MONOGRAPH

PHOSPHATE

Scope (Staff):	Medical, Pharmacy, Nursing, Anaesthetic Technicians
Scope (Area):	All Clinical Areas

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this DISCLAIMER

⚠ HIGH RISK MEDICINE ⚠

QUICKLINKS

Dosage/Dosage Adjustments	Administration	Compatibility	Monitoring

DRUG CLASS

Phosphate is the principal anion of intracellular fluid. It is involved in many physiological processes including metabolism of carbohydrates and lipids, bone structure, the storage and transfer of energy, the buffering of body fluids and in renal excretion of hydrogen ions.[1]

Phosphate salts have an osmotic laxative effect when given orally or rectally.[2]

Phosphate is a High Risk Medicine.

INDICATIONS AND RESTRICTIONS

Phosphate is used at PCH for the management of:

- Hypophosphataemia
- Hypophosphataemic rickets
- Osteomalacia
- Constipation

National PIC Hypophosphataemia Clinical Practice Guideline is available here**:**

Hypophosphataemia

The PCH **"Refeeding Syndrome Prevention and Management in Malnourished Children" Guideline** is available here:
Refeeding Syndrome Prevention and Management in Malnourished Children

Neonatal guidelines are available here:
KEMH - Phosphate (buffered)

CONTRAINDICATIONS[2,3]

- Hypersensitivity to phosphate or any components of the formulation
- Hyperphosphataemia
- Hyperkalaemia
- Hypocalcaemia
- Gastrointestinal obstruction (rectal administration)
- Severe renal impairment
- Urolithiasis (exacerbates struvite calculi formation)

PRECAUTIONS[2,3]

- Dehydration
- Congestive heart failure
- Uncontrolled hypertension (for sodium-containing phosphate preparations)
- Renal impairment: monitor and consider dose reduction and/or consultation with renal team
- Conditions associated with increased colonic absorption (e.g.Hirschsprung disease) (rectal administration)
- Imperforate anus (rectal administration)
- Inflammatory bowel disease (rectal administration)
- Diabetes mellitus – avoid phosphate-containing laxatives due to the risk of acute renal failure[3,4]

Consider other sources of phosphate the patient may be taking, e.g. from TPN or lipid emulsions

Some phosphate preparations have a high sodium and potassium content

American references (and some others) may use mEq (milliequivalents) instead of mmol. To avoid confusion, use of mEq is **not** permitted at PCH.

FORMULATIONS

Listed below are products available at PCH, other formulations may be available, check with pharmacy is required:

Oral formulations:

Phosphate 500 mg [of *phosphorus*] effervescent tablets.
Equivalent to 16.1 mmol of phosphate per tablet.
Also contains 20.4 mmol of sodium and 3.1 mmol of potassium per tablet.

Sodium Phosphate Buffered Solution 95 mg/mL [of *phosphate*].
Equivalent to 1 mmol/mL of phosphate ions.
Also contains 1.63 mmol/mL of sodium ions and 0.18 mmol/mL of potassium ions.

Parenteral formulations:

During Pharmacy opening hours Monday to Friday, contact the ward pharmacist if Potassium Dihydrogen Phosphate vials are required, during weekends and public holidays send a non-imprest request with a copy of the parenteral fluid therapy order chart to the main pharmacy. After hours, Potassium Dihydrogen Phosphate vials may be accessed via an ADM from other areas of the hospital under the explicit direction of the on-call pharmacist.

Potassium Dihydrogen Phosphate
Contains 1.361 grams of potassium dihydrogen phosphate in 10 mL.
Equivalent to 1 mmol/mL of potassium ions and 1 mmol/mL of phosphate ions.

Sodium Dihydrogen Phosphate
Contains 1.56 grams of sodium dihydrogen phosphate dihydrate in 10 mL.
Equivalent to 1 mmol/mL of sodium ions and 1 mmol/mL of phosphate ions.

Rectal formulation:
Fleet® ready-to-use enema 133 mL
Contains sodium phosphate monobasic 19 g and sodium phosphate dibasic 7 g in each 118 mL delivered dose.

Imprest location: Formulary One

DOSAGE & DOSAGE ADJUSTMENTS

Neonates: **Refer to Neonatal Medication Protocols**

Dosing in Overweight and Obese Children:

- Calculate dose based on Measured Body Weight (MBW)

In addition to phosphate, consideration must be given to the corresponding amount of sodium or potassium also present in each preparation.

HYPOPHOSPHATAEMIA (excluding refeeding syndrome)

Severe hypophosphataemia should be treated with IV phosphate to avoid diarrhoea associated with high dose oral treatment.

Oral [4,7]

- 4 weeks – < 5 years: 2 – 3 mmol/kg/day (max 48 mmol/day) in 2 - 4 divided doses, adjust as necessary.
- 5 years – 17 years: 2 – 3 mmol/kg/day (max 97 mmol/day) in 2 - 4 divided doses, adjust as necessary.

IV [7]

Consider the potassium content of intravenous phosphate preparations. Potassium dihydrogen phosphate vials also contain 1 mmol/mL potassium.

- 4 weeks – 18 years: 0.36 mmol/kg via slow IV infusion

The dose may be repeated to a maximum of 2 mmol/kg/day (maximum 70 mmol/day)

IM/Subcut/IV bolus: not recommended.[6]

REFEEDING SYNDROME

Refer to the: **Refeeding Syndrome Prevention and Management in Malnourished Children Guideline**

CONSTIPATION

Onset of action is up to 30 minutes after rectal administration. Avoid, if possible (especially if < 5 years of age) due to increased risk of renal damage (including acute renal failure), dehydration and electrolyte disturbance (deaths have occurred).[3]

Rectal: Using Fleet® ready-to-use enema[4]

- 3 years – < 7 years:
  40–60 mL (approximately ⅓ - ½) once daily
- 7 years – < 12 years:
  60–90 mL (approximately ½ - ¾) once daily

- 12 years – 17 years:
  90–118 mL (approximately ¾- whole bottle) once daily

Renal impairment:[1-4]

- Dosage adjustment is required in patients with renal impairment.
- eGFR calculator

Hepatic impairment:[1,2]

- No adjustment generally required.

