# Oleoylethanolamide regulates intestinal stem cell activity and villus size via PPARα signaling pathway

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[4]Yuelushan Laboratory


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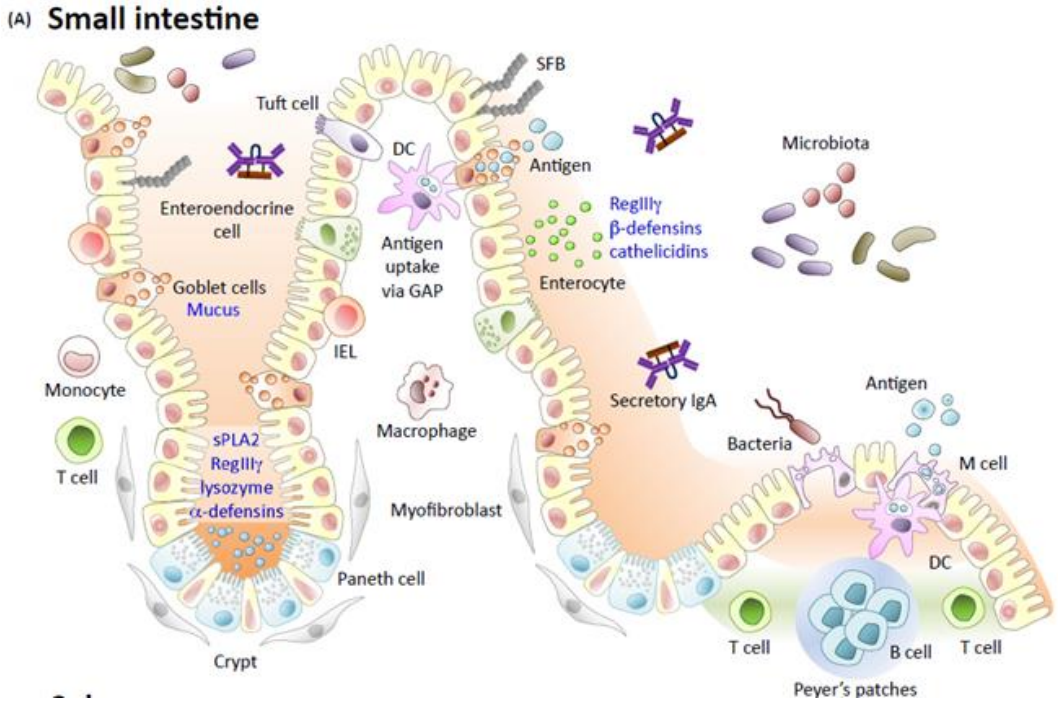
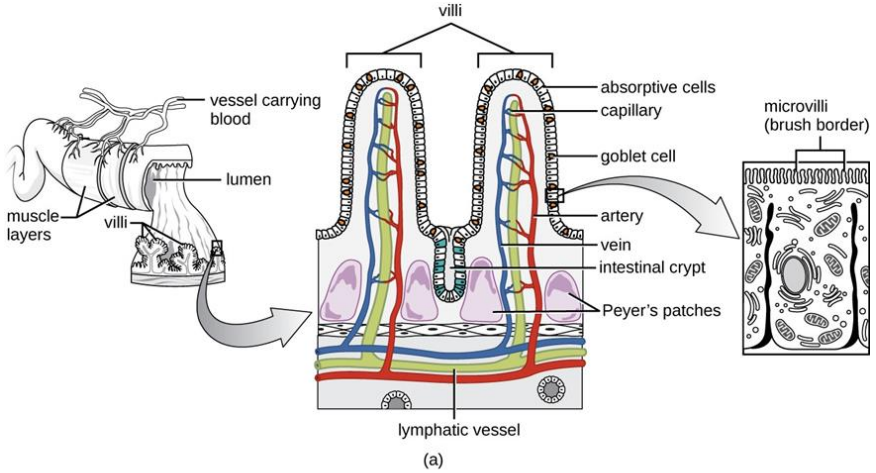
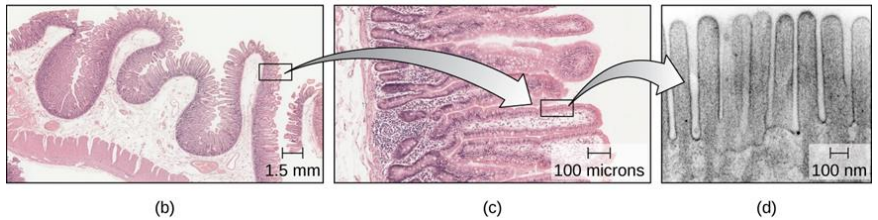
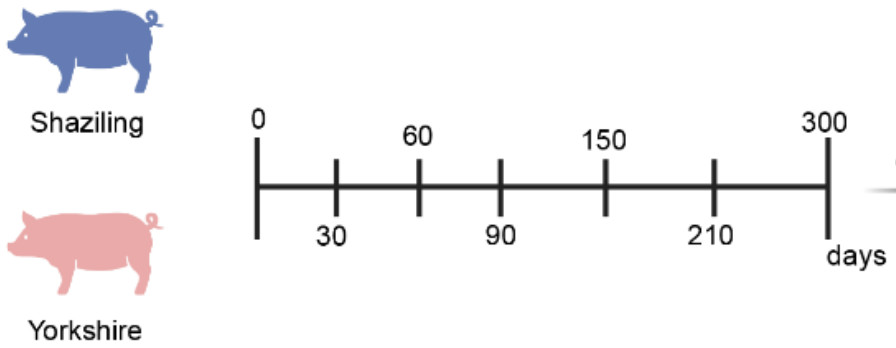
# Introduction

