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Daily Medication Volume of Phosphate Binder Therapies

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BACKGROUND

- Elevated phosphate concentrations are associated with a significantly increased risk of cardiovascular events and mortality in patients with chronic kidney disease[1]
- Current KDIGO guidelines recommend lowering elevated serum phosphorus concentrations toward the normal range in patients with end-stage kidney disease on dialysis through restriction of dietary phosphorus intake, increase in clearance by dialysis, and the use of phosphate binders[2]
- However, 78% of patients are not adherent to phosphate binders[3], possibly due to the phosphate binders' large size and high pill burden[4]
- This high daily medication volume creates a barrier to adherence and can negatively impact the quality of life
- Thus, a phosphate binder that maintains efficacy with a lower daily medication volume could improve adherence, quality of life, and potentially clinical outcomes

OBJECTIVE

The goal of this study was to assess the volume of lanthanum dioxycarbonate required to bind 1 g phosphate and to compare it with other currently available phosphate binders, to determine which binder allows for the highest normalized potency with the lowest daily medication volume

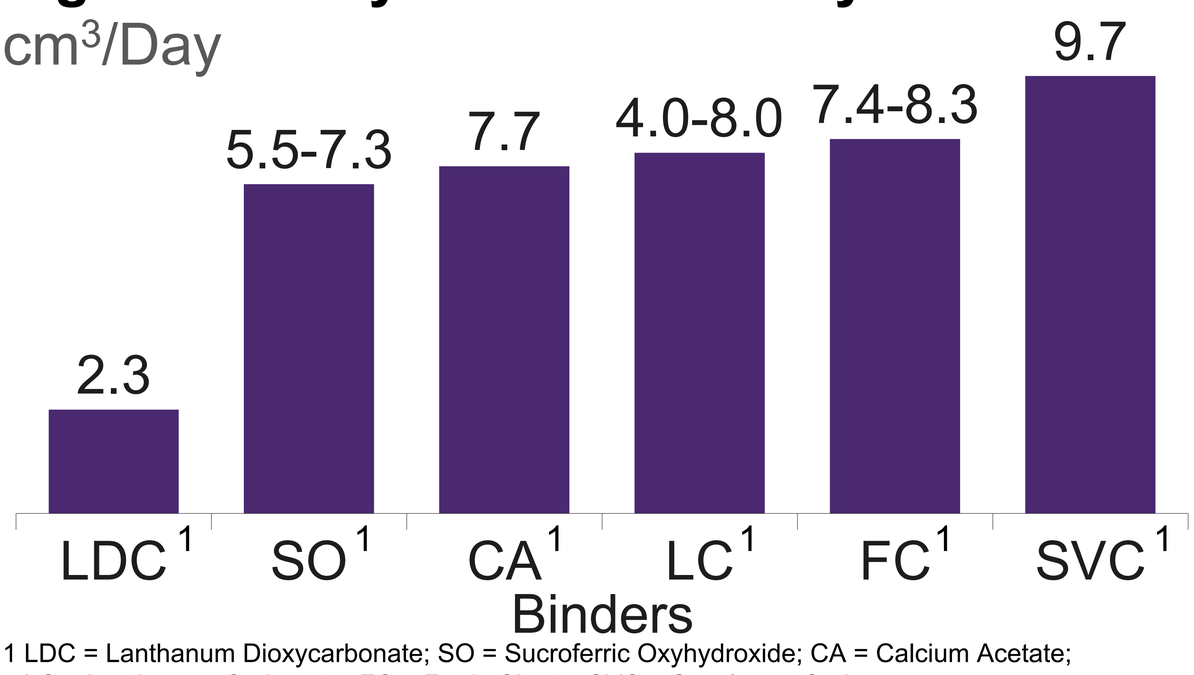
METHODS

- Six phosphate binders were assessed: ferric citrate (210 mg ferric iron), calcium acetate (169 mg calcium), lanthanum carbonate (500 and 1,000 mg lanthanum), sevelamer carbonate (800 mg sevelamer carbonate), sucroferric oxyhydroxide (500 mg ferric iron), and lanthanum dioxycarbonate (500 and 1,000 mg lanthanum)
- Table volume measurements were taken using fluid displacement in corn oil or water
- Mean daily dose volume to bind 1 g of phosphate was calculated as volume per tablet multiplied by the mean number of tablets taken per day
- Volume to bind 1 g of phosphate was calculated by dividing the volume per tablet by its in vivo binding capacity, based on NIH DailyMed website[5]

