Plasma metabolites related to nitrogen efficiency in low and high birthweight pigs

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Birthweight of piglets has a major effect on average daily gain later in life, and therefore possibly influences nitrogen efficiency of pigs. Concentrations of particular plasma metabolites might be markers for nitrogen efficiency. The present study investigated differences in nitrogen metabolism between low and high birthweight pigs at grower-finisher age (~98-126 days of age) using untargeted metabolomics. Plasma samples were collected of 40 grower-finisher pigs (three-way crossbreeds, low or high birthweight) at onset of the experiment (D0), and after the first (D17) and second (D28) experimental period. In a change-over design, pigs were either fed a protein adequate (100%) or a protein restricted (70%) diet. Plasma metabolites were characterized by untargeted liquid chromatography–mass spectrometry, and results were subjected to a discriminant approach combined with principal component analysis to discriminate pigs based on birthweight, diet fed, and diet fed within birthweight groups. Low vs. high birthweight pigs could be distinguished using seven metabolites. Pigs fed a protein adequate or restricted diet also had very distinct metabolite profiles, needing only two metabolites. However, different metabolites were important for distinguishing the effect of diet in the low compared to the high birthweight piglets. The metabolites will be further identified and linked to differences in nitrogen metabolism. In conclusion, our results show a clear effect of birthweight and dietary protein restriction on plasma metabolites, the effect of dietary protein restriction being birthweight dependent. This study is part of the Feed-a-Gene Project, funded from the European Union's H2020 Programme under grant agreement no 633531.