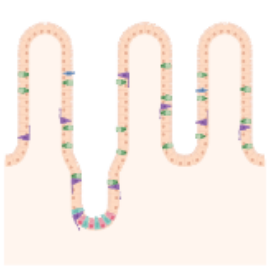
**The size of intestinal villi plays a critical role in determining digestive and absorptive functions, directly affecting nutrient digestibility and feed efficiency.**

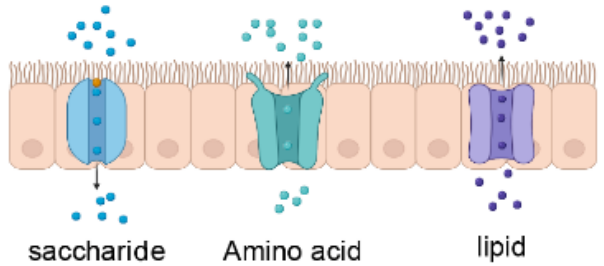


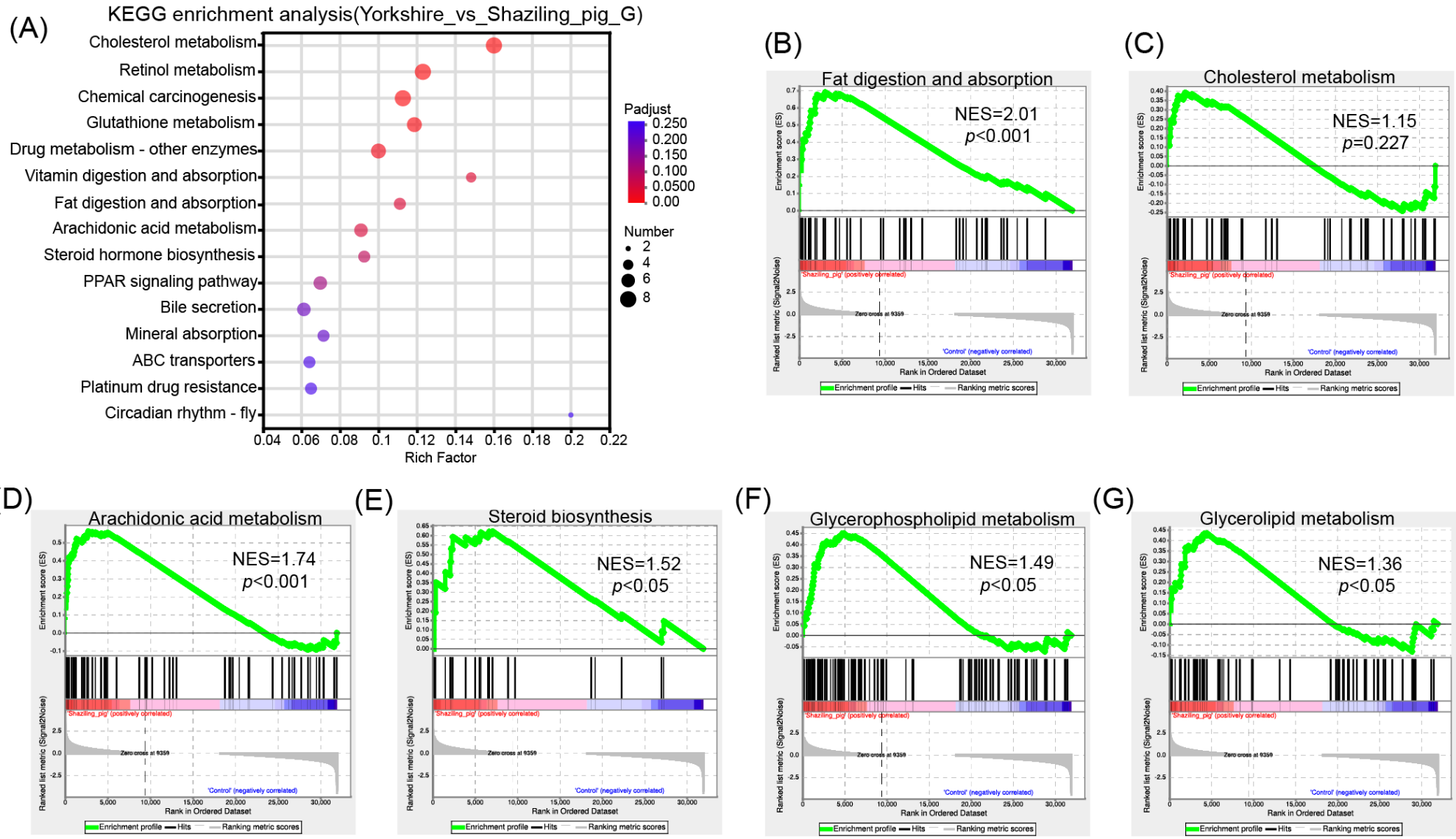





# Results

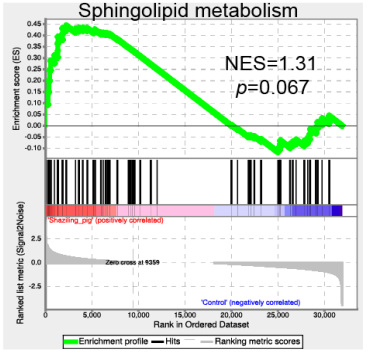
## Significant differences in lipid metabolism pathways between Shaziling and Yorkshire pigs.



