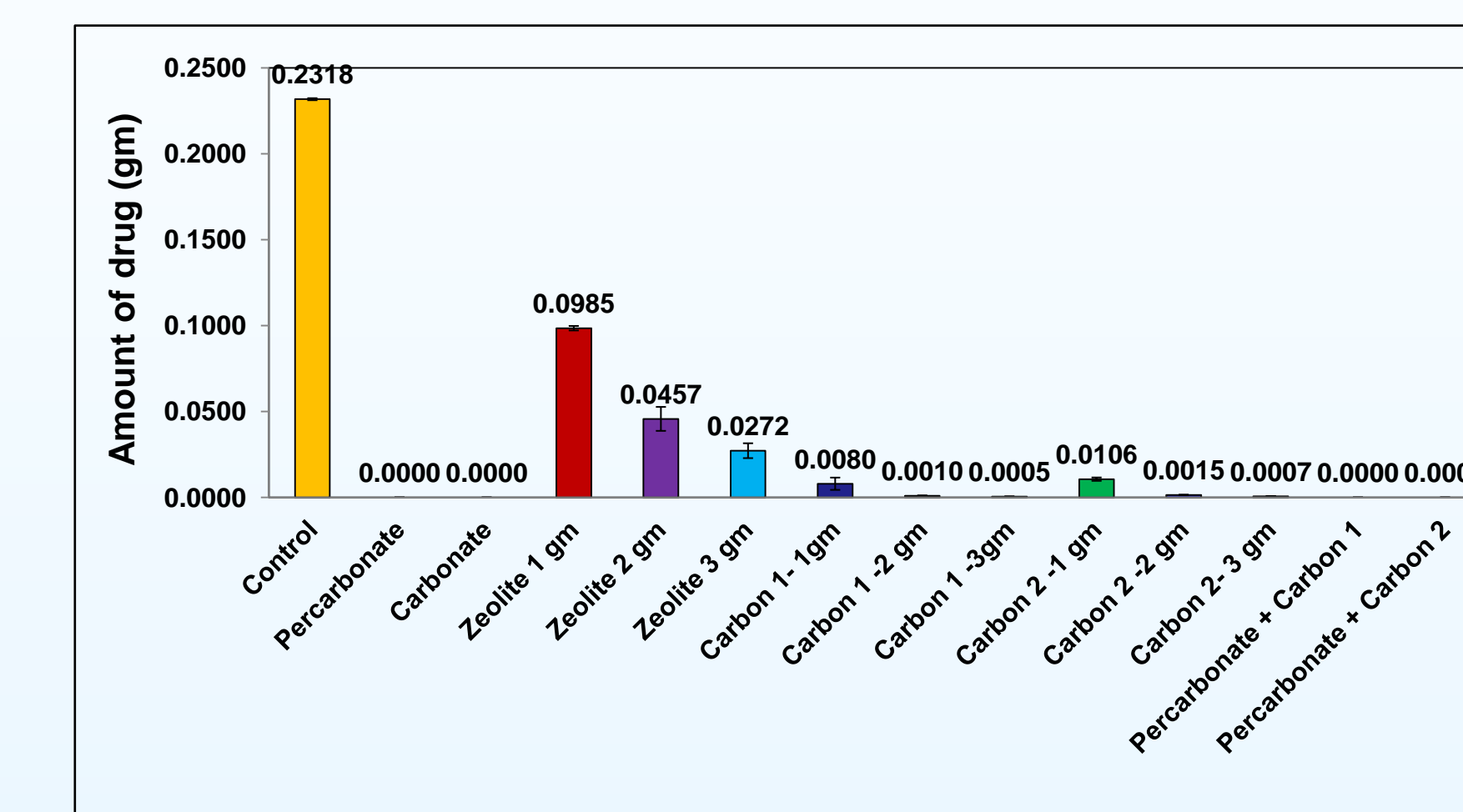
a) Cat litter, coffee grounds and free carbon was added to the empty pouches and carbon in perforated bag was enclosed in the pouch along with solid dosage forms; b) Gallon jugs were used to simulate a landfill solution; c) The gallon jugs were shaken for 4 hours followed by over night standing.

