



The role of the gut microbiome in the regulation of high-altitude adaptation

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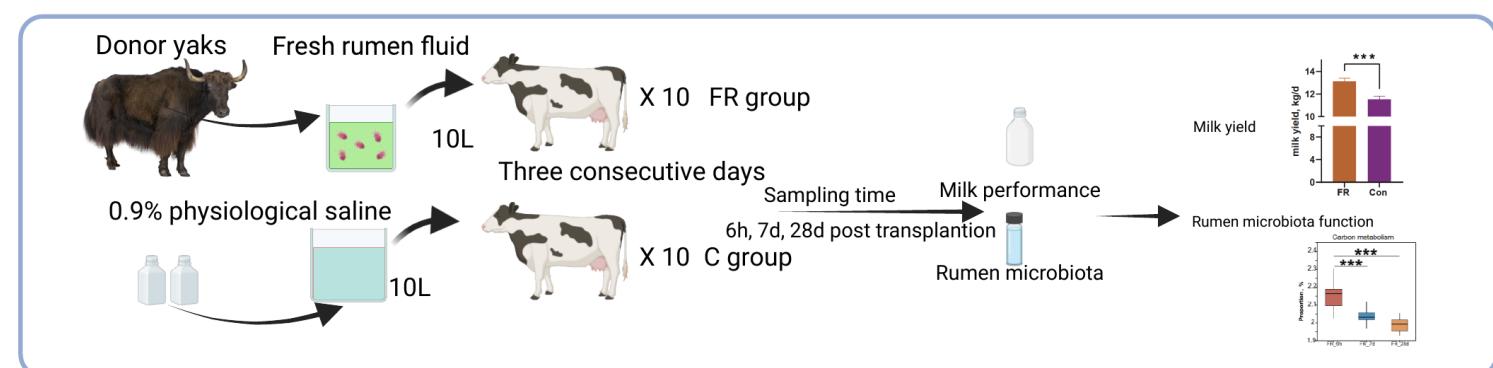
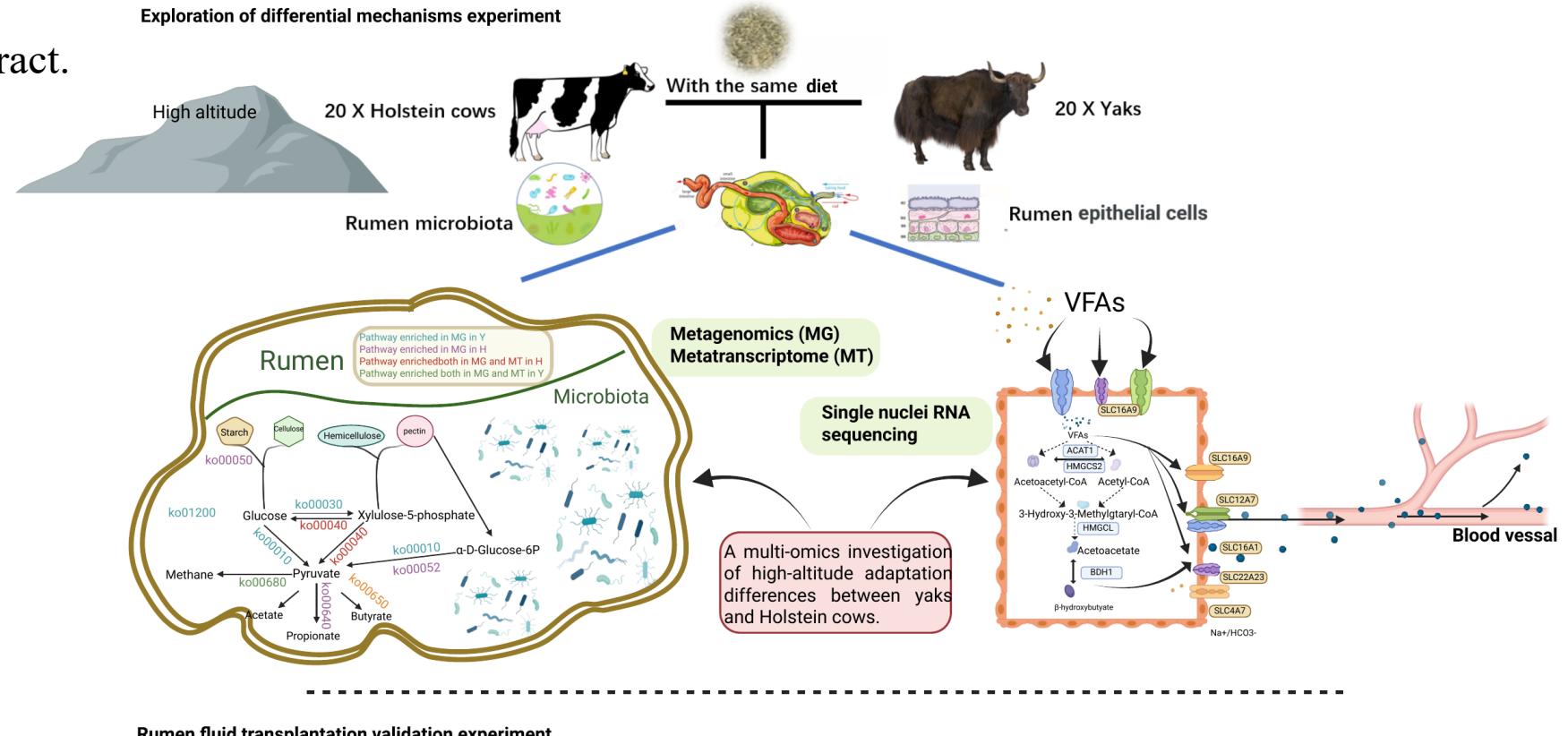


