FECAL SHORT-CHAIN FATTY ACIDS AS INDICATORS OF EGUS AND OMEPRAZOLE THERAPY OUTCOMES

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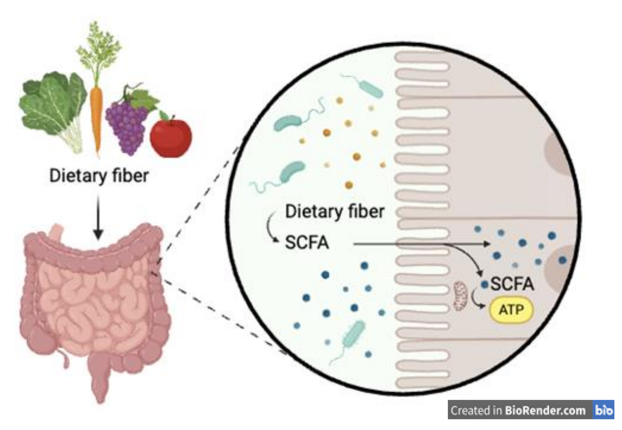
INTRODUCTION

Equine gastric ulcer syndrome (EGUS) is the most common gastrointestinal pathology in horses. Omeprazole, a proton pump inhibitor (PPI), is the only registered treatment for EGUS in horses.



Microbial fermentation of fiber and nutrients in the horse's large intestine produces short-chain fatty acids (SCFAs), which provide 50–70% of their energy needs. SCFAs are vital for gut barrier integrity, immune support, and metabolic regulation, ensuring overall equine health. Fecal analysis is a key, non-invasive indicator of digestive and overall health.

WHAT IS KNOWN?

HUMAN: PPIs significantly alter the gut microbiome and reduce SCFAs production, such as butyrate and acetate, contributing to adverse effects.

HORSES: In healthy horses omeprazole treatment did not cause significant changes in the gastrointestinal microbiome. No studies have assessed SCFAs production in horses with EGUS before and after omeprazole treatment.

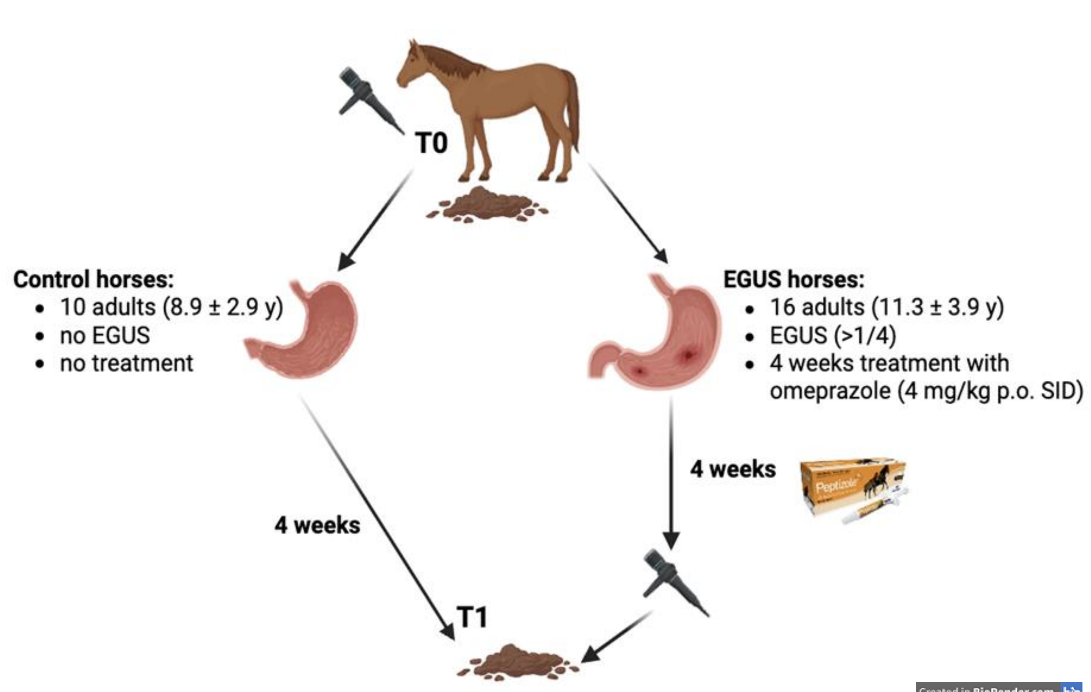
RESEARCH PURPOSE

Evaluation of fecal SCFAs concentrations in horses with diagnosed EGUS and the effect of treatment on its concentration.

