

## Metabolic Disorders: The Silent Threat to Poultry Health

Avantika Srivastav<sup>1</sup>, Ankit Jaiswal<sup>2</sup>, Ithrineni Karthik<sup>3</sup>

Ph.D. Scholar<sup>1,3</sup>, Division of Pathology, ICAR-Indian Veterinary Research Institute,  
Izatnagar, Bareilly, U.P, 243122

Ph.D. Scholar<sup>2</sup>, Department of livestock production management ANDUAT,  
Kumarganj, Ayodhya, U.P, 224229

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Poultry metabolic disorders pose a significant challenge to the poultry industry, causing great economic losses. These disorders are mainly due to the increased metabolic demands associated with rapid growth and high egg production, overwhelming the specific body systems in poultry. In this article, we delve into the various metabolic diseases affecting poultry.

### Introduction

Poultry metabolic diseases occur primarily in two body systems including the first cardiovascular ailments, which is common in broiler chickens and turkeys and are responsible for a major portion of the flock mortality. The other is musculoskeletal disorders, which account for less mortality.

Different metabolic diseases in poultry includes Fatty liver and kidney syndrome (FLKS), Hepatic steatosis, Fatty liver haemorrhagic syndrome (FLHS), Ascites, Round heart disease, Shaky-leg syndrome, Sudden death syndrome, Urolithiasis.

### Fatty Liver and Kidney Syndrome (FLKS)

Fatty Liver Kidney Syndrome (FLKS) is also referred to as fat nephrosis, pink disease, fatty liver and kidney disease. FLKD is a metabolic disorder prevalent in broiler chicks aged two to three weeks, primarily linked to biotin deficiency. This condition results in compromised hepatic gluconeogenesis and an upsurge in fat accumulation. The root cause lies in the diminished activity of the biotin-dependent enzyme, pyruvate carboxylase. Birds affected with FLKS face a fatal consequence of hypoglycemia, leading to their death. Clinical manifestations and mortality are directly associated with low blood sugar levels. Typically, FLKS manifests abruptly in the form of outbreaks, triggered by alterations in management practices, feed composition, or environmental factors affecting feeding. Despite being well-grown, affected broilers display noticeable symptoms such as aphagia, lethargy, weakness, and uncoordinated behavior. In severe



cases, chicks may be found lying on their breast with extended necks and legs. Recognizing the signs and understanding the connection to biotin deficiency is crucial for addressing and preventing Fatty Liver Kidney Syndrome in poultry.

### **Hepatic Steatosis**

Hepatic steatosis, commonly called as fatty liver syndrome. Arises when hens receive a low-protein, high-calorie diet, which exceeds their energy requirements, particularly in instances where egg production is insufficient. It is crucial to distinguish hepatic steatosis from fatty liver-haemorrhagic syndrom. Unlike FLHS, hepatic steatosis leads to a decline in egg production as hens accumulate excess fat without a significant increase in mortality. In contrast, FLHS is associated with elevated mortality rates, with little impact on egg production. Hens affected by FLHS succumb to hypovolaemic shock due to liver hemorrhage, and notably, these fatalities occur even in hens that are in full production. Understanding the distinctions between hepatic steatosis and FLHS is vital for implementing appropriate management practices and nutritional strategies to maintain the health and productivity of laying hens.

### **Fatty Liver Hemorrhagic Syndrome (FLHS)**

Fatty liver-hemorrhagic syndrome, very common in high-production commercial layers. It stands as a significant contributor to mortality rates, accounting for up to 5% of losses during the laying cycle. In layers, fat in diet is required to support egg development that can lead to increased fragility of liver. This will make the liver prone for rupture and hemorrhage. The rupture is not confined to the liver alone; the liver capsule, too, is prone to rupture, resulting in the formation of substantial blood clots within the ventral hepatoperitoneal sac of the affected lobe. It may lead to the formation of a hematoma within the liver, a condition that often cause a cessation in egg production. Understanding the intricate dynamics of fatty liver-haemorrhagic syndrome is crucial for the poultry industry to implement effective preventive measures. By addressing the fragility of the liver in high-production hens and mitigating the associated risks during egg-laying, poultry farmers can safeguard their flocks and contribute to the overall well-being and productivity of their commercial layers.

### **Ascites**

Ascites is common in broiler chickens, turkeys, and ducks. This condition is associated with right ventricular hypertrophy, pulmonary hypertension syndrome, and the notorious water belly phenomenon. Fluid leakage from increased vascular permeability can contribute to ascites, the predominant cause in birds is increased portal pressure. This elevated pressure often due to underlying issues such as right ventricular failure or liver damage. Understanding these factors is crucial for diagnosing and addressing ascites in avian species. Live birds affected by ascites may



exhibit a swollen abdomen and respiratory distress, especially in fast-growing broilers, correlating with their body weight.