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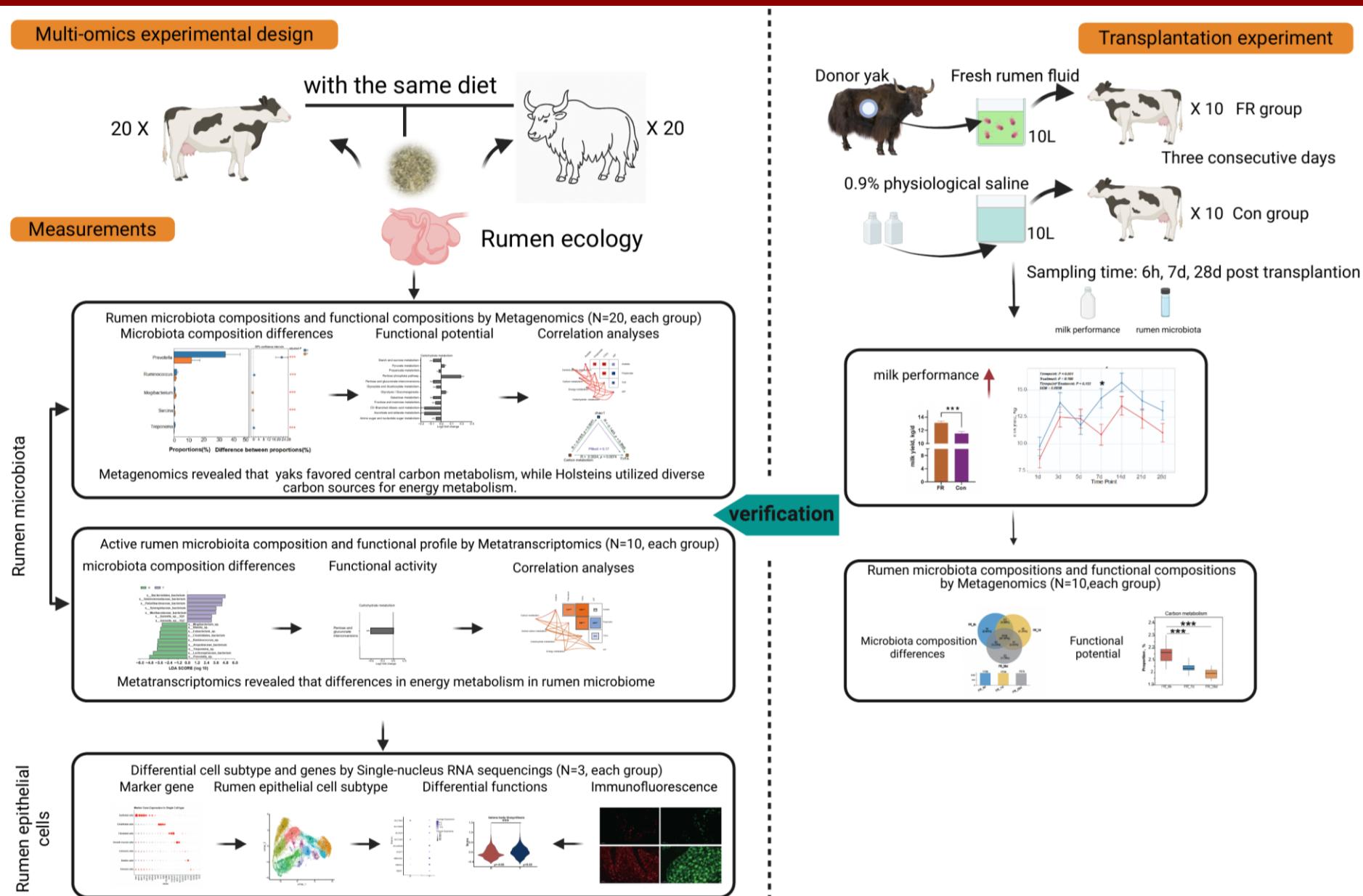
INTRODUCTION

FIGURE 1 Graphical abstract.