Does EGUS and omeprazole treatment affect SCFAs production in horses?

MATERIALS AND METHODS

ANIMALS: patients of Wroclaw University of Environmental and Life Sciences in Poland and Royal Veterinary College.



FECAL SAMPLES: collected immediately after defecation (center of the fecal pellet) from all horses twice: on the day of the initial gastroscopy (T0) and after four weeks (T1).

SCFAs ANALYSIS:

- concentrations of lactic, acetic, propionic, butyric, valeric, and isovaleric acids
- high-performance liquid chromatography with a UV/Vis detector (HPLC UV/Vis)

STATISTICAL ANALYSIS:

- SCFAs concentration control vs. EGUS: Mann-Whitney U test
- SCFAs concentration T0 vs. T1: Wilcoxon signed-rank test
- correlation between EGUS grade, separate for equine squamous (ESGD) and glandular gastric disease (EGGD) vs. SCFAs concentration: Pearson correlation coefficient statistically significant when $p<0.05$.

RESULTS

Gastroscopy results for EGUS group on a generally accepted 4 point scale (mean ± SD):

T0: ESGD 2.8 ± 0.6; EGGD 2.3 ± 0.8

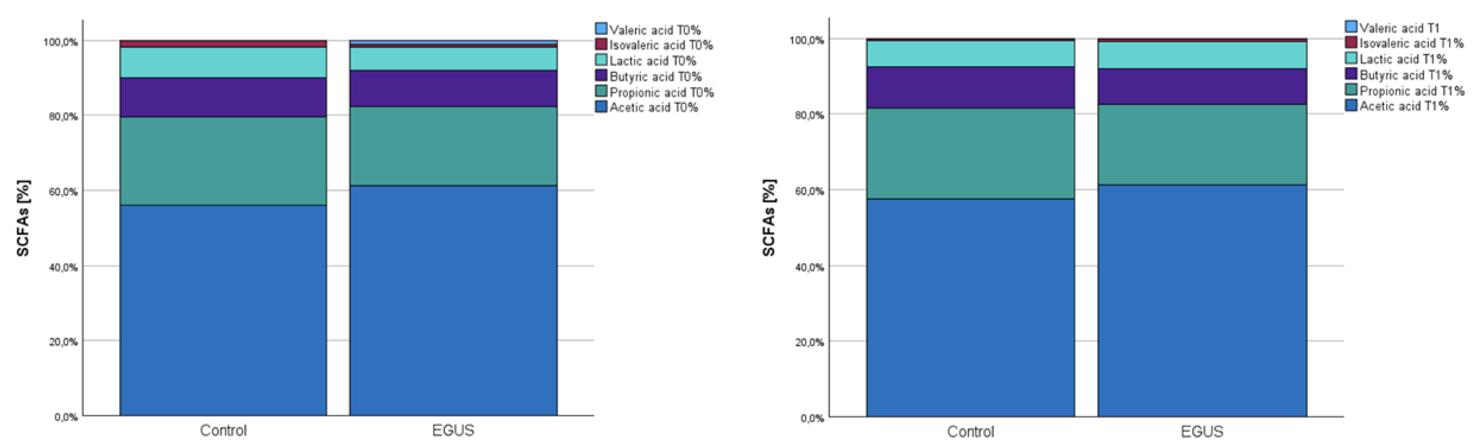
T1: ESGD 0.1 ± 0.5; EGGD 0.9 ± 1.2

SCFAs results:

T0: all SCFAs higher in EGUS horses with significantly higher fecal acetic ($p=0.036$), and valeric ($p=0.036$) acids than controls.

