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Effect of aleurone on glucose & insulin dynamics and gut microbiome in trained horses

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Aleurone is known to positively modulate glucose and insulin dynamics in pigs and mice and is deemed to be responsible for the positive health effects of whole grain products [1,2]. In the past, our research group has reported on a dose-response trial of oral aleurone supplementation on glucose and insulin dynamics in untrained horses [3].

We aimed to study whether aleurone has an additional effect on top of training on glucose and insulin dynamics and gut microbiome composition in horses, applying a cross-over training trial model with iso- energetic diets.

Sixteen untrained Standardbred mares (age: 3–4y) were trained for 2 periods of 8 weeks with and without 200 g/day aleurone supplementation. A frequently sampled intravenous glucose tolerance test (FSIGTT) and an oral glucose tolerance test (OGTT) were performed before and after each training period.

For the OGTT outcome the variables included were: Maximumglucose, AUCglucose, Maximum insulin, AUCinsulin, and Time to peak insulin; for the FSIGTT: acute insulin response to glucose (AIRg), insulin sensitivity (SI), glucose effectiveness (Sg) and disposition index (DI) were included. Either a paired t-test was applied or a paired Wilcoxon test (after FSIGTT minimal model analysis). Data preparation and metagenomics analyses were all done using QIIME2 (v2019.4). Prediction of microbiome metabolic output shifts was performed Phylogenetic Investigation of Communities by Reconstruction of Unobserved States (PICRUSt). Microbiome composition (R using ANCOM v2.1) was correlated to FSIGTT data using a Spearman correlation.

Training *without* aleurone induced significant OGTT curve parameter changes, which were not seen in the FSIGTT. OGTT Maximum insulin was significantly lower ($P = 0.005$); Time to peak insulin was significantly higher ($P = 0.034$) and AUC insulin 0–210 was significantly lower after training ($P = 0.001$). Training *with* aleurone delayed OGTT Time to peak insulin ($P = 0.089$). Training *with* aleurone decreased FSIGTT AIRg ($P = 0.030$) and increased glucose effectiveness (Sg) ($P = 0.031$). The FSIGTT basal glucose (GB) also decreased ($P = 0.03$) when compared to the condition untrained *with* aleurone. When comparing the FSIGTT variables after training *with* aleurone to those after training *without* aleurone AIRg was significantly lower in the aleurone-fed group ($P = 0.004$). Training *with* aleurone decreased *Desulfovibrio* genus abundance (logFC -4.536 FDR = 0.002). *Firmicutes* families Peptostreptococcaceae ($r = 0.895$ $P \leq 0.001$) and Lachnospiraceae genus *Marvinbryantia* ($r = 0.732$ $P = 0.002$) showed a positive correlation with AIRg changes after training with aleurone. A negative correlation was found between Sg differences induced by training with aleurone and the relative abundance of the Moraxellaceae family. ($r = -0.735$, $P = 0.002$).

Training has a positive effect on insulin dynamics of the OGTT. Aleurone has an additional beneficial effect on glucose and insulin dynamics on top of training in healthy horses. This is attributable to increased tissue glucose uptake capacity and this is correlated to microbiome shifts.

References

1. Graf D, Monk JM, Lepp D *et al.* (2019) *Nutrients* **11**.
2. Theil PK, Jørgensen H, Serena A *et al.* (2011) *Br J Nutr* **105**, 373–383.
3. Boshuizen B, Moreno de Vega CV, De Maré L, *et al.* (2021) *Front Vet Sci* **8**, 642809.