METHODS



RESULTS

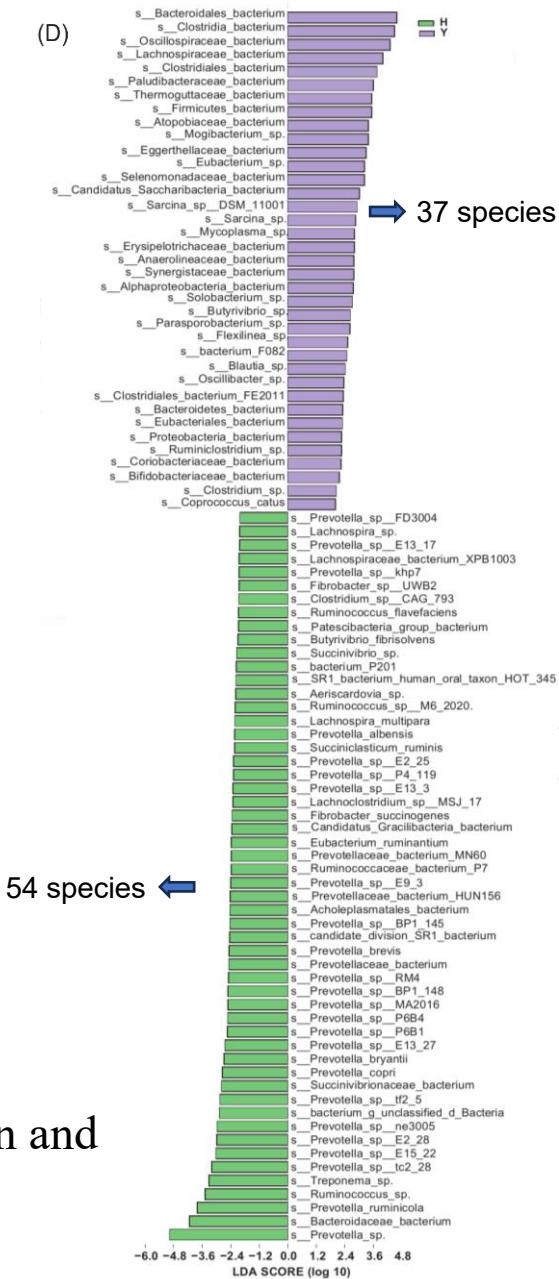
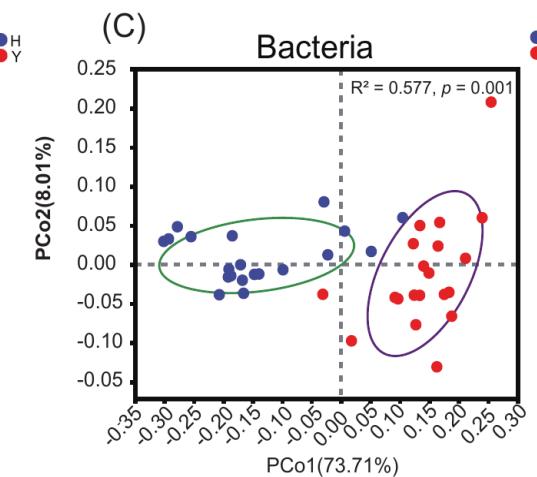
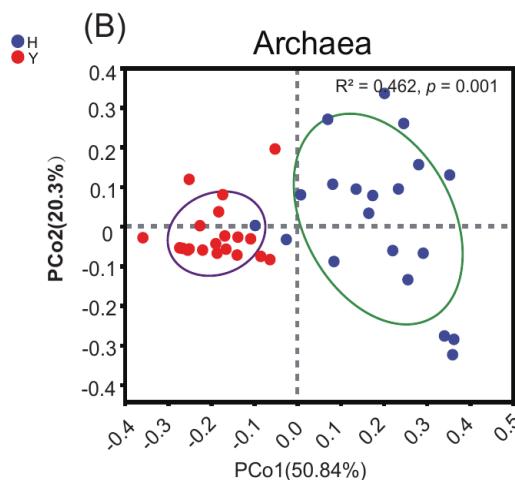
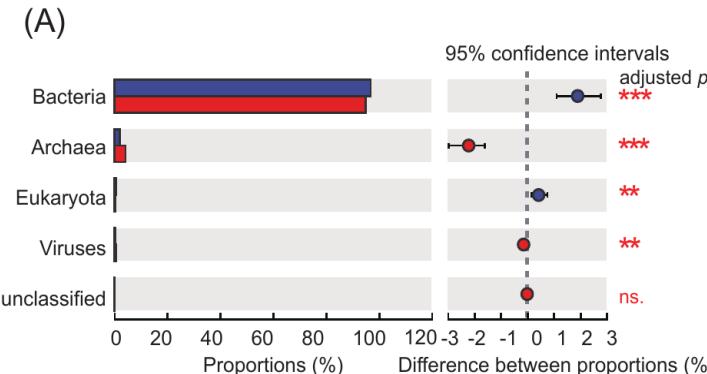
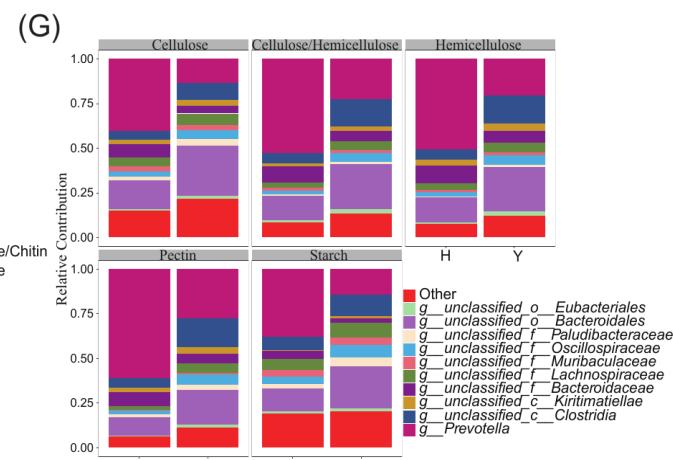
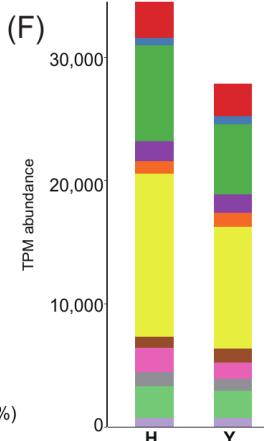
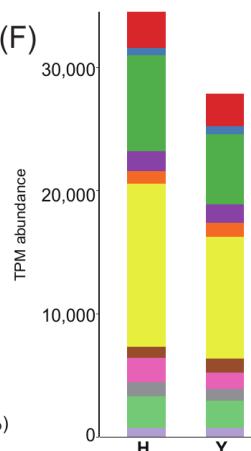


FIGURE 3 Differences between Holstein cows (H) and yaks (Y) in microbial taxonomic composition and functional potential in the rumen fluid, as determined by metagenomic analysis.