## Results

### Test of different deactivation agents

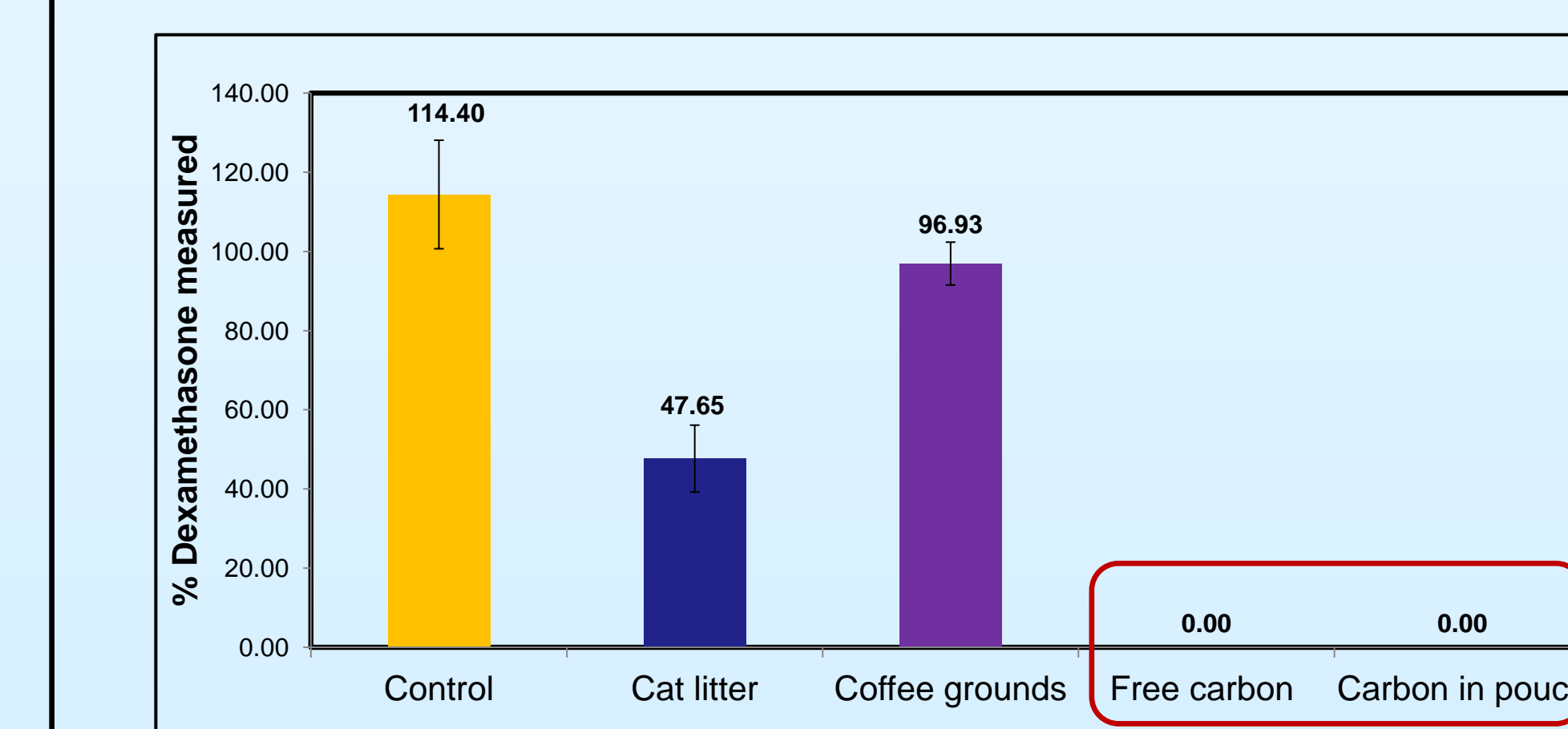


Dexamethasone sodium phosphate

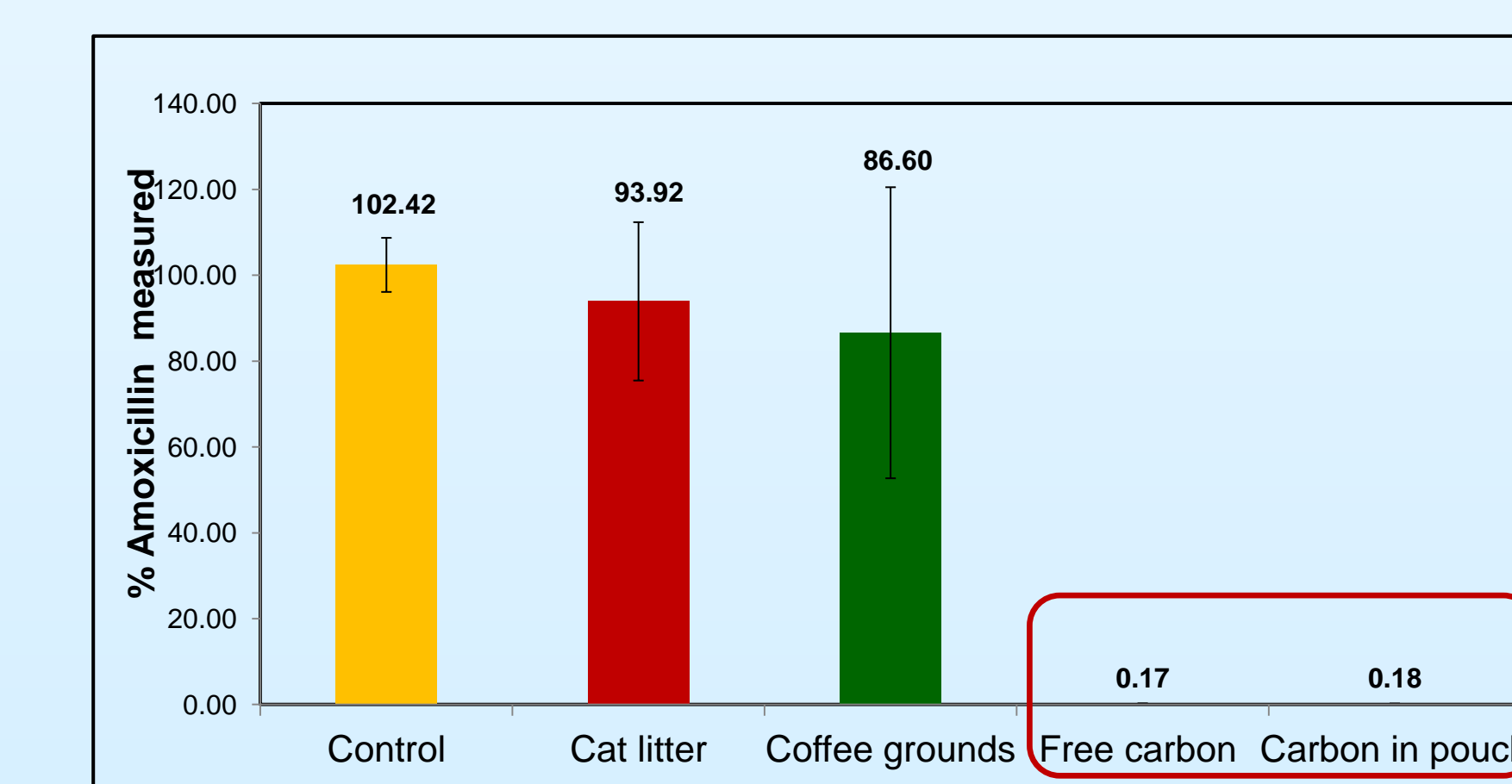


Amoxicillin hydrochloride

### Test of different adsorption agents



Dexamethasone



Amoxicillin trihydrate

## Conclusion

- Activated carbon (both free and in perforated pouch) was the most efficient deactivation agent for dexamethasone pills and amoxicillin capsules; both the drugs were completely deactivated by activated carbon
- Cat litter deactivated 48 % of dexamethasone whereas coffee grounds showed no effect on deactivation at end of gallon jug study
- The percent of amoxicillin measured at the end of study(gallon jugs) for adsorption agents cat litter and coffee grounds was 94% and 87 % respectively
- Dilution of samples, from free carbon and carbon in pouch, in gallon jugs did not affect the deactivation of dexamethasone and amoxicillin by these agents
- Safe disposal of solid dosage forms can be accomplished using this adsorption agent

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