RESULTS

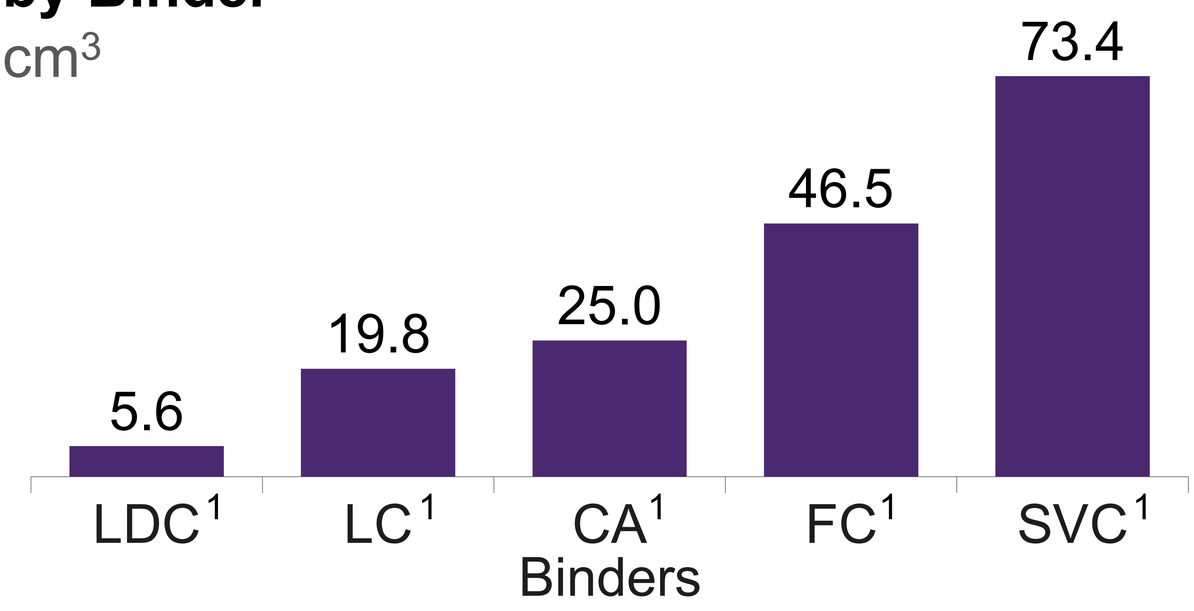
- The daily dose volume of lanthanum dioxycarbonate was 2.3 cm^3/day, and the range of volumes for all other phosphate binders was 5.5-9.7 cm^3/day **(Figure 1)**
- Binding to 1 g of phosphate required 5.6 cm^3 of lanthanum dioxycarbonate (7.5 pills) compared with lanthanum carbonate (19.8 cm^3, 7.4 pills), calcium acetate binders (25.0 cm^3, 33.3 pills), ferric citrate (46.5 cm^3, 50.5 pills), and sevelamer carbonate (73.4 cm^3, 68 pills) **(Figure 2)**

Figure 1. Daily Dose Volume by Binder



1 LDC = Lanthanum Dioxycarbonate; SO = Sucroferric Oxyhydroxide; CA = Calcium Acetate; LC = Lanthanum Carbonate; FC = Ferric Citrate; SVC = Sevelamer Carbonate

Figure 2. Volume to Bind 1 g of Phosphate by Binder



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CONCLUSIONS

- Lanthanum dioxycarbonate and sevelamer carbonate had the lowest and highest daily dose volume, respectively
- The daily dose volume of lanthanum dioxycarbonate was 3- to 4-fold lower than other phosphate binders
- Lanthanum dioxycarbonate has the lowest volume to bind the same amount of phosphate compared to other binders

IMPLICATIONS

- With a low medication volume and high phosphate binding capacity, lanthanum dioxycarbonate, a novel investigational nanotechnology product, can be a welcoming choice for patients to manage their hyperphosphatemia
- The drug's decreased size (making it easy to swallow) and tolerability have the potential to increase medication adherence and phosphate control

References:

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