RESULTS

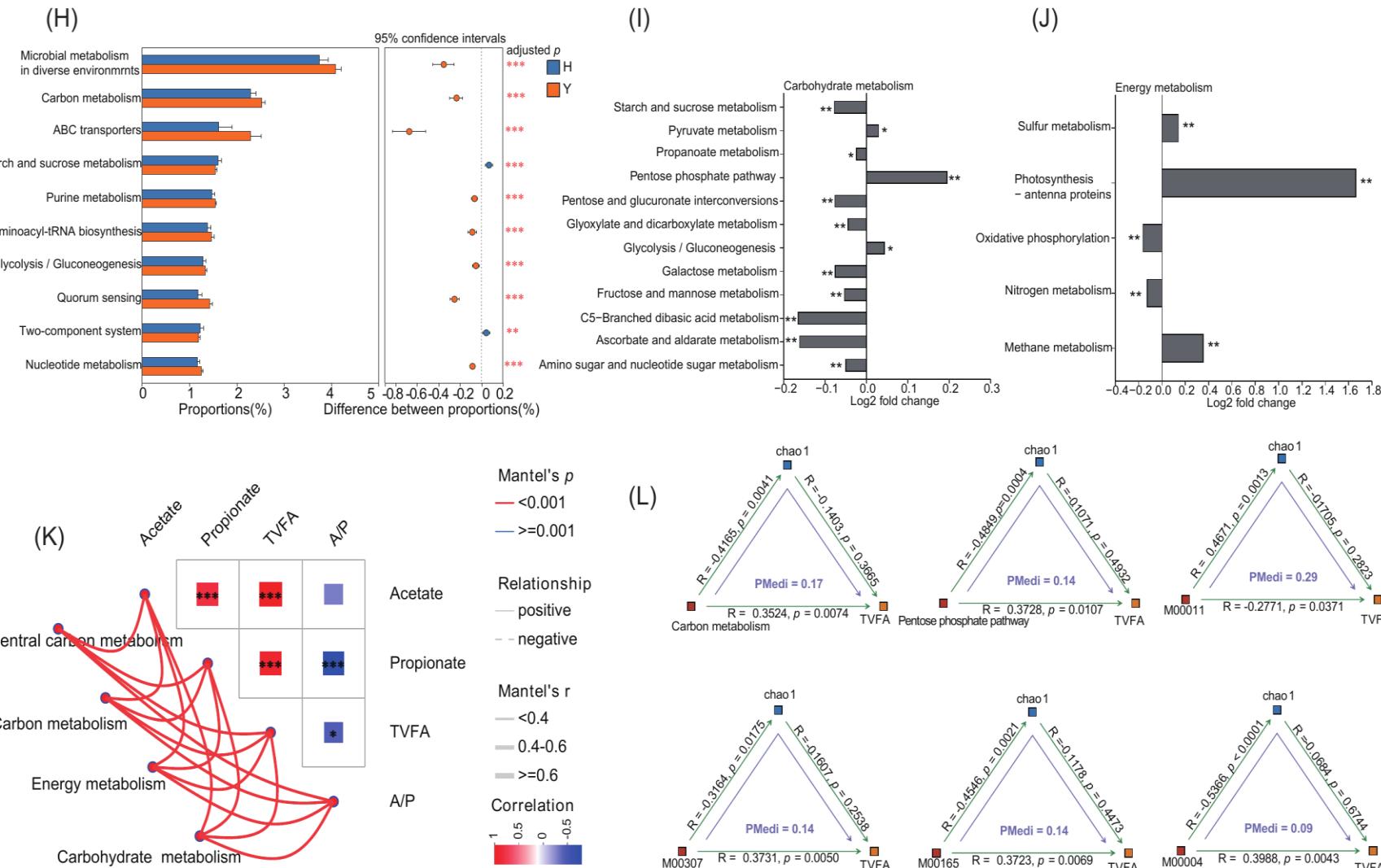


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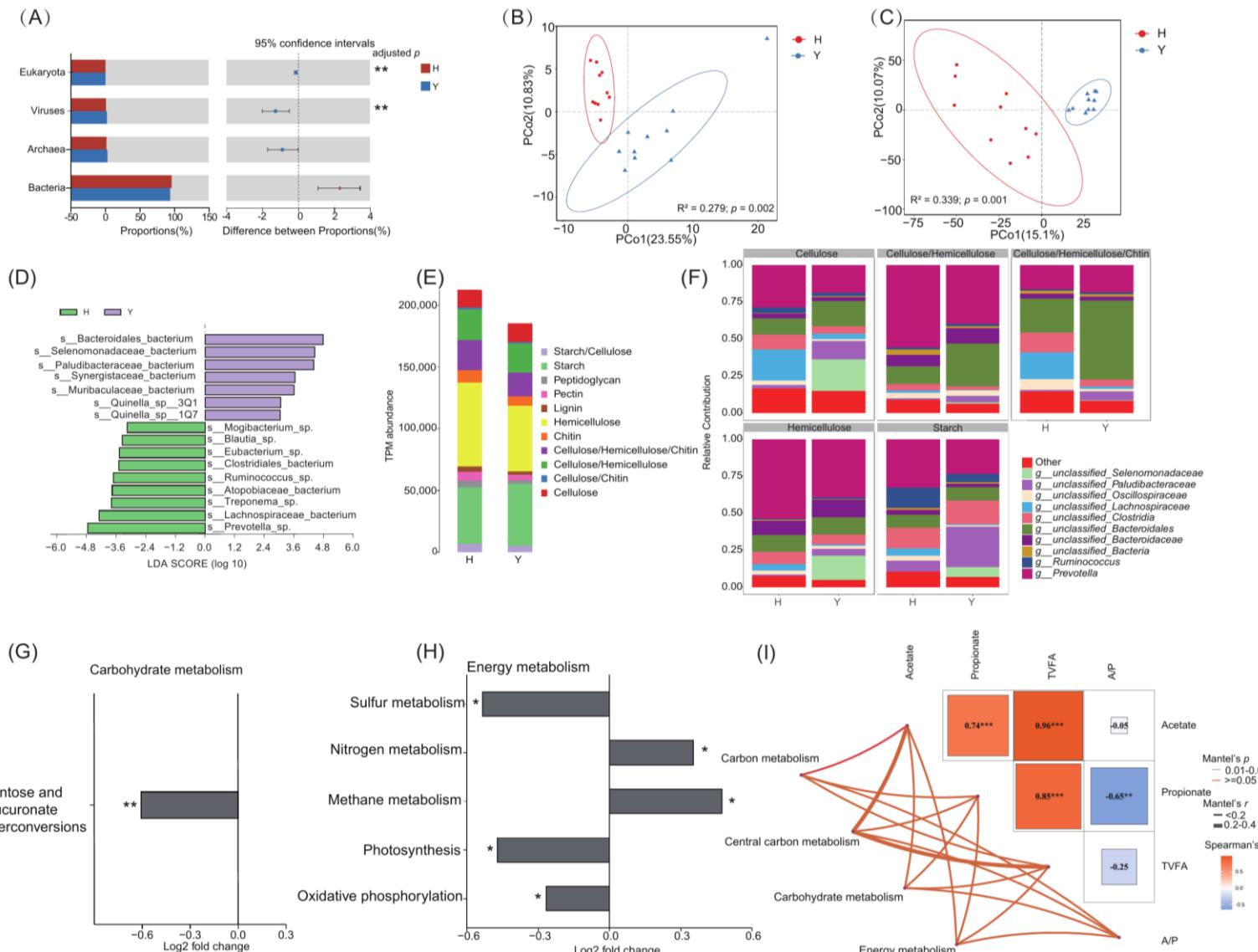


FIGURE 4 Differences in rumen microbial composition and functional gene expression between Holstein cows (H) and yaks (Y), as determined by metatranscriptomic analysis of rumen fluid samples.



