

Instructional Objectives / Learning Outcomes
DMP 775, Veterinary Clinical Pathology
Department of Diagnostic Medicine/Pathobiology
College of Veterinary Medicine, Kansas State University

Chapter 11: Calcium, phosphorus, magnesium, and their regulatory hormones

214. If given serum concentrations of calcium and phosphorus and other supporting information and pertinent patient information:
- a. List or classify abnormalities using appropriate terms.
 - b. Propose appropriate ideas or conclusions (i.e., diseases, syndromes, or pathologic states) that might cause the defined abnormalities.
 - c. Based on your conclusions or ideas, explain the pathogenesis of each defined abnormality if the abnormality could be caused by the disorder.
215. If routine laboratory assays are used, state what is represented by measured serum values for calcium, phosphorus (or phosphate), magnesium, PTH, PTHrp, and vitamin D.
216. Explain why serum protein (esp. albumin) concentrations should be known when you are interpreting a serum calcium concentration.
217. List the three major processes that produce hypercalcemia.
218. Explain and recognize the pathogenesis of hypercalcemia that may be found in the following conditions.
- a. Primary hyperparathyroidism
 - b. HHM
 - c. Rodenticide toxicosis
 - d. Systemic fungal infections
 - e. Equine renal failure
 - f. Canine hypoadrenocorticism
219. List the five major processes that produce hypocalcemia.
220. Explain and recognize the pathogenesis of hypocalcemia that may be found in the following conditions.
- a. Hypoalbuminemia
 - b. Primary hypoparathyroidism
 - c. Chronic renal disease in dogs, cats, and cattle
 - d. Pregnancy, parturient, or lactational hypocalcemia
 - e. Hyperphosphatemia
221. Explain and recognize the potential consequences of the following on serum, plasma, or blood [fCa^{2+}].
- a. Aerobic handling of serum, plasma, or blood sample
 - b. Delayed processing or handling of blood sample
 - c. Excess heparin in blood sample or its subsequent plasma sample
 - d. Collecting sample in an EDTA tube
222. Explain why and recognize that a [fCa^{2+}] may be useful in the following conditions.
- a. Concurrent hypocalcemia and hypoalbuminemia
 - b. Concurrent hypercalcemia and renal failure or multiple myeloma
 - c. Horses after an endurance or cross-country race
223. List the three major processes that produce hyperphosphatemia.
224. Explain or recognize the pathogenesis of a hyperphosphatemia that may be found in the following conditions:
- a. Azotemic animals

- b. Hypoparathyroidism
 - c. Acromegaly
 - d. Myopathies or extensive tissue necrosis
 - e. *In vitro* hemolysis
225. List the four major processes that produce hypophosphatemia.
226. Explain and recognize the pathogenesis of hypophosphatemia that may be found in the following conditions:
- a. Hyperparathyroidism
 - b. Anorexia
 - c. Hyperinsulinism
 - d. Milk fever
227. List the three major processes that produce hypermagnesemia.
228. Explain and recognize the pathogenesis of hypermagnesemia that may be found in the following conditions:
- a. Renal failure
 - b. Milk fever
 - c. *In vitro* hemolysis
229. List the three major processes that produce hypomagnesemia.
230. Explain and recognize the pathogenesis of hypomagnesemia that may be found in the following conditions:
- a. Hypoproteinemia
 - b. Prolonged anorexia
 - c. Grass tetany
 - d. Osmotic diuresis
 - e. Ketonuria
 - f. Metabolic alkalosis
231. Explain and recognize the pathogenesis of increased [PTH] that may be found in the following conditions:
- a. Primary hyperparathyroidism
 - b. Chronic renal disease
 - c. Diet with low $\text{Ca}^{2+}:\text{PO}_4$ ratio
232. Explain and recognize the pathogenesis of decreased [PTH] that may be found in the following conditions:
- a. Hypoparathyroidism
 - b. Hypervitaminosis D
 - c. HHM
233. If given appropriate values for serum $[\text{tCa}^{2+}]$, $[\text{Pi}]$, $[\text{Mg}^{2+}]$ and other supportive information or laboratory data, recognize data which are consistent with primary hyperparathyroidism, hypoparathyroidism, humoral hypercalcemia of malignancy, systemic fungal infections, hypoalbuminemia, renal insufficiency or failure (in different species), eclampsia or milk fever, growing animals, *in vitro* hemolysis, prolonged anorexia in carnivores, hypervitaminosis D, and hypoadrenocorticism.
234. Extra credit material
- a. Vitamin D section (p. 426-427)
 - b. Calcitonin section (p. 427-428)