Selected Blood Chemistry Values in Mobility-Impaired Broiler Breeder Hens with Suspected Calcium Tetany Using the i-STAT® Handheld Clinical Analyzer

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Important Findings
This study evaluated if hens with impaired mobility had calcium tetany or other abnormalities.

Normal hens and hens with signs consistent with calcium tetany were sampled from seven flocks. Significant hypocalemia in suspect hens was observed only in two of the seven flocks. Findings indicate calcium tetany is one cause of impaired mobility in breeder hens, but mobility impairment without hypocalemia can also occur.

Significance of Findings
Calcium tetany is a poorly defined disease of broiler breeder hens that results from acute hypocalemia. Calcium tetany should be confirmed by finding significantly decreased levels of ionized calcium (iCa) in the blood, as diagnosis based on clinical presentation and necropsy results can be inaccurate. The i-STAT® handheld clinical analyzer is an efficient, relatively low-cost method to determine iCa and other blood chemistry values that may be associated with impaired mobility in broiler breeder hens.

Additional Information
Calcium tetany is an acute metabolic disease of broiler breeder hens characterized by impaired mobility and acute hypocalemia at the onset of lay prior to peak egg production. Published descriptions are limited; however, calcium tetany is a common clinical diagnosis. Prepeak production hens are susceptible to calcium tetany because of metabolic shifts during the onset of egg shell formation. Acute loss of metabolically active iCa during shell formation depletes its availability for other physiological needs, predisposing hens to neuromuscular disease and cardiovascular failure. Neurological signs include lethargy, muscle tremors, incoordination, and paralysis. Affected hens are often unable to leave the breeding (“scratch”) area of the breeder house and behave similar to hens that are receptive to breeding. Excessive breeding of affected hens can occur and cause increased mortality from trauma. In addition to trauma, mortality may increase from hypocalemia-induced cardiovascular failure and inability to access feed and water. Mortality from calcium tetany can reach 1%–3% per week but typically decreases as hens come into peak egg production.

Additional calcium is typically introduced into the breeder diet when the flock is at 5%–10% egg production. Hens given additional calcium too early or given a high calcium breeder ration prior to reproductive maturity are predisposed to calcium tetany. High calcium in the diet of immature hens stimulates parathyroid hormone (PTH) release causing decreased calcium absorption through the gastrointestinal tract and decreased vitamin D metabolism in the kidney. Hypocalcemia can occur at the start of egg production when calcium becomes depleted from shell formation and hens abruptly shift from calcium excretion to calcium retention. Poor flock uniformity makes it difficult to determine when to start feeding a higher calcium breeder ration. Other factors that contribute to acute hypocalemia include feeding time, form of available calcium in the diet, and heat stress altering feed intake. Heat stress can cause respiratory alkalosis from hyperventilation that binds physiologically active calcium to maintain a normal acid/base balance making it unavailable to the bird.

Clinically, flocks and individual birds are often diagnosed with calcium tetany based only on clinical signs and necropsy findings, or response to treatment, without determining serum iCa levels. Affected hens are in good body condition, reproductively active, and often have an egg in the shell gland. Comb cyanosis, congestion of the lungs, and dark or irregularly colored skeletal muscles may be observed. Minimal response to treatment with supplemental calcium or vitamin D₃ in the field is often not interpreted as a treatment failure but rather that morbidity and mortality would have been worse if treatment had not been given. Excessive calcium supplementation may decrease the production of PTH and exacerbate the disease after supplementation is stopped.

Determining iCa levels in blood is the most appropriate way to diagnose calcium metabolism diseases in avian species. iCa is the physiologically active portion available for normal neuromuscular and cardiovascular function. Serum total calcium levels can vary up to 42% due to changes in plasma total protein concentration. Therefore, analyzing iCa is more accurate than evaluating total calcium. Analysis of iCa has been difficult in field situations because of storage and timing requirements for processing samples.

The i-STAT® handheld clinical analyzer is used in human and veterinary medicine to provide accurate and rapid information on electrolytes including iCa, glucose levels, acid/base status, and blood gases. Within the last decade, the i-STAT has successfully been used in the evaluation of avian patients including chickens. Recently, reference ranges were established for i-STAT blood values in broiler breeder hens. They were developed to assist with the evaluation of broiler breeders with metabolic diseases such as calcium tetany.