T1: all SCFAs decreased in the EGUS group, but remained higher than in controls (acetic acid $p=0.009$).

Percentage distribution of fecal SCFAs in control and EGUS horses at baseline (T0) and post-intervention (T1).



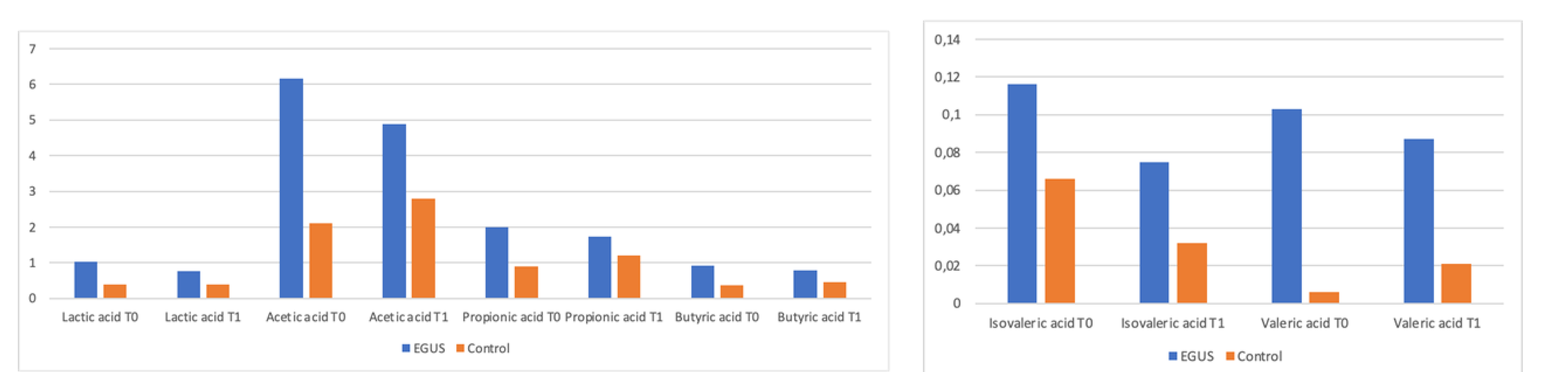
Results for specific SCFAs (umol/g) in feces in EGUS and control horses at T0 and T1: mean ± SD, below - median [Q1; Q3].