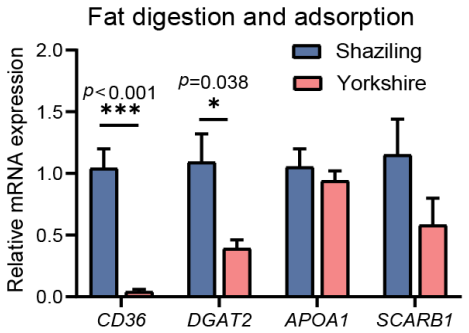
# Results

## Genes related to the fat metabolism pathway are upregulated in Shaziling pigs.

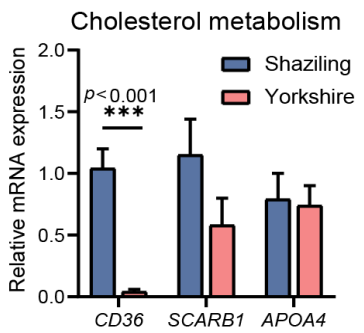
(H)




(I)




(J)

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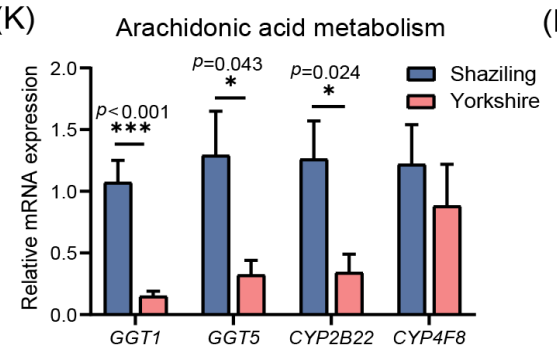


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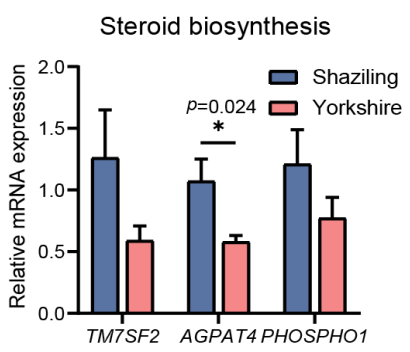


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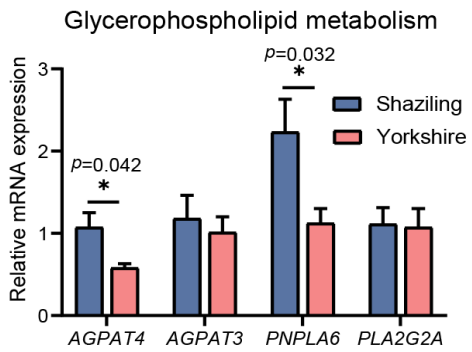


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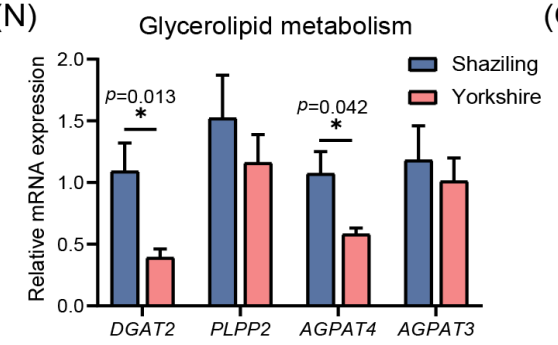
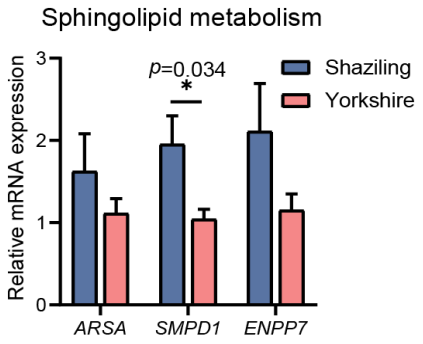
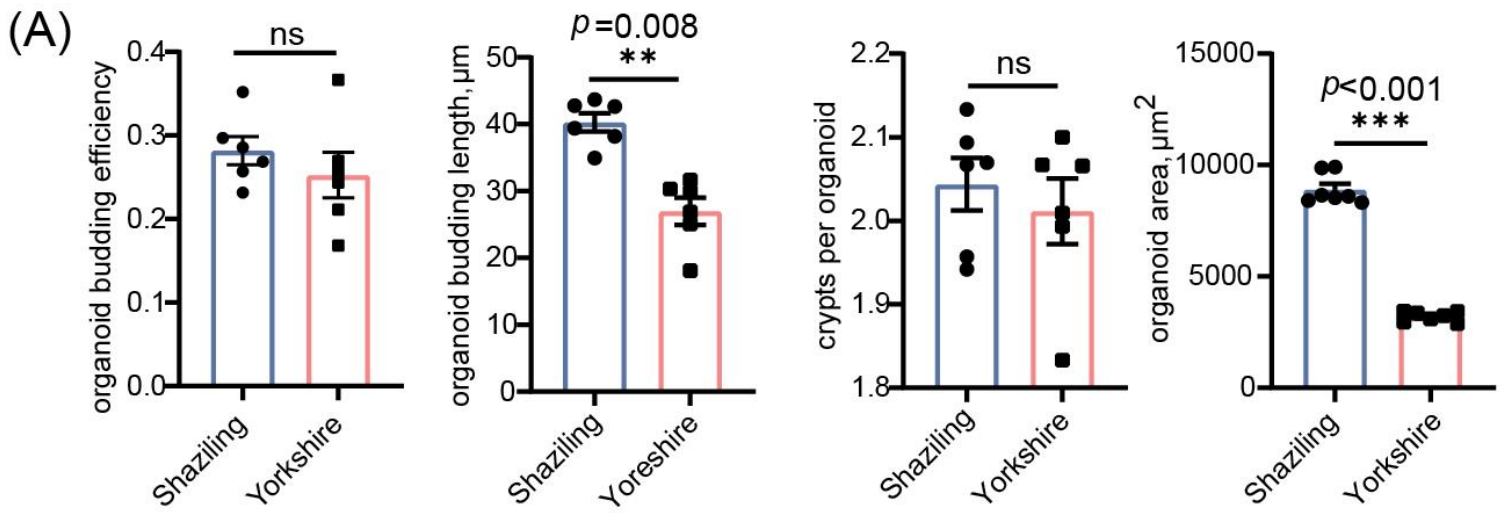


