

Novel iron-oxide based Nanoparticles for Treating Hyperphosphatemia

Ref. No.: CH557

Background

Patients with impaired renal function develop a disturbed phosphate and calcium metabolism. The elevated phosphate serum level (Hyperphosphatemia) increases the risks for cardiovascular diseases such as atherosclerosis, myocardial infarction and stroke. Although almost all hemodialysis patients are treated with oral phosphate adsorbents, less than 50% of treated patient reach the recommended target serum phosphate level. State of the art oral phosphate binders which bind phosphate in the gastrointestinal tract, show either adverse effects, such as e.g. calcium-, aluminium- or Lanthanum-based (e.g. Fosrenol®) phosphate binders or are not able to lower sufficiently the phosphate serum level such as e.g. currently clinical tested iron oxide based phosphate adsorbents (e.g. Velphoro).

Technology

Novel maghemite-based iron oxide nanoparticles have been developed which are highly efficient in lowering phosphate serum level. The special coating of the iron oxide core with mannitol (or other carbohydrates) in combination with inulin and gum fibers as excipient results in a very effective phosphate binding surface and in suitable physicochemical properties of the particles. Analytical *in vitro* results show that the new iron particles (C-PAM) have better phosphate adsorption capacity than the iron based adsorbents Velphoro or SBR759. In rats feed with C-PAM (0,5 w/w % iron / g food), the serum phosphate level even becomes lowered under the target serum level (=Hypophosphatemia) in contrast to rats treated with Reneval or the new iron-oxyhydroxide based phosphate lowering drug Velphoro. Furthermore *in-vivo* preclinical testing by chow co-feeding with C-PAM revealed a serum phosphate reduction which exceeds published data for the new NaPi2b-transport inhibitor and the NHE3-Sodium-Transporter (Tenapanor), indicating for C-PAM serum phosphate lowering mechanisms beyond simple adsorption.

Benefits

- ✓ Improved phosphate adsorbing efficiency (1,5 g PO₃ / g iron)
- ✓ Low manufacturing costs, simple manufacture
- ✓ Further assumed mode of action: Reduction of NaPi2 transporter protein expression in the small intestine
- ✓ Reduced pill burden (1 -1,5 g per day, estimated on preclinical data)

Application

Oral phosphate adsorbent for treatment of hyperphosphatemia

Commercial Opportunity

Searching for a licensing or strategic partner

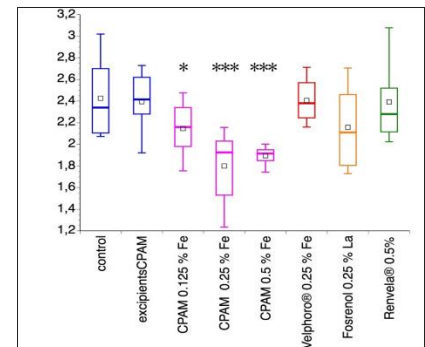


Fig. 1: C-PAM lowers serum phosphate better than Velphoro®, Fosrenol® and Reneval® in healthy rats after a four-week co-feeding

Key words

Phosphate adsorbent, phosphate binder, iron oxide particle, maghemite, magnetite, hyperphosphatemia, renal disease, kidney disease

Developmental Status

In vivo

IP Status

US and DE priority application 09/2011
Pending patent applications 09/2011:
EP, BR, CA, IN, US, KR, MX, PH, ZA
Patents granted in AU, CN, JP (2017)
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publication [here](#)

Patent Owner

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