ADMINISTRATION[3,6,7]

IV INFUSION:

NOTE: Rapid IV injection can result in hypocalcaemia and fluid overload. Rapid injection of potassium containing phosphate preparations may lead to arrhythmia / cardiac arrest.

Avoid extravasation as severe tissue necrosis can occur.

Careful and thorough mixing after dilution is essential to prevent pooling of phosphate solutions.

Potassium Dihydrogen Phosphate vials must not be added to an infusion bag once it has been hung for administration.

Concentration;

Using a compatible fluid dilute to;

- *Peripheral line:* 0.05 mmol/mL, or weaker
- *Central line:* 0.12 mmol/mL, or weaker

Administration time;

- Give via slow IV infusion over 6 hours.
- Rate should not exceed 0.2 mmol/kg/hour (maximum 10 mmol/hour).

ORAL:

Oral phosphate should be given either 1 hour before or 2 hours after antacids, calcium and magnesium.

RECTAL:

- Unscrew cap, remove and discard the excess volume of liquid then replace cap and administer.

COMPATIBILITY *(LIST IS NOT EXHAUSTIVE)*

Compatible fluids[4,6]:

Glucose 5%, Glucose 10%, Sodium chloride 0.9%

Incompatible fluids[6]:

Do not infuse with calcium containing IV fluids (e.g. Compound Sodium Lactate Solution [Hartmann's Solution]).

Only commonly used drugs are listed below. This is not a complete list of incompatible drugs. Compatibilities of IV drugs must be checked when two or more drugs are given concurrently.

INCOMPATIBLE drugs[6]:

Aciclovir, amiodarone, anidulafungin, calcium folinate, calcium salts, caspofungin, ceftaroline fosamil, ciprofloxacin, magnesium salts, mycophenolate mofetil, rocuronium.

MONITORING

IV: Monitor sodium, potassium, calcium and phosphate levels as well as renal function at least every 12 to 24 hours.[6] Repeat serum phosphate level 2 hours after repletion is complete.[3]

Consider cardiac monitoring in potassium containing preparations[7]

Oral: serum phosphate, calcium, sodium, potassium, renal function checked daily until stable and then at the discretion of the treating consultant.[8]

As phosphate administration may cause hypocalcaemia, patients should also be monitored for signs of tetany, e.g. muscle cramps, spasms and tremors.[6] Refer to the Calcium Monograph.

Monitor for signs of hyperkalaemia in patients receiving potassium-containing phosphate preparations, e.g. nausea, vomiting, abdominal discomfort, hypotension, paraesthesia of the extremities, listlessness, flaccid paralysis, mental confusion, weakness and heaviness of the legs[9].

ADVERSE EFFECTS[1-4]

Common: Diarrhoea

Infrequent: Hypotension, convulsions, muscle cramps, numbness, tingling, pain or weakness in hands or feet, shortness of breath or troubled breathing, tremor.

Phosphate-containing laxatives may cause dehydration, electrolyte disturbances, nausea, vomiting, abdominal pain, bloating, fatigue, anal irritation.

Rare: Myocardial infarction.

Metastatic calcification, which can cause hypotension and organ damage, may also lead to acute renal failure.

STORAGE

Store below 25°C

Potassium Dihydrogen Phosphate vials kept as imprest in clinical areas must be stored in a locking lid bin of an ADM.

INTERACTIONS

Phosphate has many interactions; consult PCH approved references (e.g. Clinical Pharmacology), a clinical pharmacist or PCH Medicines Information Service on extension 63546 for more information.

Please note: The information contained in this guideline is to assist with the preparation and administration of phosphate. Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related CAHS internal policies, procedures and guidelines

Calcium Monograph

High Risk Medicine Policy

KEMH - Phosphate (buffered)

Refeeding Syndrome Prevention and Management in Malnourished Children Guideline

References

1. MIMS Australia Pty Ltd. [online]. Potassium Dihydrogen Phosphate Phebra Concentrated Injection monograph. [cited March 2024]
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3. UpToDate: Potassium phosphate and sodium phosphate: Paediatric Drug Information. [Online] Available from: Potassium phosphate and sodium phosphate: Pediatric drug information - UpToDate (health.wa.gov.au) [Cited March 2024]
4. BNF for Children (BNFC) [Internet]. Pharmaceutical Press. 2024 [cited March 2024]. Available from: https://www-medicinescomplete-com.pklibresources.health.wa.gov.au/mc/bnfc/current/.
5. Ma RCW, et al. Acute renal failure following oral sodium phosphate bowel preparation in diabetes. 2007; 30(1): 182-3.

6. Sodium phosphate and potassium phosphate monograph. In Australian Injectable Drugs Handbook. 9th ed. [online] Melbourne: The Society of Hospital Pharmacists of Australia; 2024 [cited March 2024].
7. RCH Melbourne – Paediatric Improvement Collaborative. Hypophosphataemia Guideline. [Online]. Accessed March 2024. Available from: Clinical Practice Guidelines : Hypophosphataemia (rch.org.au)
8. PCH Refeeding Syndrome Prevention and Management in Malnourished Children Guideline [online] [cited March 2024].
9. Potassium dihydrogen phosphate monograph. In Australian Injectable Drugs Handbook. 9th ed. [online] Melbourne: The Society of Hospital Pharmacists of Australia; 2024 [cited March 2024].

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