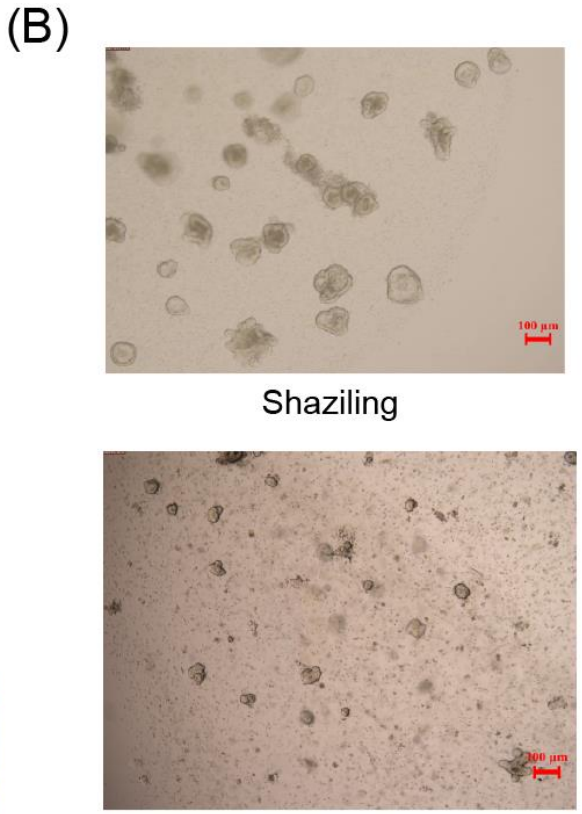

(O)

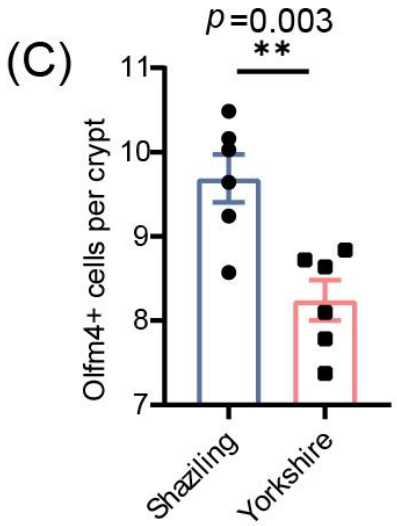


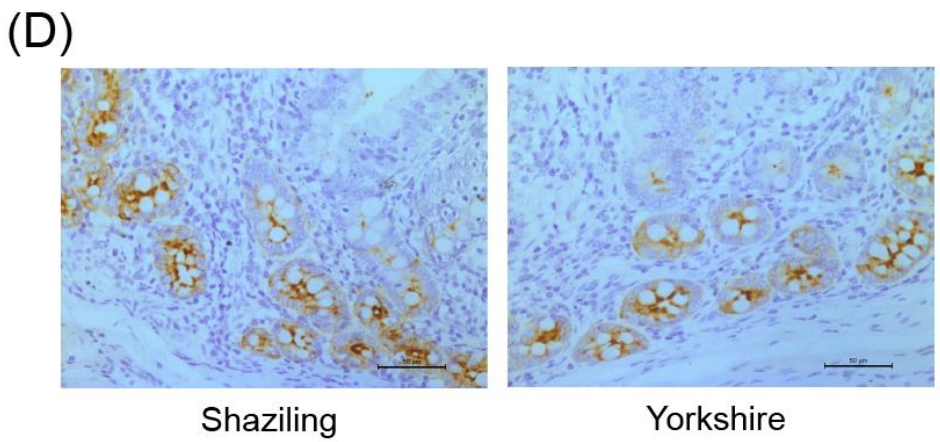
# Results

**The organoids derived from Shaziling pigs exhibited significantly greater budding length and growth area compared to those from Yorkshire pigs.**