p=0.036

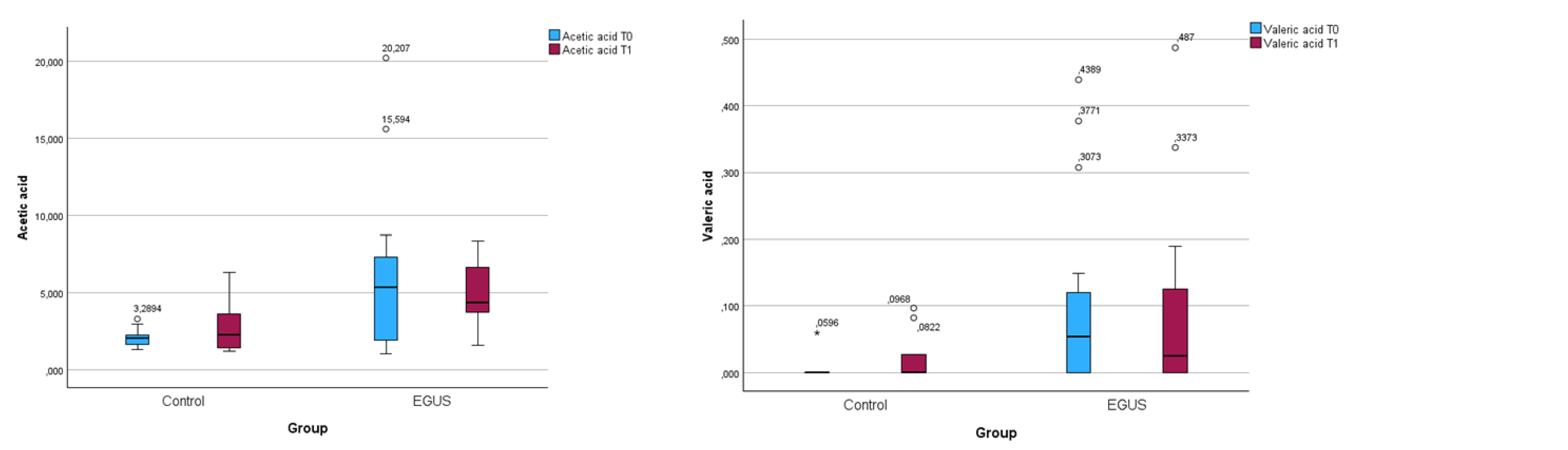
		Lactic acid	Acetic acid	Propionic acid	Butyric acid	Isovaleric acid	Valeric acid
EGUS	T0	1.04 ± 2.17	6.16 ± 5.24	2.01 ± 1.38	0.93 ± 0.9	0.12 ± 0.14	0.1 ± 0.14
		0.133 [0.000; 0,533]	5.320 [1.918; 7.201]	2.007 [0.530; 2.757]	0.741 [0,228; 1.163]	0.081 [0.000; 0.158]	0.053 [0.000; 0.120]
	T1	0.76 ± 1.1	4.89 ± 2.01	1.75 ± 1.03	0.78 ± 0.8	0.08 ± 0.09	0.09 ± 0.14
		0.196 [0.000; 1.440]	4.363 [3.726; 6.651]	1.520 [1.158; 1.984]	0.533 [0.357; 0.850]	0.047 [0.000; 0.129]	0.025 [0.000; 0.126]
Control	T0	0.39 ± 0.43	2.1 ± 0.63	0.9 ± 0.4	0,37 ± 0,17	0.07 ± 0.06	0.01 ± 0.02
		0.298 [0.000; 0.765]	2.051 [1.618; 2.233]	0.744 [0.612; 1.132]	0.327 [0.249; 0.548]	0.063 [0.000; 0.105]	0.000 [0.000; 0.000]
	T1	0.4 ± 0.63	2.8 ± 1.7	1.2 ±0.4	0.46 ± 0.2	0.03 ± 0.05	0.02 ± 0.04
		0.071 [0.000; 0.451]	2.272 [1.404; 3.607]	1.019 [0.443; 1.814]	0.428 [0.282; 0.591]	0.000 [0.000; 0.059]	0.000 [0.000; 0.027]

p=0.009

Fecal concentrations of mean results of all SCFAs in control and EGUS groups at T0 and T1.



Fecal concentrations of acetic acid and valeric acid in control and EGUS groups at T0 and T1.



Correlation between SCFAs vs. EGUS: moderate, positive between ESGD severity and concentrations of acetic acid ($r = 0.421$; $p = 0.032$) and propionic acid ($r = 0.490$; $p = 0.011$).

DISCUSSION AND CLINICAL RELEVANCE

- This is the first study to evaluate fecal SCFAs levels in horses with EGUS and their response to omeprazole therapy.
- Horses with EGUS has elevated fecal SCFAs concentrations.
- Changes in SCFAs production may reflect alterations in the activity of the microbiome bacteria in horses with EGUS.
- Higher fecal SCFAs concentrations in EGUS could be a result of increased microbial production or reduced absorption of SCFAs.
- Decrease in SCFA concentrations after treatment may indicate treatment success.
- In future: specific SCFAs could serve as potential biomarkers for monitoring EGUS therapy.

STUDY LIMITATIONS

- Small sample size limits its conclusions.
- Dietary and environmental factors may influence results.
- Healthy horses underwent only one gastroscopy, so development of EGUS-like lesions post-examination cannot be excluded.
- Future research should include fecal microbiome analysis and larger cohorts with long-term treatment to better understand SCFAs dynamics.