RESEARCH

England, E.E.; Pratt, C.J.; Elshahed, M.S.; Youssef, N.H. **Evaluating the impact of redox potential on the growth capacity of anaerobic gut fungi**. *FEMS microbes* 2024, xtae033, doi: 10.1093/femsmc/xtae033.

Abstract: Anaerobic gut fungi (AGF, *Neocallimastigomycota*) inhabit the alimentary tract of herbivores. Although strict anaerobes, studies have suggested their capacity to retain viability after various durations of air exposure. It is currently unclear whether AGF can actively grow, and not merely survive, in redox potentials (E_h) higher than those encountered in the herbivorous gut. We evaluated the growth of two AGF strains (*Orpinomyces joyonii* and *Testudinimyces gracilis*) at various E_h levels, achieved by manipulating the concentrations of reductant (cysteine hydrochloride) in culture media. Both strains exhibited robust and sustainable growth at negative E_h (−50 mV or below). However, growth in the absence of cysteine hydrochloride (E_h value around +50 mV) was possible only for *O. joyonii* and only for one subcultivation. The capacity to grow at +50 mV was further confirmed in four additional taxa (*Pecoramyces ruminatium, Anaeromyces mucronatus, Aklioshbmyces papillarum*, and *Piromyces communis*), while two (*Aestipascuomyces dupliciliberans* and *Capellomyces foraminis*) failed to grow under these conditions. Our results establish the ability of AGF to grow at redox potential values higher than those encountered in their natural habitats. Such capability could contribute to efficient AGF dispersal and horizontal transmission between hosts, and could have important implications for industrial applications of AGF.

Shi, Q.; Ma, J.; Abdel-Hamid, A.M.; Li, Y.; Zhong, P.; Wang, D.; Sun, Z.; Tu, T.; Zhu, W.; Cheng, Y. **Mining of latent feruloyl esterase resources in rumen and insight into dual-functional feruloyl esterase-xylanase from *Pecoramyces ruminantium* F1**. *Bioresource Technol* 2024, 131854, doi: 10.1016/j.biortech.2024.131854.

Abstract: Feruloyl esterase (FAE) has been extensively studied for its crucial auxiliary effect in the biodegradation of lignocellulose. In this study, a FAE database including 15,293 amino acid sequences was established to gain a better understanding of rumen FAEs through multi-omics analysis. The higher expression level of rumen fungal FAEs over bacterial FAEs suggests that rumen fungi may have more important role in the lignocellulose degradation. Analyses of the information acquired through the database showed that the rumen FAEs are mainly derived from anaerobic fungi. One special candidate harboring both feruloyl esterase and endoxylanase modules (Fae00416) from anaerobic fungus *Pecoramyces ruminantium* F1 was found to have intramolecular synergy between the esterase and xylanase domains, which underpins the importance of this enzymes in heteropolysaccharide degradation. The discovery of novel and efficient FAEs in rumen could contribute to enhancing the production of biofuels and bioproducts.

BOOK CHAPTERS

ÇÖMLEKÇİOĞLU, U. **Rumen fungi in the degradation of plant cell walls**. *Research And Evaluations In The Field Of Biology* 2024, 27.

Abstract: The degradation of plant cell walls is a critical process for ruminants, primarily facilitated by the complex symbiotic relationship between the rumen microbiome and the host animal. This review explores the pivotal role of rumen fungi in the breakdown of lignocellulosic materials, highlighting their enzymatic capabilities and interactions with other rumen microorganisms. While rumen fungi are less abundant than bacteria, their contribution to plant cell wall degradation through the production of highly active fibrolytic enzymes is significant. These fungi not only possess the ability to form cellulosomes, enhancing their cellulolytic activity, but also demonstrate unique enzymatic profiles that allow them to degrade resistant plant cell wall components more effectively than their bacterial counterparts. Additionally, the review discusses the potential biotechnological applications of anaerobic fungi, including their use in improving ruminant feed efficiency, their role in biofuel production, and the challenges associated with their industrial use. The continuous culture of these fungi remains a challenge, yet their ability to produce a wide range of potent enzymes presents numerous opportunities for various industries. Understanding the specific contributions of rumen fungi to lignocellulose degradation and overcoming the challenges in their cultivation are essential for advancing both agricultural and industrial applications.