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Li, Y.; Gao, J.; Cao, Y.; Cheng, X.; Sun, Z.; Zhang, J.; Zhu, W.; Gierus, M.; Cheng, Y. **Detoxification of coumarins by rumen anaerobic fungi: insights into microbial degradation pathways and agricultural applications.** *Journal of Animal Science and Biotechnology* 2025, *16*, 59, doi: 10.1186/s40104-025-01195-9.

Full text access:

https://link.springer.com/article/10.1186/s40104-025-01195-9

Abstract: [Background] Coumarins are toxic phytochemicals found in a variety of plants and are known to limit microbial degradation and interfere with nutrient cycling. While the degradation of coumarins by fungi has been studied in an environmental context, little is known about their degradation in the gastrointestinal system of herbivores after ingestion. [Results] In this study, we investigated in vitro fermentation by microbial enrichment, transcriptome sequencing, and high-resolution mass spectrometry to evaluate the ability of rumen anaerobic fungi to degrade coumarins. The results showed that despite the low abundance of anaerobic fungi in the rumen microbiota, they were able to effectively degrade coumarins. Specifically, *Pecoramyces ruminantium* F1 could tolerate coumarin concentrations up to 3 mmol/L and degrade it efficiently via metabolic pathways involving alpha/beta hydrolases and NAD(P)H oxidoreductases within the late growth phase. The fungus metabolized coumarin to less toxic compounds, including *o*-coumaric acid and melilotic acid, highlighting the detoxification potential of anaerobic fungi. [Conclusions] This study is the first to demonstrate the ability of rumen anaerobic fungi to degrade coumarin, providing new insights into the use of anaerobic fungi in sustainable agricultural practices and environmental detoxification strategies.

O'Hara, E.; Chomistek, N.; Terry, S.A.; Beauchemin, K.A.; Gruninger, R.J. **Assessing the Impact of the Methane Inhibitors 3-Nitrooxypropanol (3-NOP) and Canola Oil on the Rumen Anaerobic Fungi.** *Animals* 2025, *15*, 1230, doi: 10.3390/ani15091230.

Full text access:

https://www.mdpi.com/2076-2615/15/9/1230

Abstract: Reducing enteric methane emissions is critical for improving the sustainability of ruminant livestock production. In this study, we investigated the impact of the methane inhibitors 3-nitrooxypropanol (3-NOP) and canola oil, fed both individually and in combination, on the anaerobic gut fungi (AGF) of the rumen. Eight ruminally cannulated Angus heifers were used in a replicated double 4 × 4 Latin square over 28-day periods with a 2 (control, 3-NOP) × 2 (control, canola oil) factorial arrangement. Rumen samples were collected after 13 d dietary adaptation, and AGF communities were evaluated using amplicon sequencing of the D1/D2 region of the 28S rRNA (LSU) gene. Although 3-NOP reduced methane yield by approximately 32%, it did not substantially alter the diversity, composition, or overall abundance of the AGF community. In contrast, canola oil supplementation, either alone or combined with 3-NOP, markedly disrupted the fungal community. These treatments reduced overall fungal diversity and the abundance of key fiber-degrading taxa, such as *Neocallimastix* and *Piromyces*, while eliciting variable responses among less abundant genera. Furthermore, resilience analyses using control-diet-fed samples indicated that repeated perturbation impaired the recovery of some AGF taxa, leading to a shift in the composition of the fungal community. Overall, our findings suggest that 3-NOP offers a targeted methane mitigation strategy and does not alter the rumen AGF. In contrast, the addition of canola oil at levels that inhibit enteric methane emissions has a disruptive impact on the AGF community, contributing to reduced feed digestibility.