This condition intensifies at high altitudes, where low oxygen tension in inhaled air exacerbates the situation. In an effort to meet metabolic demands, birds attempt to pump more blood through their lungs, placing extra stress on the right ventricle of the heart. Under normal circumstances, the right ventricle is relatively small, but in the context of ascites, it becomes grossly dilated, doubling in size. This weakened ventricle exerts back-pressure on various supply systems, resulting in the leakage of plasma from the liver, commonly known as ascitic fluid or water belly.

Understanding the intricacies of ascites is vital for poultry farmers to implement preventive measures. By addressing the root causes, such as right ventricular hypertrophy and pulmonary hypertension syndrome, the industry can work towards ensuring the optimal health and well-being of their flocks, mitigating the impact of this complex condition.

### **Shaky-Leg Syndrome**

Shaky-leg is a severe lameness. Mainly of male turkeys 8–18 weeks old, in which the turkeys are reluctant to rise and walk. This can be a major problem in some flocks. When forced to rise, turkeys stand with their bodies tipped forward and quiver with pain. The specific etiology is not clear, but the pain is caused by tendinitis. It becomes most obvious at the time leg tendons begin to ossify.

### **Sudden Death Syndrome**

Sudden Death Syndrome, also known as Acute Cardiac Death, Acute-death Syndrome, or Flip-over Disease, is a concerning phenomenon primarily observed in fast-growing broilers, particularly affecting males. Among the various manifestations of this syndrome, one notable occurrence is the sudden death of broiler breeders, layers, and broiler breeder hens, often attributed to hypocalcemia during the egg-shelling process. In these cases, the affected hens have typically extracted a significant amount of calcium from their bones, rendering them osteoporotic. An additional variant of sudden death syndrome specific to broiler breeder hens has been reported in Australia. This variant is associated with low dietary potassium levels and hypokalemia, particularly occurring at the onset of egg production. Understanding and addressing the specific nutritional and physiological factors contributing to sudden death syndrome is crucial for effective prevention and management in poultry farming.

### **Urolithiasis**

Urolithiasis, a condition characterized by the formation of concretions in the kidney tubules and ureters, is influenced by various nutritional factors, particularly the anion/cation ratio. Elevated levels of cations, in this case, can impact urine pH, leading to the development of kidney



stones. This condition poses a significant threat to birds, as the blockage of both ureters can result in hyperuricemia, ultimately leading to mortality. Affected birds may exhibit visceral urate deposits on their serous membranes, underscoring the severity of the condition. Notably, the composition of feed plays a crucial role in avian health. The detrimental effects of high sodium on kidney health are highlighted as the mechanism behind this involves the increase in blood viscosity caused by high sodium levels, reducing red blood cell deformability and potentially impeding blood flow through the capillaries in the glomerulus. Understanding and managing these factors are imperative in safeguarding avian well-being and preventing the onset of urolithiasis in poultry farming practices.

### **Gout**

Gout, a prevalent metabolic disease in laying chickens, manifests as the deposition of monosodium urate crystals in joints and visceral organs, contributing to sporadic occurrences throughout the year. Despite some instances being linked to infectious agents, the root causes of gout in chickens primarily stem from metabolic origins. The various factors include feed with elevated crude protein content, high salt levels in the diet, and the excessive use of sodium bicarbonate to combat heat stress, especially in layers aiming to improve eggshell quality. The alkalinity resulting from sodium bicarbonate usage promotes the formation of kidney stones in egg-laying birds. Moreover, dietary imbalances, such as low available phosphorus paired with high calcium intake, lead to the precipitation of calcium-sodium-urate crystals. Sodium intoxication, long-term vitamin A deficiency, water deprivation, and exposure to hard water with higher salt content are additional factors imposing a load on the kidneys, that lead to gout development.

The clinical symptoms of gout in chickens are diverse, encompassing a pasty vent with greenish feces, disability, staggering, frog-like posture, and swollen joint. The gross findings associated with gout reveal urate deposition on various organs such as the epicardium, air sac, and lungs. White chalky urate crystals form layers on the liver, intestine, and reproductive organs, leading to the sticking of soft-shell eggs in the uterus. Acute conditions may present urate crystals in the joint cavity. Recognizing these symptoms and findings is crucial for timely intervention and effective management of gout in laying chickens, ensuring their well-being and sustaining optimal egg production.

### **Conclusion**

Understanding and managing metabolic diseases in poultry are crucial for maintaining the health and productivity of flocks. Proper nutrition, monitoring, and early intervention are essential components of a comprehensive approach to mitigate the impact of these diseases on poultry farming. As the industry continues to evolve, ongoing research and advancements in



poultry health management will play a pivotal role in addressing and preventing metabolic disorders.

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