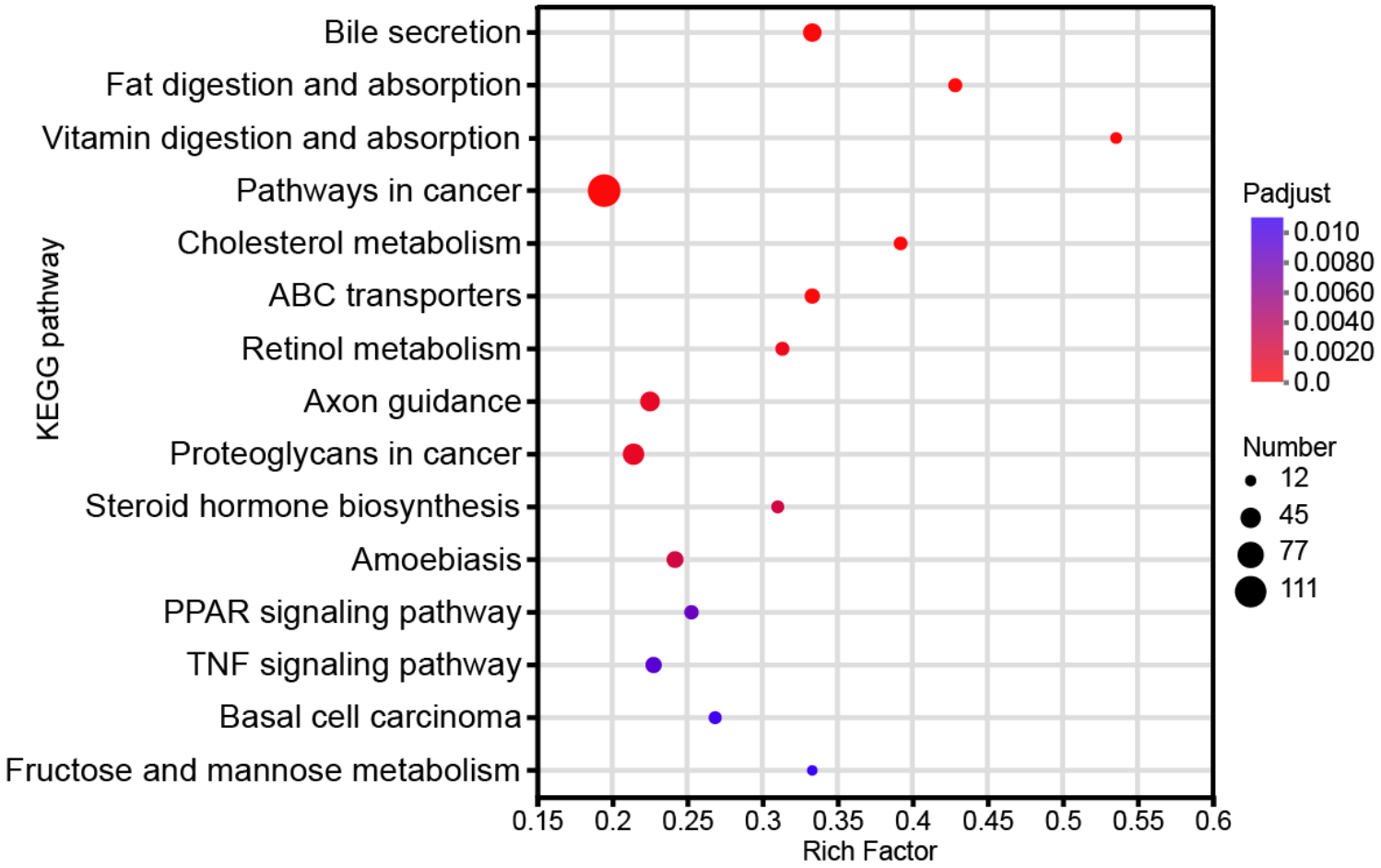



# Results

**PPARα signaling pathway is more highly expressed in Shaziling pigs.**

(E) KEGG enrichment analysis(Yorkshire_organoids_vs_Shaziling_organoids)

