elimination is through the kidney and they are quite stable compounds, bisphosphonates can accumulate to toxic levels in patients with compromised or no kidney function. While a number of these analogs are currently used to treat osteoporosis, their use in end stage renal disease is contraindicated because patients cannot excrete the drug and unlike pyrophosphate they are not broken down by the ubiquitous circulating pyrophosphate degradative enzymes such as alkaline phosphatase. Their accumulation is thought to result in softening of bone thereby reducing their applicability.

SUMMARY

[0007] The present disclosure relates to methods and compositions for reducing, preventing or reducing the progression of vascular calcification in patients. In a first aspect, the present invention refers to the use of pyrophosphate ranging between 30 μM and 150 μM in the manufacture of a medicament for reducing, preventing or reducing the progression of vascular calcification in a patient wherein the pyrophosphate is comprised in a dialysis solution and wherein the solution is to be administered to the patient during peritoneal dialysis therapy. In a second aspect, the present invention refers to a dialysis solution comprising a therapeutically effective amount of pyrophosphate ranging between 30 μM and 150 μM. In a third aspect, the present invention refers to a multi-part dialysis product comprising: a first part comprising at least one of a concentrated pyrophosphate solution or a pyrophosphate powder; and a second part comprising a dialysis solution, the combination of the first part and the second part forming a mixed solution comprising a therapeutically effective amount of pyrophosphate ranging between 30 μM and 150 μM. In a fourth aspect, the present invention refers to a solution comprising a therapeutically effective amount of pyrophosphate ranging between 30 μM and 150 μM. In a fifth aspect, the present invention refers to a multi-part dialysis product comprising: a first part comprising at least one of a concentrated pyrophosphate solution or a pyrophosphate powder; and a second part comprising a dialysis solution, wherein the first part is stored in a separate container from the second part, the combination of the first part and the second part capable of forming a mixed solution comprising a therapeutically effective amount of pyrophosphate ranging between 30 μM and 150 μM. In a sixth aspect, the present invention refers to the use of pyrophosphate ranging between 30 μM and 150 μM in the manufacture of a medicament for reducing, preventing or reducing the progression of vascular calcification in a patient, wherein the patient is to be administered during peritoneal dialysis therapy at least one of a concentrated pyrophosphate solution or a pyrophosphate powder that is diluted prior to or during the administration to provide the patient a therapeutically effective amount of pyrophosphate. In a general example~~mbodiment~~, the method comprises administering to a patient during peritoneal dialysis

therapy a dialysis solution including a therapeutically effective amount of pyrophosphate ranging between about 30 μM and about 400 μM. Formulations of dialysis solutions according to the dose ranges claimed in the present disclosure allow therapeutically effective amounts of pyrophosphate to be delivered to peritoneal dialysis therapy patients. The therapeutically effective amounts of pyrophosphate are sufficient to be maintained in the patient's body to reduce, prevent or reduce the progression of vascular calcification without adversely affecting the patient. The peritoneal dialysis therapy can be, for example, automated peritoneal dialysis, continuous ambulatory peritoneal dialysis or continuous flow peritoneal dialysis.

[0008] In an example~~embodiment~~ of the method, the pyrophosphate ranges between about 30 μM and about 300 μM in the dialysis solution. The dialysis solution can be in the form of a single solution, a concentrate that is subsequently diluted, or a multi-part dialysis product. The pyrophosphate can be pyrophosphoric acid, salt of pyrophosphate or a combination thereof. In an example~~embodiment~~, the pyrophosphate is tetra sodium pyrophosphate.

[0009] In an example~~embodiment~~ of the method, the dialysis solution includes one or more dialysis components including osmotic agents, buffers, electrolytes or a combination thereof. The osmotic agent can be glucose, glucose polymers, glucose polymer derivatives, cyclodextrins, modified starch, hydroxyethyl starch, polyols, fructose, amino acids, peptides, proteins, amino sugars, glycerol, N-acetyl glucosamine or a combination thereof. The buffer

can be bicarbonate, lactate, pyruvate, acetate, citrate, tris, amino acids, peptides, an intermediate of the KREBS cycle or a combination thereof.

[0010] In another example~~embodiment~~, the present disclosure provides a dialysis solution including a therapeutically effective amount of pyrophosphate ranging between about 30 μM and about 400 μM. In an alternative example~~embodiment~~, the pyrophosphate ranges between about 30 μM and about 300 μM. The dialysis solution can be in the form of a single solution, a concentrate or a multi-part dialysis product. The pyrophosphate can be pyrophosphoric acid, salt of pyrophosphate or a combination thereof. In an example~~embodiment~~, the pyrophosphate is tetra sodium pyrophosphate.

[0011] In an example~~embodiment~~ of the dialysis solution, the solution further includes one or more dialysis components such as osmotic agents, buffers, electrolytes or a combination thereof. The osmotic agent can be glucose, glucose polymers, glucose polymer derivatives, cyclodextrins, modified starch, hydroxyethyl starch, polyols, fructose, amino acids, peptides, proteins, amino sugars, glycerol, N-acetyl glucosamine or a combination thereof. The buffer can be bicarbonate, lactate, pyruvate, acetate, citrate, tris, amino acids, peptides, an intermediate of the KREBS cycle or a combination thereof.

[0012] In an example~~embodiment~~ of the dialysis solution, the dialysis solution can be in the form of at least two dialysis parts housed separately and the pyrophosphate is present with at least one of the dialysis parts and sterilized with said dialysis part.

[0013] In an alternative example~~embodiment~~, the present disclosure provides a multi-part dialysis product including a first part having a concentrated pyrophosphate solution and/or a pyrophosphate powder, and a second part having a dialysis solution. The combination of the first part and the second part form a mixed solution having a therapeutically effective amount of pyrophosphate ranging between about 30 μM and about 400 μM.

[0014] In another example~~embodiment~~, the present disclosure provides a solution comprising a therapeutically effective amount of pyrophosphate ranging between about 30 μM and about 400 μM.

[0015] In yet another example~~embodiment~~, the present disclosure provides a method of reducing, preventing or reducing the progression of vascular calcification in a patient. The method comprises administering to the patient during peritoneal dialysis therapy a concentrated pyrophosphate solution and/or a pyrophosphate powder that is diluted prior to or during the administration to provide the patient a therapeutically effective amount of pyrophosphate ranging between about 30 μM and about 400 μM. The concentrated