Causes of Hypokalemia

Potassium is required for protein synthesis and to metabolize carbohydrates. It is required for the growth and development of muscles, as well as for normal body growth. Potassium is critically required by cells to maintain their electrical potential and to control their acid base balance. This is obviously important for nerve and muscle cells that require the ability to depolarize in order to function. Hypokalemia leads to flaccid paralysis of smooth and skeletal muscle.

First symptoms often include skeletal muscle cramps and weakness. The heart muscle is strongly affected by alterations in potassium levels, which lead to arrhythmias. Other symptoms include the constipation and fatigue.

In general, as people age, serum potassium levels go down such that an elderly patient is much more likely to be hypokalemic than a younger adult. Women are also more likely to be hypokalemic than men.

Loss of potassium from the gastrointestinal tract:

1. Vomiting
   a. Enteritis
   b. Anorexia nervosa
   c. Bulimia
   d. Drug-induced
2. Diarrhea
   a. Enteritis
   b. Drug-induced
   c. Irritable bowel syndrome
3. Git bypass surgeries
   a. Ileostomy
   b. Gastric Bariatric surgery
4. Git tumors
   a. Villous adenoma (Colon polyps that allow potassium to leak from colon)
   b. Other Git tumors
5. Use of laxatives or enemas
   a. Phenolphthalein
   b. Sodium polystyrene sulfonate
6. Radiation enteropathy (damage to the giT following cancer radiation therapy)
7. Drugs
   a. Fluconazole

Loss of potassium from the kidney:

1. Drug-induced hypokalemia
   a. Diuretics
      i. Thiazides
         1. Hydrochlorothiazide (Esidrix)
Causes of Hypokalemia

ii. Loop
   1. Furosemide (Lasix)

b. Corticosteroids
   i. Glucocorticoids
      1. Endogenous cortisol
      2. Prednisone
      3. Prednisolone
      4. Dexamethasone
      5. Hydrocortisone, etc.
   6. But not budesonide, fluticasone, mometasone, or flunisolide

ii. Mineralocorticoids
   1. Aldosterone
   2. Fludrocortisone (Florinef) – also used to treat orthostatic hypotension due to autonomic dysfunction in PD.

c. Antibiotics
   i. Penicillin-type
      1. Carbenicillin
      2. Ampicillin
      3. Nafcillin
      4. Penicillin-G
   ii. Aminoglycosides
      1. Gentamicin (Garamycin)
      2. Tobramycin

d. Antifungals
   i. Amphotericin B
   ii. Fluconazole (Diflucan)

e. Antineoplastic agents
   i. Cisplatin (Platinol)

f. Asthma and COPD medications (actually cause a shift of potassium from sera into cells)
   i. Beta 2 agonists
      1. Albuterol (Proventil)
      2. Terbutaline (Brethaire)
      3. Salmeterol (Serevent)
   ii. Theophylline (Theo-24)
   iii. Steroids (glucocorticoids, see above)

g. Other drugs or foods
   i. Pseudoephedrine (shifts potassium into cells from serum)
   ii. Verapamil (Covera – shifts potassium into cells from serum in HIGH doses)
   iii. Licorice containing glycyrrhizinic acid (which inhibits 11 β hydroxysteroid dehydrogenase type 2 in kidney cells – the enzyme that converts cortisol to cortisone and prevents cortisol activating the aldosterone receptor)

2. Diseases of the kidney or that affect the kidney
   a. Renal artery stenosis
b. Adrenal tumors or syndromes
   i. Cushing’s syndrome
      1. Too much cortisol (and aldosterone) secreted
   ii. Hyperaldosteronism
      1. Conn’s syndrome (primary hyperaldosteronism)
      2. Familial hyperaldosteronism Type 1 or Type 2
      3. Congenital adrenal hyperplasia
      4. Congenital dysfunction of the mineralocorticoid receptor
      5. Syndrome of apparent mineralocorticoid excess (missing 11 \( \beta \) hydroxysteroid dehydrogenase type 2 in kidney cells)

c. Congenital (genetic) disorders of renal tubular function
   i. Bartter syndrome
   ii. Gitelman’s syndrome
   iii. Fanconi syndrome
   iv. Liddle syndrome

d. Renal tubular acidosis
   i. Acute kidney failure
   ii. Chronic kidney failure

e. Low magnesium levels

f. Cancer and other blood dyscrasias
   i. Leukemia
   ii. Pernicious anemia


g. Alcoholism
   i. Delirium tremens

h. Alkalosis (as may occur with excessive vomiting)
   i. Diabetes mellitus
      i. Insulin – in large doses (as when used to treat the non-ketotic hyperosmolar state that sometimes occurs, especially in older diabetics) or when first started in uncontrolled diabetes.

j. Extreme hyperthyroidism
   i. Familial hypokalemic periodic paralysis
   ii. Hyperthyroidism
      1. Grave’s disease

Loss of potassium from other sources:

1. Sweating (The skin)