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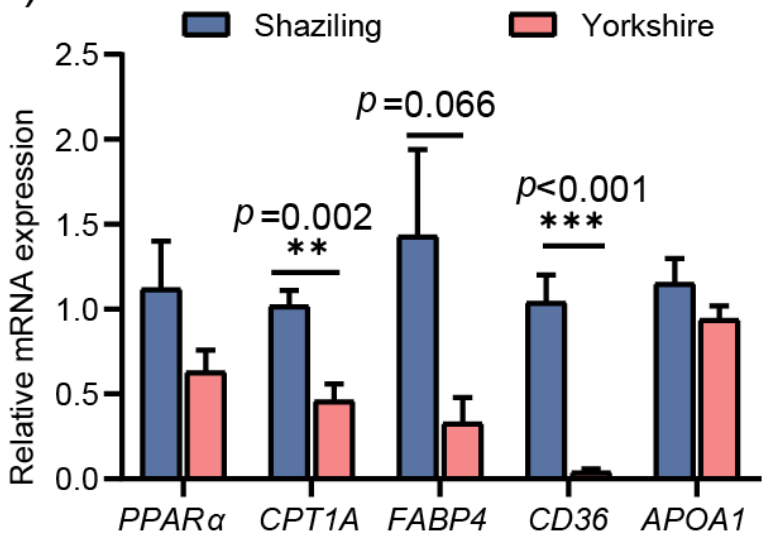
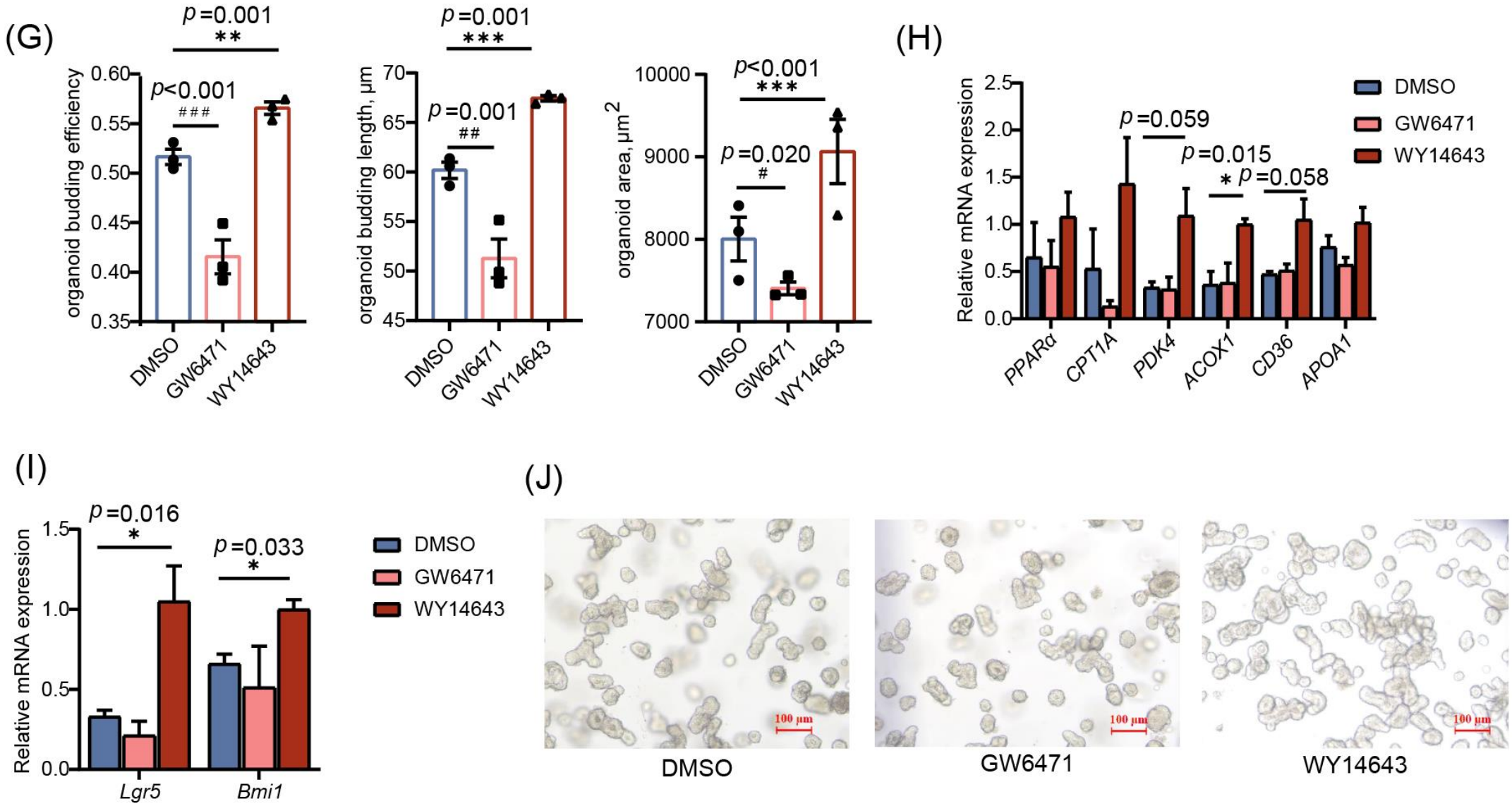


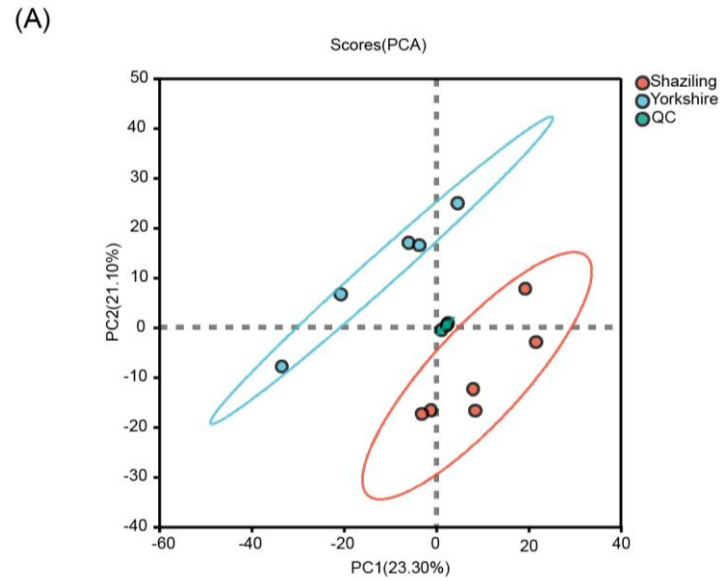
# Results

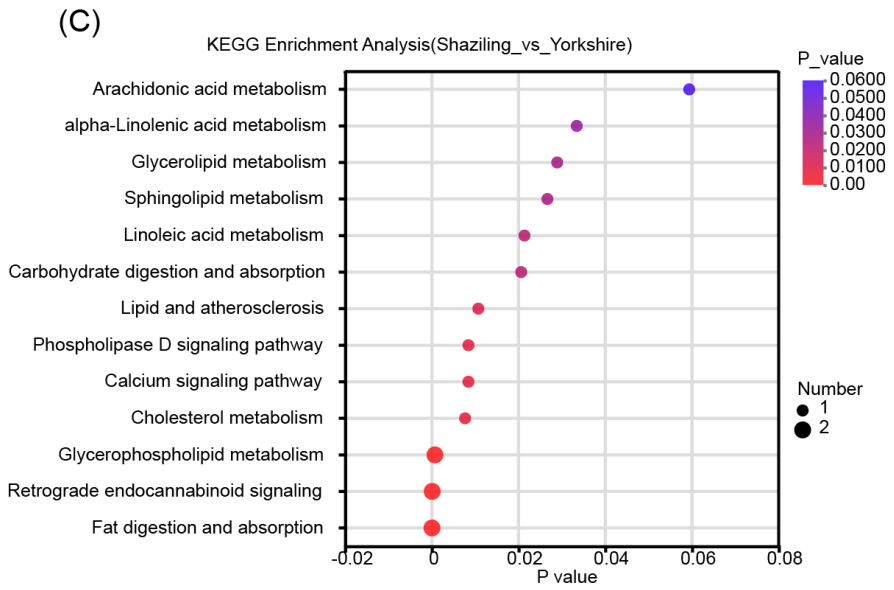
**PPARα plays an important role in intestinal development.**