RESULTS

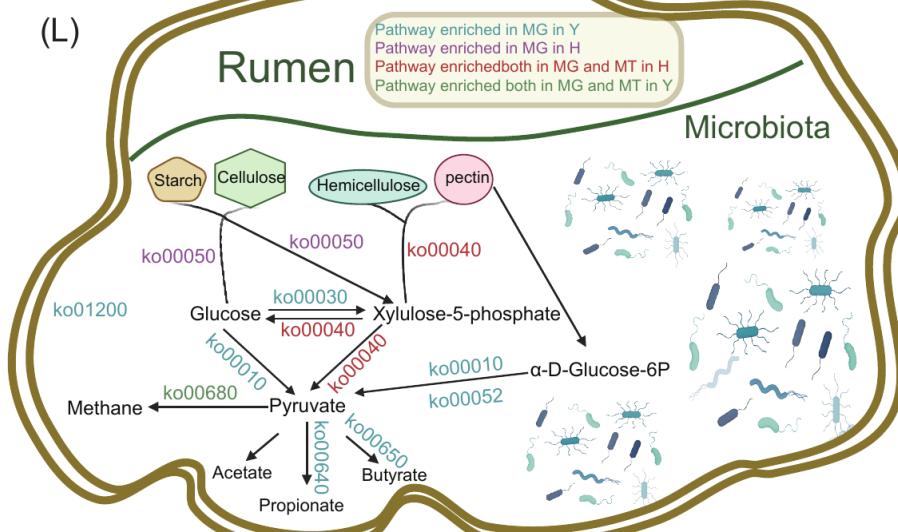
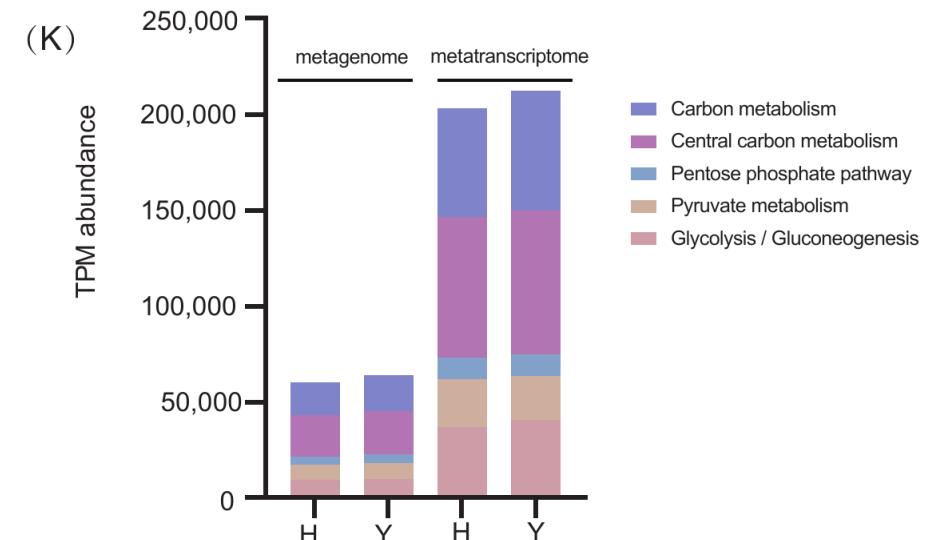
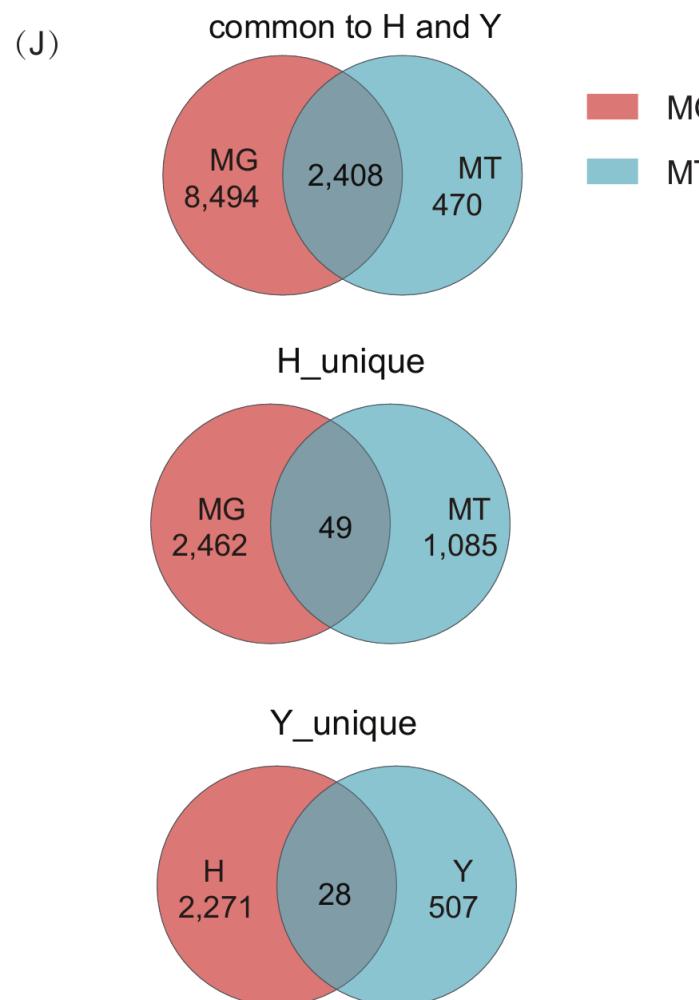


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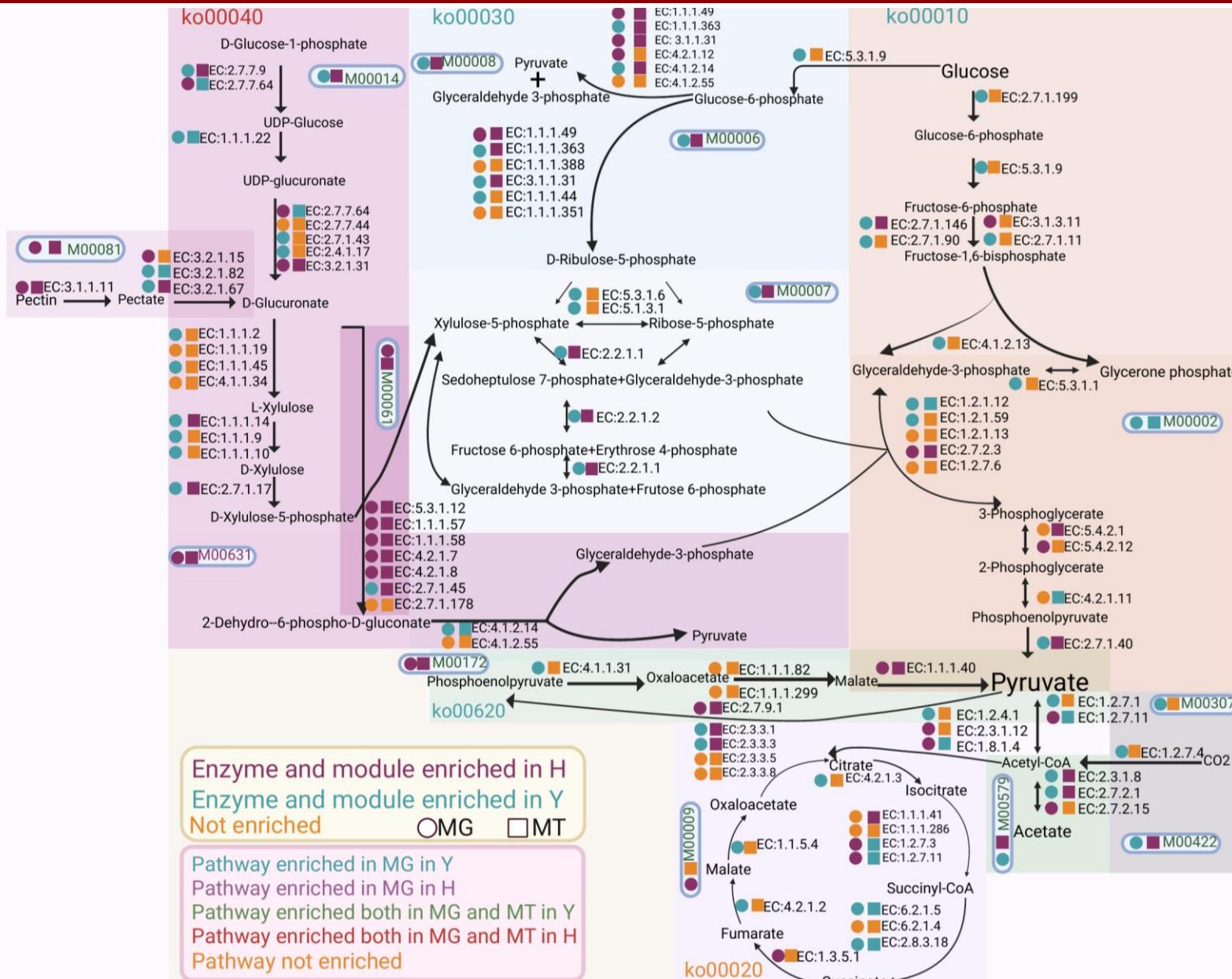


