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Summary of the cumulative dissertation

CHARACTERIZING ENDOCRINAL AND TRANSCRIPTIONAL DETERMINANTS OF PHOSPHORUS UTILIZATION MEDIATED BY THE ENVIRONMENT-HOST INTERACTION IN LAYING HENS AND BROILER CHICKENS

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Efficient phosphorus (P) utilization in laying hens and broiler chickens is crucial for optimal growth, production, and welfare of the organism. Four studies were conducted to investigate responses elicited by laying hens and broiler chickens via endogenous determinants, including endocrinal, transcriptional, microbiota, and the bone mediating mineral P and Calcium (Ca) homeostasis and efficiency. Studies 1 and 2 conducted a holistic transcriptomic profiling on the jejunum of two commercial layer strains, considering the effects of age (study 1) and diets (study 2). Results from study 1 distinguished between layers in the pre-laying and laying phase endocrinal profiles, while the expression patterns of the jejunal mucosa responded directly to the changing metabolic profiles at the onset of egg-laying activity. This observations were significantly influenced by strain effects in study 2. Study 3 investigated responses elicited by the broiler chicken for adaptation following a dietary P depletion. Study 4 consolidated on findings in study 3 seeking to decipher the roles of the gut microbiota in the homeostatic compensatory mechanism in the broilers fed depleted P diets. Results in study 3 revealed a marked response to P depletion at the earliest developmental phase, showing the most severe response to the depletion compared to grower and finisher developmental stages. However, with advancing ages, the birds activated an effective compensatory mechanism. The contribution of the gut-microbiota of the jejunum to these compensatory mechanisms was subtle. Conclusively, reductions in P supply to broilers are possible, but precise timing, duration, and magnitude of a P depletion strategy in broiler chickens should be considered for optimized nutrient utilization for production, welfare, and health.