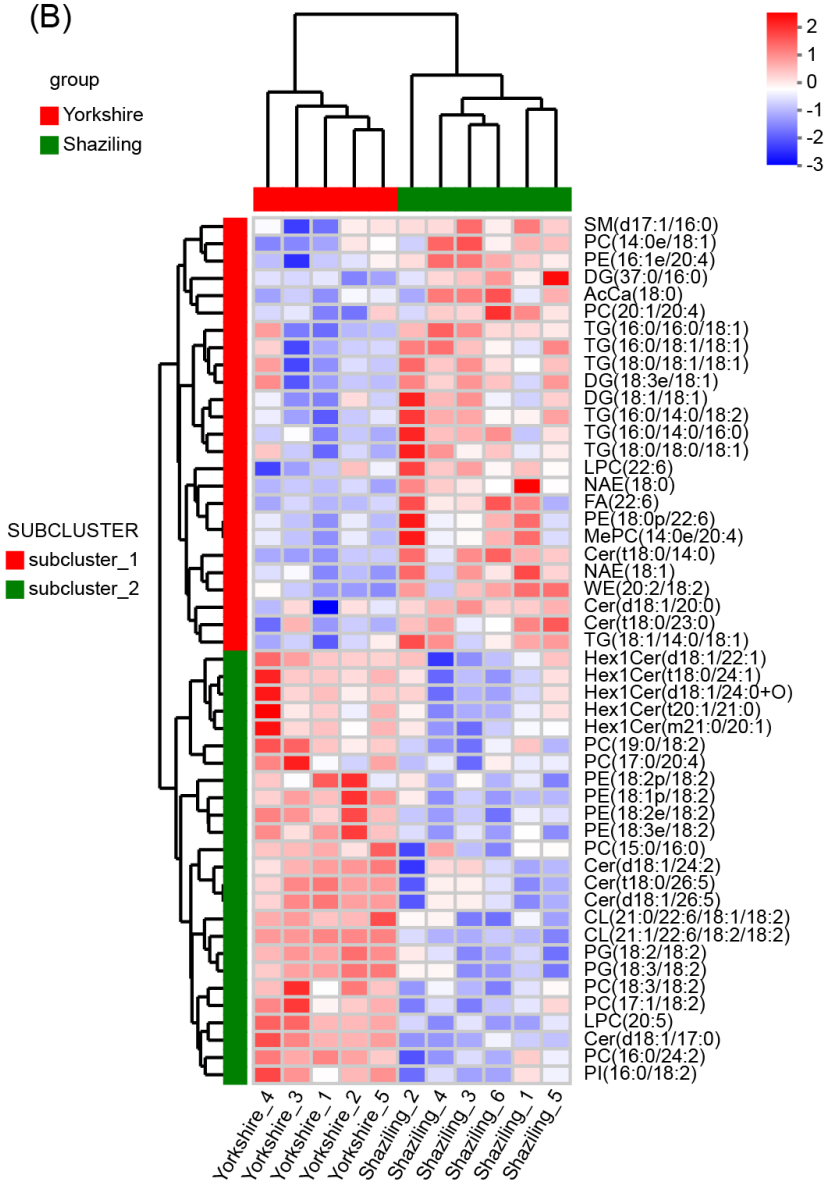


# Results

## The differential metabolites clustered mainly in glycerophospholipids