FIGURE 5 Modules and enzymes of central carbon metabolism and key carbohydrate and energy metabolism pathway.



RESULTS

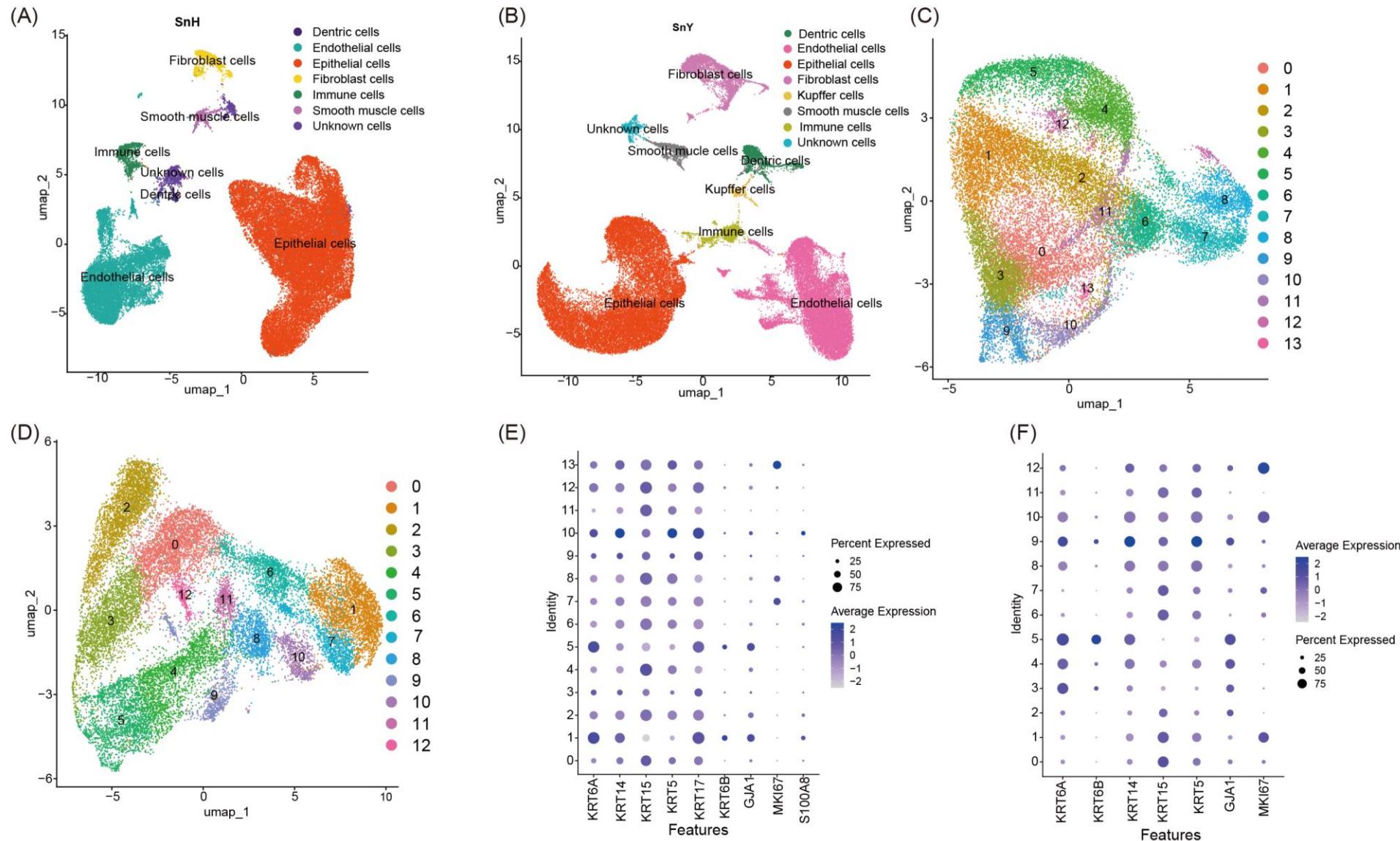


FIGURE 6 Differences between the Holstein cows (H) and yaks (Y) as illustrated by a rumen epithelial single-cell map.

