

Absorption Test of Calcium Aspartate Anhydrous

Various calcium compounds including calcium aspartate anhydrous, calcium citrate, calcium aspartate dihydrate, calcium amino acid chelates and calcium carbonate, were tested for calcium absorption rate. It is demonstrated that calcium aspartate anhydrous has a significantly higher calcium absorption rate than those of other calcium compounds tested.

Materials and Equipment

- (1) Rats: pure breed SD rats of average body weight of 135g (120-150g) were provided by Academic Sinica.
- (2) Apparatus: VM3 Vortex Mixer was produced by Shanghai Guanghua Scientific Apparatus and Materials Co. Ltd; Centrifuge CR7 was produced by Hitachi; DT-100 Single Pan Balance was produced by Beijing Optical Apparatus Factory.
- (3) Calcium deficient forage.
- (4) Calcium aspartate anhydrous (13%) was formulated into solutions with calcium concentration of 3.6mg/ml.
- (5) Calcium citrate (20.3%) was formulated into a mixed suspension with calcium concentration of 3.6mg/ml.
- (6) Calcium aspartate dihydrate (19.2%) was formulated into a mixed suspension with 3.6mg/ml calcium concentration.
- (7) Calcium amino acid chelates (11.2%), was formulated into a mixed suspension with 3.6mg/ml calcium concentration.
- (8) Calcium carbonate (40.0%) was formulated into a mixed suspension, which has a calcium concentration of 3.6mg/ml.

Groups and Dosage

- (1) Group A: each rat was dosed orally (gavage) twice (1ml each time) a day with 53mg/kg body weight of calcium aspartate anhydrous.
- (2) Group B: each rat was administrated orally twice (1ml each time) a day with 53mg/kg body weight of calcium citrate.
- (3) Group C: each rat was fed twice (1ml each time) a day with 53mg/kg body weight of calcium aspartate dihydrate.
- (4) Group D: each rat was dosed twice (1ml each time) a day with 53mg/kg body weight of calcium amino acid chelates.

- (5) Group E: each rat was fed twice (1mg each time) a day with 53mg/kg body weight of calcium carbonate.

Procedures

- (1) One hundred twenty pure breed SD rats were divided evenly into six groups set forth: the calcium aspartate anhydrous group, the calcium citrate group, the calcium amino acid chelates group and the calcium carbonate group.
- (2) Rats in every group were fed with calcium deficient forage for three days before administration of prepared agents.
- (3) Rats were contained separately in individual stainless steel metabolic cages. Excreta were collected for seven consecutive days. The excreta were then nitrated and assayed for calcium using AAS method.
- (4) At the end of testing 5-6ml plasma was drawn from the heart and centrifuged. Serum was isolated and assayed for calcium using AAS method.

Results

- (1) Urine calcium concentration is reported in Table 1.

Table I. Urine Calcium Concentration

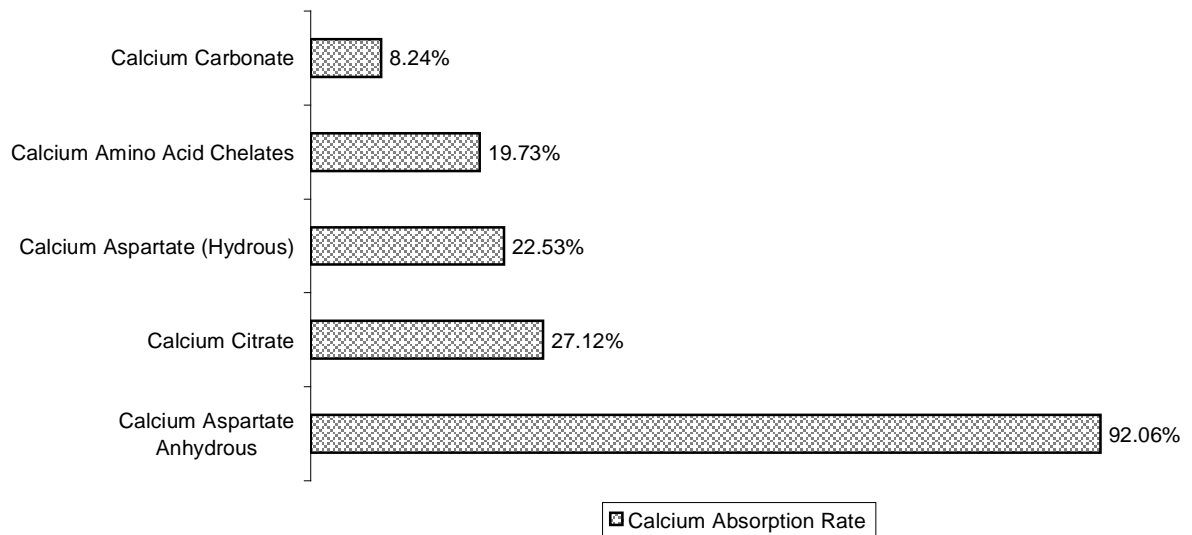
| Group | Urine Calcium Concentration ($\mu\text{g/ml}$) |
|---------------------------------------|--|
| A: calcium aspartate anhydrous | 89.30 |
| B: calcium citrate | 68.35 |
| C: calcium aspartate dihydrate | 65.34 |
| D: calcium amino acid chelates | 56.93 |
| E: calcium carbonate | 51.03 |

- (2) Stool calcium concentration and calcium absorption rates are shown in Table 2 and the chart below.

Table II. Stool Calcium Concentration

| Group* | Ca Concentration ($\mu\text{g/g}$) | Total Ca in the Stool (mg) | Total Ca Intake (mg) | Ca Absorption Rate (%) |
|---------------|--|---------------------------------------|---------------------------------|-----------------------------------|
| A | 132.32 | 4.00 | 50.40 (3.6x2x7) | 92.06 |
| B | 1,456.96 | 36.73 | 50.40 (3.6x2x7) | 27.12 |
| C | 1,608.57 | 39.04 | 50.40 (3.6x2x7) | 22.53 |
| D | 1,679.34 | 40.46 | 50.40 (3.6x2x7) | 19.73 |
| E | 1,712.92 | 46.25 | 50.40 (3.6x2x7) | 8.24 |

* Group A: calcium aspartate anhydrous B: calcium citrate C: calcium aspartate dihydrate
 D: calcium amino acid chelates E: calcium carbonate

Figure 1. Calcium Absorption Test Results

(2) Serum calcium level

Serum Ca levels after administration of different calcium preparations are shown in Table III.

Table III. Serum Ca Levels After Administration

| Group | Serum Calcium Level ($\mu\text{g/ml}$) |
|---------------------------------------|--|
| A: calcium aspartate anhydrous | 84.50 |
| B: calcium citrate | 66.60 |
| C: calcium aspartate dihydrate | 62.80 |
| D: calcium amino acid chelates | 63.40 |
| E: calcium carbonate | 59.20 |

Conclusion

The test results show that calcium aspartate anhydrous is well absorbed in rat body and has a significantly higher calcium absorption rate than those of other calcium agents including calcium citrate, hydrous form of calcium aspartate, calcium amino acid chelates and calcium carbonate.