191 Meta-analysis of phosphorus ileal digestibility in growing broilers: effect of dietary phosphorus, calcium and phytase supply. C. Couture*[1], R. Chiasson[1], A. Narcy[2], and M.-P. Montminy[1], [1]*Université Laval, Quebec, QC, Canada,* [2]*UMRBOA, Nouzilly, France.*

A key element for sustainable poultry production system is the optimization of phosphorus (P) utilization efficiency. Optimizing P utilization requires improving our capacity to predict the amount of P absorbed and retained, taking into account the main modulating factors, and a precise determination of P requirements. Given the recent consensus of expressing P availability in poultry as ileal digestible P, published data are now numerous. A meta-analysis was therefore performed to quantify the impact of the dietary forms of P (Non-Phytate P (NPP) and phytate P (PP)), of the amount of dietary calcium (Ca) and of exogenous phytase on P apparent ileal digestibility in growing broilers. A database of 77 publications, reporting 112 trials and 693 treatments was used. Dietary forms of P, namely PP, NPP from plant, from mineral, ans from animal were recalculated based on feedstuff tables. Multiple linear regression models predicting the digestible P (Total P × Apparent Ileal Digestibility coefficient, g/kg) with the experiment as random effect showed that without phytase, the AID was higher in NPP from plant (0.75), followed by NPP from monocalcium phosphate (0.69), from animal origin (0.66), from dicalcium phosphate (0.55) and from Phytic P (0.53) ($P < 0.001$; $R^2 = 0.94$)). The inherent capacity of broilers to digest PP, however, showed a linear decrease with increasing dietary Ca (Ca × PP, $P < 0.001$). When expressing NPP as the sum of plant, mineral and animal it showed a linear and quadratic effect on digestible P ($P < 0.001$) indicating that a plateau is reached. In the overall database, dietary Ca as a negative effect on both NPP (Ca × NPP, $P < 0.001$) and PP (Ca × PP, $P = 0.03$). The increase in digestible P with the addition of microbial phytase (PhytM) was curvilinear ($P < 0.001$) and showed a higher effect and a more linear response in low than in high Ca diet (PhytM × Ca and PhytM × PhytM × Ca, $P < 0.001$). The response of digestible P to PhytM also depends on the amount of substrate (PhytM × PP, $P < 0.001$). These interactions showed that phytase efficiency is higher in high PP and low Ca diets. This meta-analysis improves our understanding of P digestive utilization, with major modulating factors taken into account. The information generated will be useful for the development of robust models to formulate environmentally friendly diets for growing broilers.

Key Words: phosphorus, digestibility, calcium, phytase, broilers