RESULTS

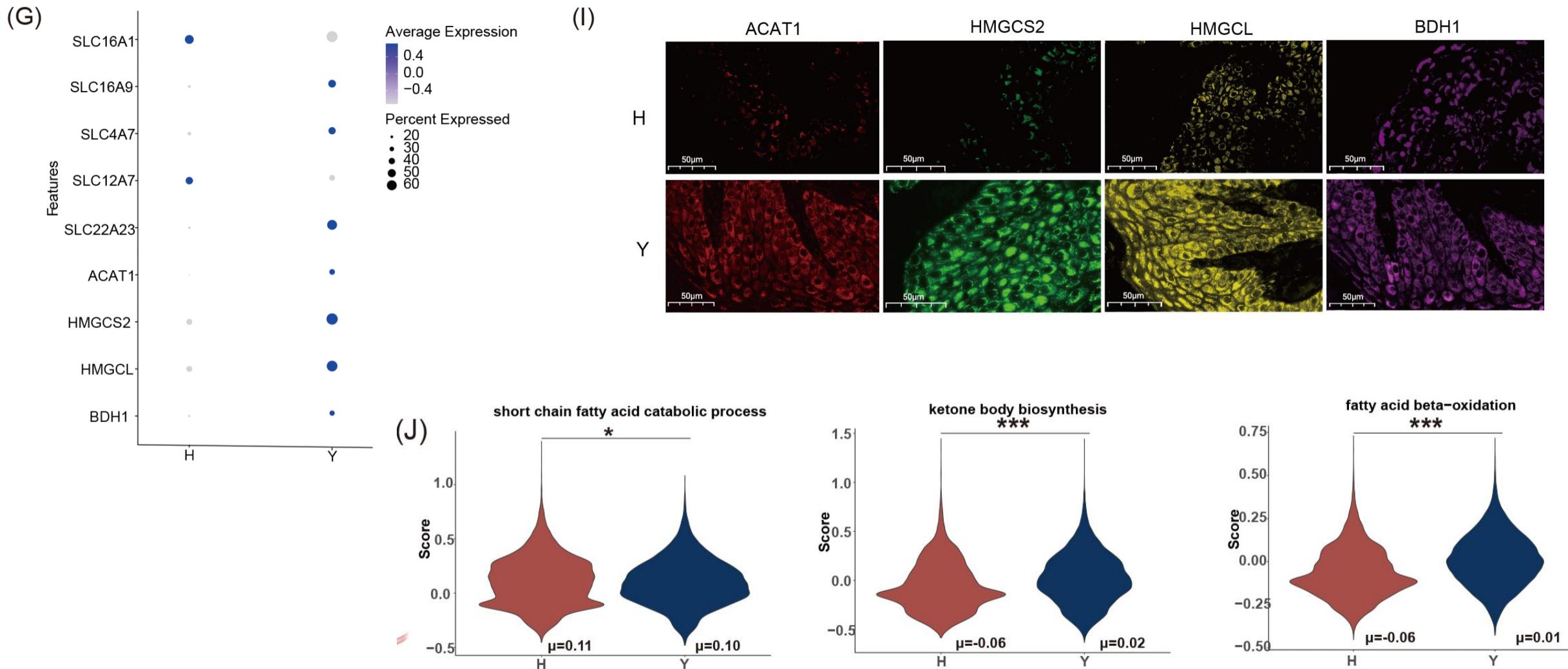


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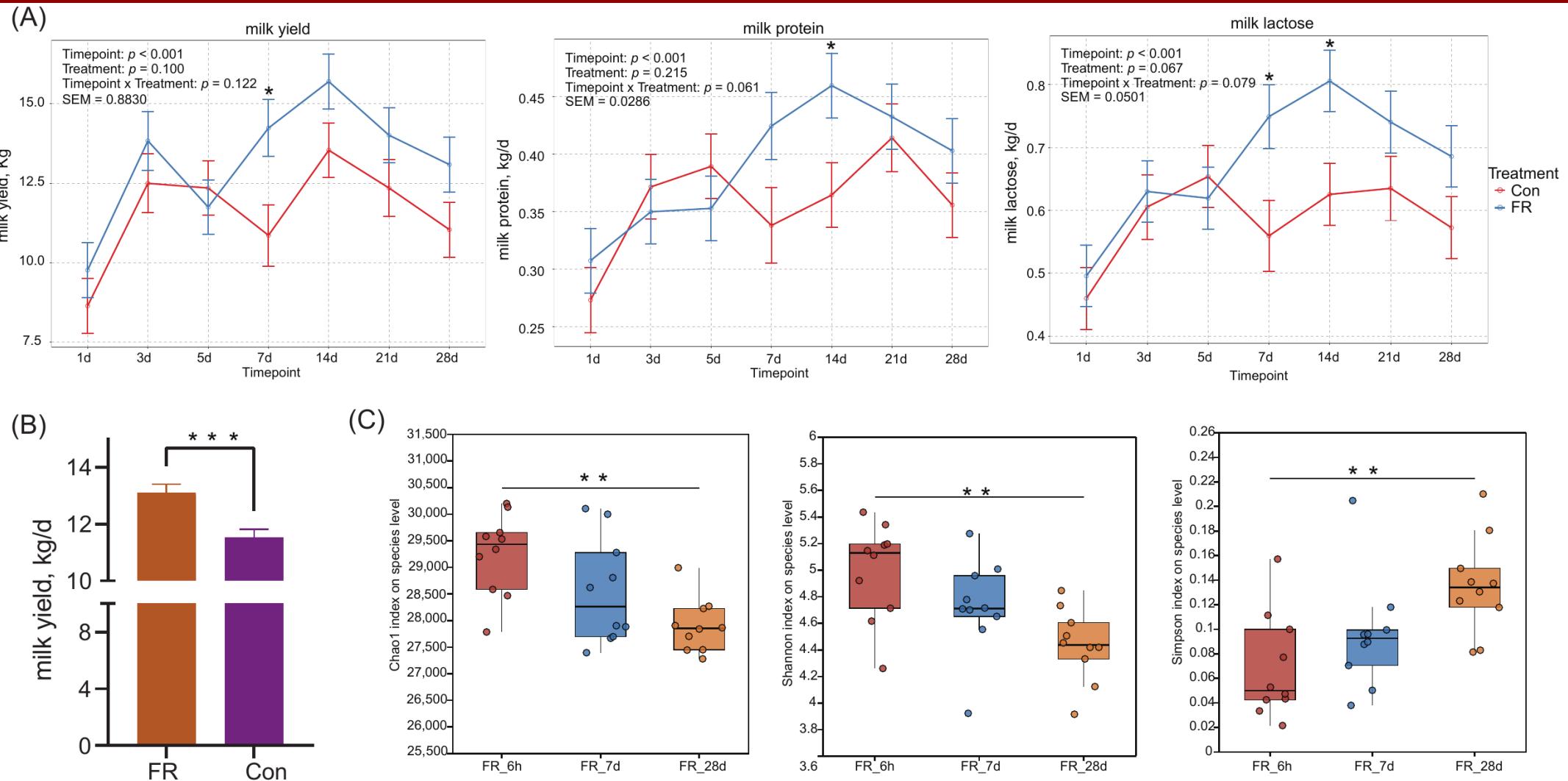
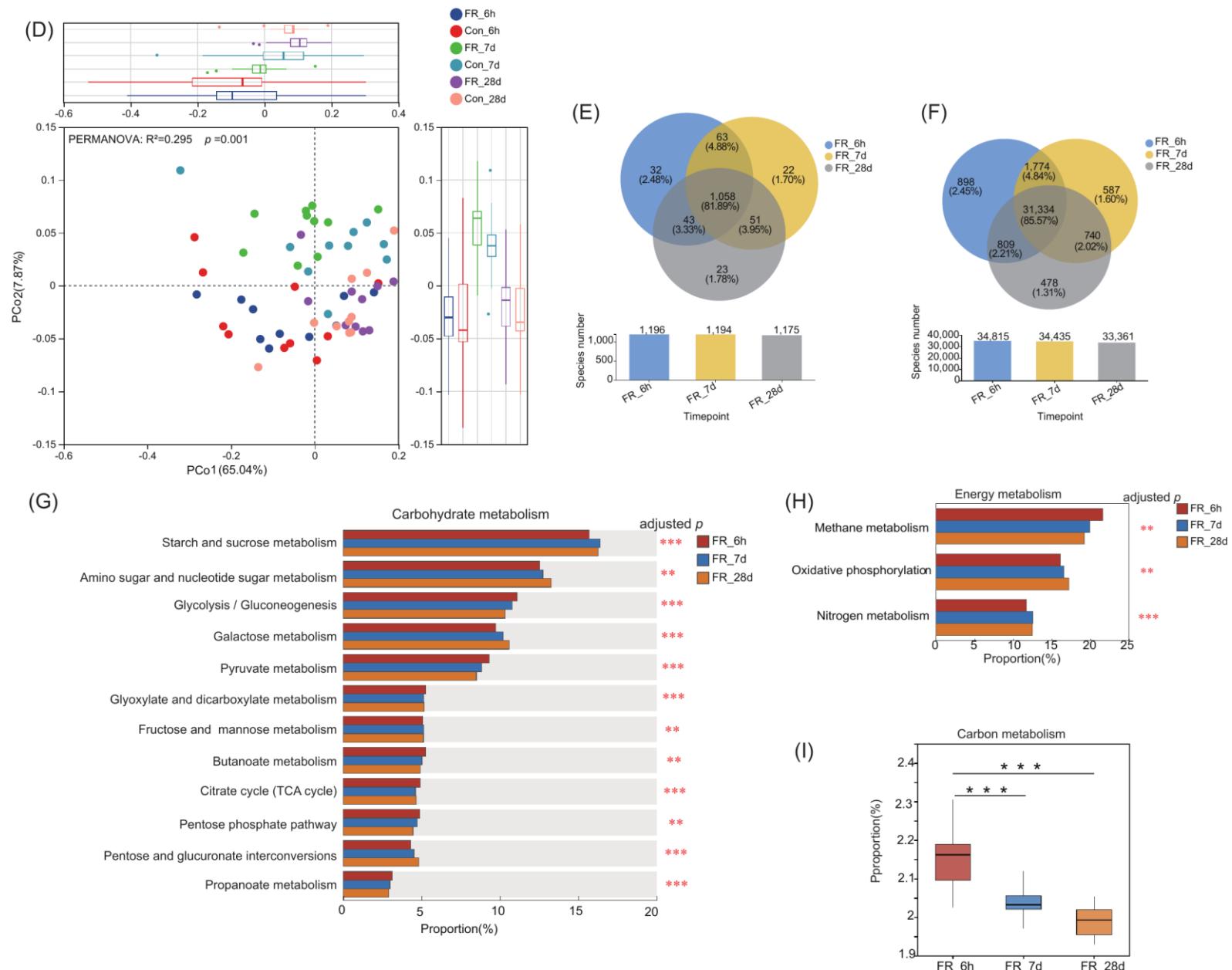


