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# 11 Assessment of the impact of age on fecal microbial ecosystem in horses

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In humans, aging influences gut microbiota diversity and structure. In horses, modifications in gut microbiota could also occur, potentially leading to alteration in digestion and metabolism, development of diseases and even behavioral changes. Such modifications can affect microbial functions and consequently digestive capabilities. The aim of this *in vivo* study was to assess the age-related variations of microbial activity and physical parameters in the equine fecal ecosystem. The study population was composed of 50 horses (6–30 years old, geldings and mares from different breeds) conducted outdoors in the same sanctuary. Before the study, horses were dewormed and a dental examination was performed. They were gradually adapted during 1 week to the experimental diet (hay *ad libitum* + 860g muesli/horse/day). After 3 weeks of dietary management, naturally voided feces were collected individually for determination of pH, dry matter (DM), and fermentation end products concentrations (lactate and volatile fatty acids (VFA)). Age was correlated to each parameter

(R software) and Pearson correlation coefficients were calculated. A GLM procedure was performed to compare the 5 age classes considered. Lactate and total VFA concentrations, propionate and iso-butyrate proportions were not correlated with age. Fecal pH and acetate (C2) proportion decreased with age, while DM, butyrate (C4), iso-valerate (iC5) and valerate (C5) proportions increased with age (Table 1). The fecal pH ( $P = 0.024$ ), DM ( $P = 0.014$ ), C4 ( $P < 0.001$ ) and C5 ( $P < 0.001$ ) proportions were different between elder horses ( $\geq 26$  years) and younger (Table 1). These preliminary data suggest age-related modifications in digestion or metabolites absorption. Variation in microbiota activity and/or composition might explain some of these modifications. Bacterial structure and diversity in fecal ecosystem would provide complementary information to understand digestive evolution with age.

**Keywords:** Age, Fecal Ecosystem, Digestion**Table 1**

Significant effects of age on physical fecal parameters and VFA proportions

Age classes (years)	6-10 (N=12)	11-15 (N=11)	16-20 (N=13)	21-25 (N=8)	26-30 (N=6)	Correlation with age	
						P-value	Pearson coefficient
pH	6.91 <sup>a</sup> 0.13	6.90 <sup>a</sup> 0.24	6.83 <sup>a,b</sup> 0.43	6.68 <sup>a,b</sup> 0.45	6.40 <sup>b</sup> 0.27	0.002	−0.431
DM (%)	17.9 <sup>a</sup> 1.7	19.5 <sup>a,b</sup> 1.6	20.1 <sup>a,b</sup> 2.9	20.3 <sup>a,b</sup> 2.8	22.5 <sup>b</sup> 4.0	< 0.001	0.464
%C2	75.252.13	74.252.82	73.153.83	73.493.55	71.472.72	0.014	−0.346
%C4	5.26 <sup>b</sup> 0.64	5.39 <sup>b</sup> 1.04	5.36 <sup>b</sup> 0.71	6.16 <sup>a,b</sup> 1.13	7.65 <sup>a</sup> 1.91	< 0.001	0.499
%iC5	1.510.32	1.700.54	1.700.50	2.290.98	2.180.60	0.005	0.390
%C5	0.50 <sup>b</sup> 0.28	0.62 <sup>b</sup> 0.29	0.72 <sup>b</sup> 0.37	0.88 <sup>a,b</sup> 0.35	1.29 <sup>a</sup> 0.44	< 0.001	0.587

For each parameter LS mean and standard error (in italic) are indicated.

a,b For each parameter, means are different if superscripts differ.