

SUMMARY

US HORSES

Age-Dependent Modulation of the Equine Hindgut Microbiome by a Multi-Seaweed Marine Bioactive



BACKGROUND AND RATIONALE

Horses are obligate hindgut fermenters, relying on a complex microbial ecosystem to efficiently digest fibre and produce energy, primarily in the form of short-chain fatty acids (SCFAs), with acetate as the dominant end-product. Disruption of this finely balanced system—through excessive rapid fermentation, lactate accumulation, or protein putrefaction—can compromise gut stability and overall health.

Prebiotic strategies in horses must therefore enhance fibre utilisation **without overstimulating destabilising pathways**, and must be sensitive to differences in age, baseline microbiome state, and physiological capacity.

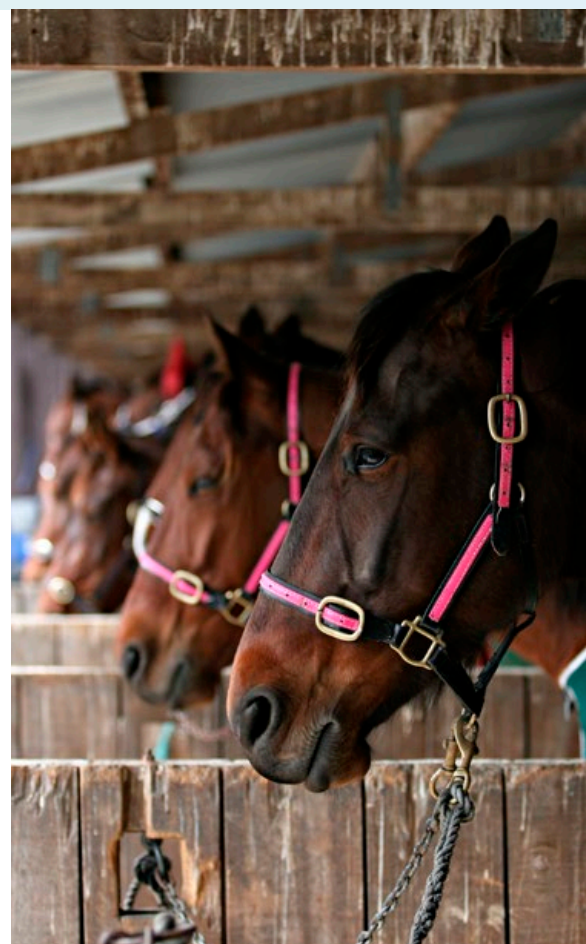
STUDY OVERVIEW

An exploratory feeding trial was conducted in **10 horses across two stables in Florida**, spanning a wide age range (2–23 years). Horses received **45 g/day of a blended seaweed prebiotic** added to their normal diet for **60 days**.

Faecal samples were collected before and after the intervention and analysed using **16S rRNA sequencing**. Rather than focusing on individual bacterial taxa, results were interpreted using **biologically defined, composition-based functional proxy indices** aligned with equine hindgut physiology. These indices were designed to assess:

- ✓ Fibre-associated fermentation capacity
- ✓ Acetate-linked carbohydrate metabolism
- ✓ Downstream SCFA cross-feeding potential
- ✓ Lactate-producing (rapid fermentation) pathways
- ✓ Proteolytic (protein fermentation) pathways

This approach allowed assessment of whether microbiome modulation occurred in a **coherent and balanced manner**, rather than via indiscriminate stimulation.



KEY FINDINGS

COORDINATED, FIBRE-FIRST MODULATION

Across the full cohort, the intervention produced directionally coherent changes consistent with improved routing of hindgut fermentation:

- Fibre-associated and acetate-linked pathways increased or stabilised
- Lactate-producing and proteolytic pathways declined
- No bloom-like or destabilising patterns were observed in faecal profiles

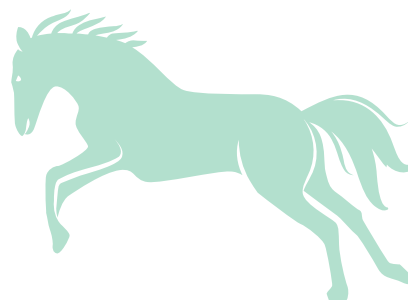
This pattern suggests a re-routing of microbial metabolism toward slow, fibre-first fermentation, rather than a general increase in fermentative intensity.

AGE-DEPENDENT RESPONSES

Responses differed meaningfully by age, reflecting biological context:

Younger horses (n=6)

- Marked increases in fibre-associated and acetate-linked proxy indices
- Consistent responses across individuals
- Indicates substantial fermentative "headroom" and adaptive capacity



Very old horses (n=4)

- Fibre and SCFA-related proxies stabilised or declined modestly
- Lactate-producing and proteolytic pathways still declined
- Suggests rebalancing and stabilisation, rather than overstimulation, in a system likely operating near functional saturation

These patterns are consistent with known age-related constraints in equine digestion and microbiome plasticity.

NO EVIDENCE OF METABOLIC TRADE-OFFS

Importantly, improvements in fibre-associated fermentation were not accompanied by increases in risk-associated pathways. Instead:

- Lactate-associated taxa declined
- Proteolytic taxa declined
- Indicators of harsh or dysbiotic fermentation were reduced

This supports a regulatory, not stimulant, mode of action.

INTERPRETATION

Taken together, the findings suggest that the blended seaweed prebiotic:

-  Increases substrate accessibility and diversity in the hindgut
-  Allows the microbiome to respond according to age-appropriate capacity
-  Enhances efficiency where headroom exists
-  Stabilises and simplifies fermentation where systems are already saturated
-  Suppresses potentially destabilising metabolic routes

Rather than imposing a uniform microbiome outcome, the intervention appears to **support ecosystem-level regulation**.

IMPORTANT CONTEXT

This was an **exploratory trial** with a small sample size and no control group. Functional outcomes were inferred using **composition-based proxy indices** derived from faecal microbiome data; **SCFAs, pH, and fermentation metabolites were not measured directly**. Findings should therefore be interpreted as **indicative of directional biological tendencies**, and confirmation in larger, controlled trials is warranted.

WHY THIS MATTERS

These results support the concept that effective equine prebiotics should:

- ✓ Work with hindgut biology, not against it
- ✓ Be sensitive to age and baseline microbial state
- ✓ Enhance fibre utilisation without increasing risk
- ✓ Regulate rather than overstimulate fermentation

A full technical report detailing methods, indices, and age-stratified analyses is available.