FIGURE 7 Effect of transplantation of rumen fluid from yaks to Holstein cows on indicators of performance and rumen microbiome function.



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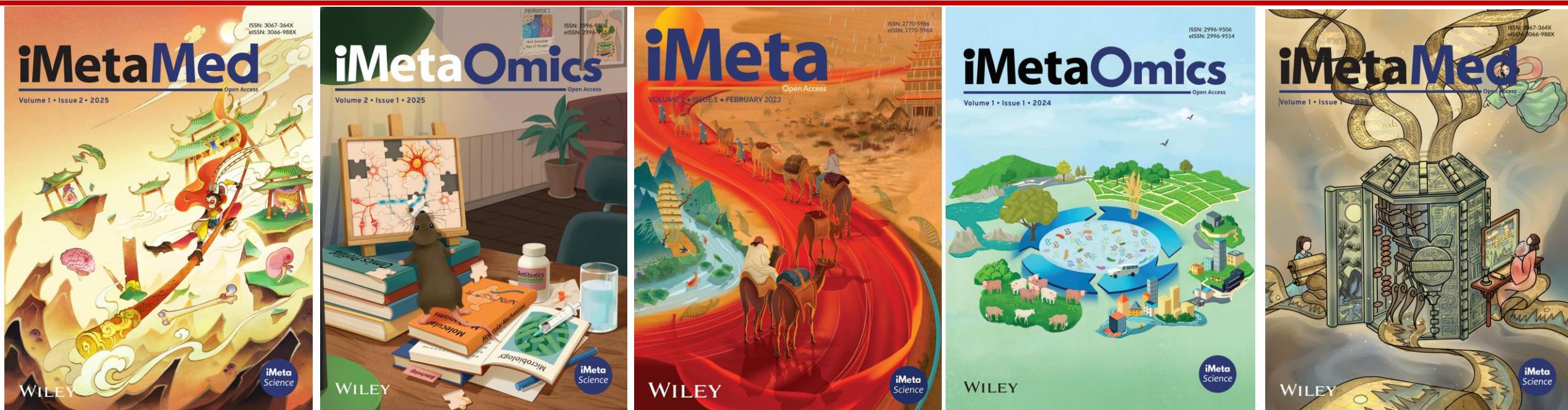


Summary

- Multi-omics integration revealed species-specific rumen energy metabolic strategies in yaks and Holstein cows under **extreme high-altitude** environment.
- Compared with those of Holstein cows **also** reared at high altitudes their entire lives, yak rumen epithelial cells exhibited **clearly different functions indicative of energy metabolism**.
- Yak rumen fluid transplantation confirmed **an** enhanced microbial central carbon metabolism and resulted in **an** improved milk production in Holstein cows **that received yak rumen fluid**.

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