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Effect of Activated Charcoal on Diethylcarbamazine Absorption in Humans


INTRODUCTION

Benzimidazoles (DEC) were discovered in 1947 as a potent therapeutic agent in amebic liver abscess and has been a major form of antimalarial therapy over the past five decades. Several hundred million doses of this drug have been administered to people. The maximum dose of 10 mg/kg body weight/day is rapidly excreted and harmless. The well-known reaction to treatment is nausea, vomiting, and diarrhea, and dyspepsia due to decreased motility of the stomach and intestines. The reaction may be fatal in infants or in a group of 327 patients treated with DEC, there were 27 deaths, seven of whom attributable to treatment. Six of the 15 patients treated by Keyes and Anderson became medically bedridden, one collapsed, and another became amnestic. Previous workers showed that the treatment of uncomplicated DEC has potentially dangerous, and amebic symptoms are not effective in the management of this reaction, whereas one of a concurrent drug is simply asymptomatic.

The present study investigated the effect of activated charcoal (AC) on DEC with a view of explaining the former in the cases of overdose or gastrointestinal reactions of the latter.

MATERIALS, METHODS, AND SUBJECTS STUDIED

Study design

Six healthy male volunteers aged 19 to 28 years participated in the study after giving informed consent. The subjects' weights ranged from 56 to 75 kg, and their health status was assessed by reviewing their medical history. The subjects were not taking any prescribed medication, had no sensitivity to DEC or AC, had no history of abnormalities, and had not consumed DEC within 1 week of the study.

The study was initiated with a single oral dose of 150 mg DEC equivalent to three standard-35-mg DEC tablets, along with 350 mL water. The study commenced at 00:00 hours after an overnight fast. One and 13 hours later, the subjects were selected in a randomized fashion injected the same dose of DEC, immediately followed by 7.5 and 15 g AC. Ultrasound, Merck, West Point.
Pharmacokinetic calculations

For each subject a plot of the cumulative amount of DEC excreted in the urine was made.

The amount of DEC recovered in each of the tests was calculated from the cumulative urinary excretion
and percentage recovery was determined.

The cumulative amount of DEC excreted was obtained by
adding the amounts of the drug excreted in the sampling
time samples. The excretion rate (mg/hr) was determined
using the method of Klopper.

Statistical analysis

The differences between sample means were analyzed
using Student's t test for paired data with statistical
significance defined as P < .05.

RESULTS

Figure 1 shows the effect of AC on DEC absorption. A
cumulative plot of the amount of DEC excreted reached
a plateau at approximately 24-72 hours after the
oral administration of 150 mg. A similar cumulative
plot of the amount of DEC excreted after ingestion of
150 mg of the drug with 7.5 and 15 g of AC showed
a much lower plateau indicative of reduced absorption
of the drug.

Table 1 indicates the amount of DEC recovered from
the urine for each of the three tests. The test group
that received 15 g of AC showed the least absorption
of DEC with only 5.4% recovery of the drug in the urine.
The excretion rate of DEC is shown in Fig. 1. Doses of
7.5 and 15 g of AC showed a significant reduction in the
excretion rate of DEC.

DISCUSSION

This study shows conclusively this significant and
consistent absorption of DEC by AC takes place in the
gastrointestinal tract of humans. The absence of multiple
peaks in the cumulative urinary excretion plot tend to
lead credence to the fact that the DEC did
absorb from the DEC-AC complex to a clinically sig-
ificant extent.

Table 1. Amount of DEC recovered from urine.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>DEC alone</th>
<th>DEC + 7.5 g AC</th>
<th>DEC + 15 g AC</th>
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<tr>
<td>DEC recovered (mg)</td>
<td>75.07 ± 4.46</td>
<td>22.12 ± 2.04*</td>
<td>8.16 ± 1.23*</td>
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<tr>
<td>Percentage recovered</td>
<td>46.7</td>
<td>14.8</td>
<td>5.4</td>
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*Significance was established using Student's t test at P < .05.
Values are expressed as mean ± SEM for N = 8.

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Infarction or drug overdose is not usually discovered immediately; hospital experience shows that 20 minutes to 4 hours lapse before medical attention is requested. We did not have this consideration in the present study because the AC and DEC were administered simultaneously. Despite this apparent discrepancy, the significant reductions in both the quantity of DLC recovered in urine and excretion rates suggest that the charcoal can "catch up" even if there was a time lag.

REFERENCES