pathway.

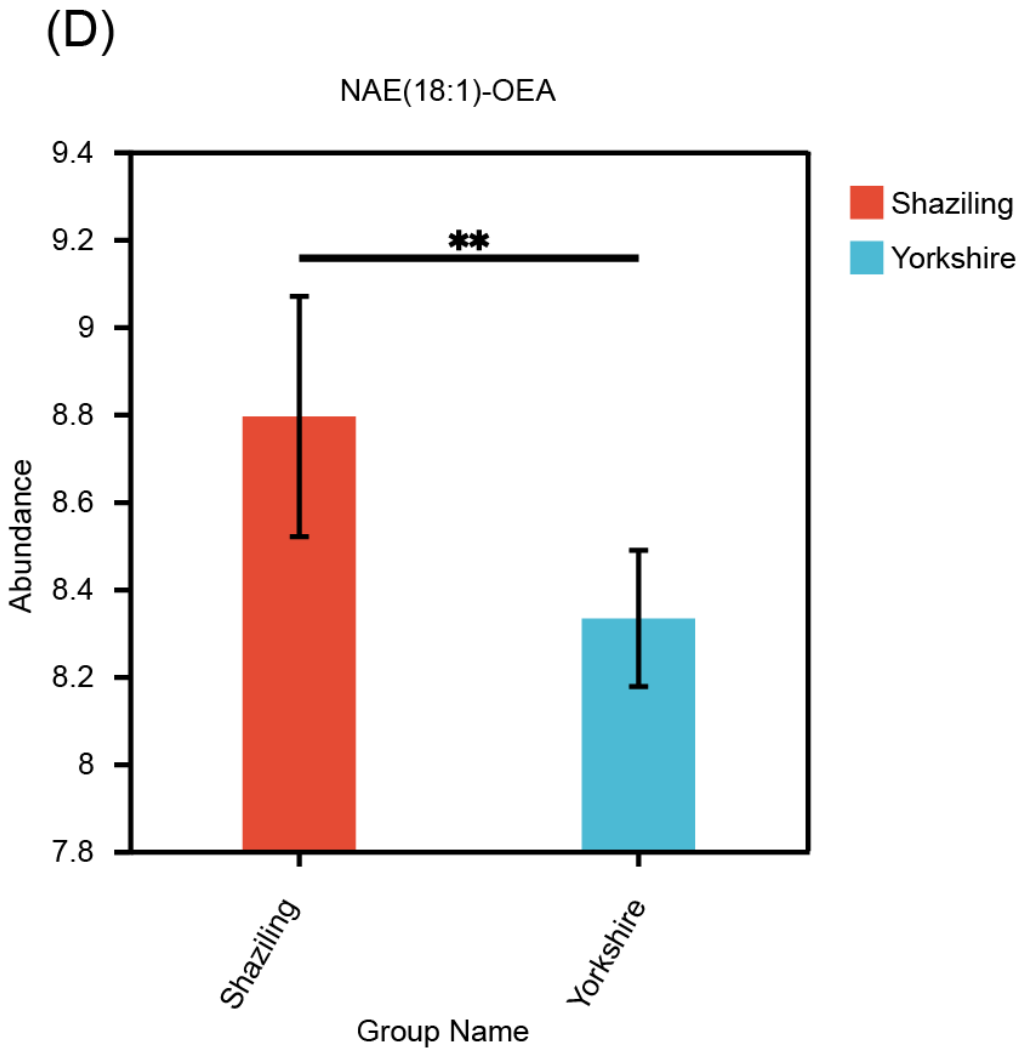


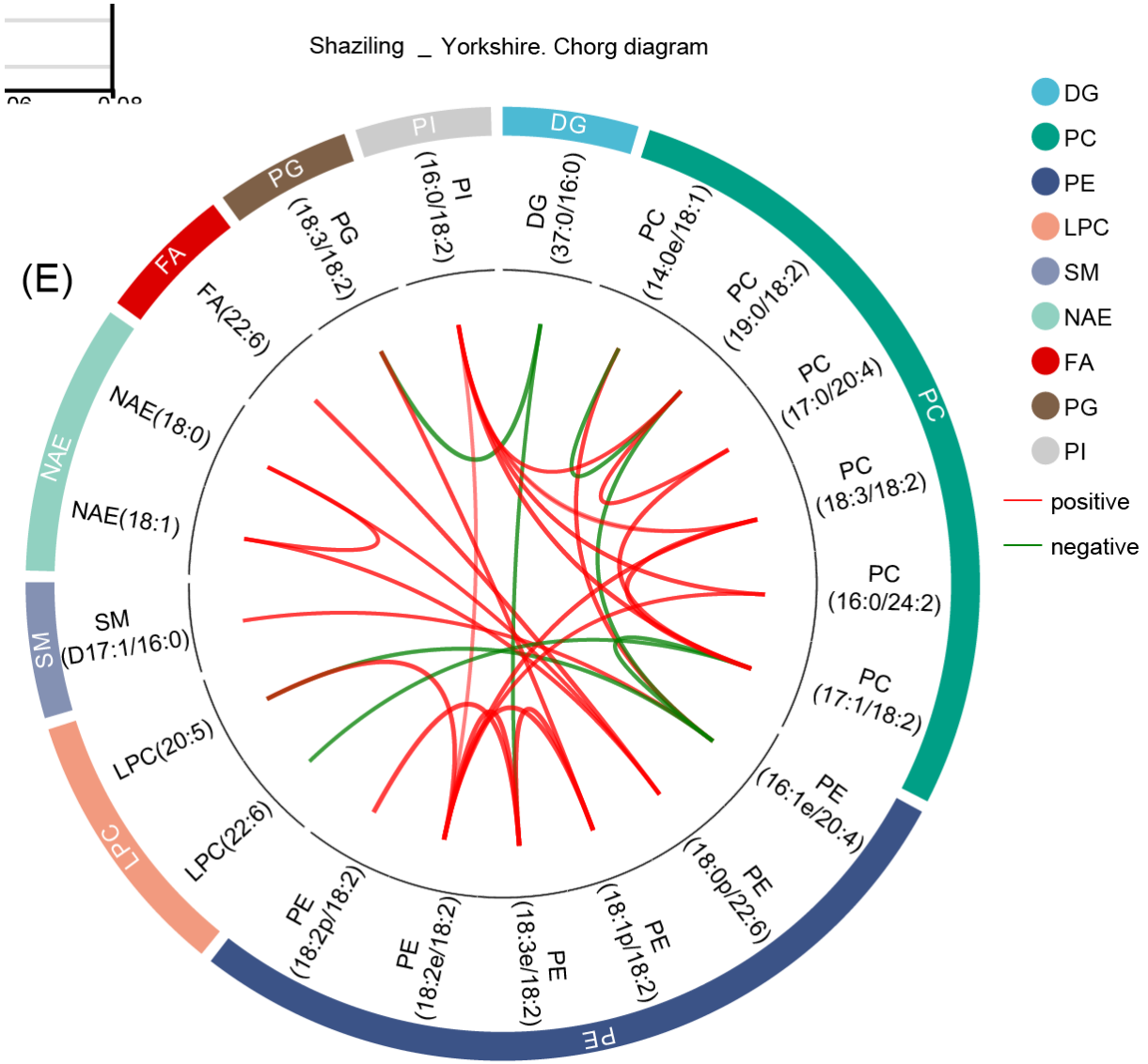



# Results

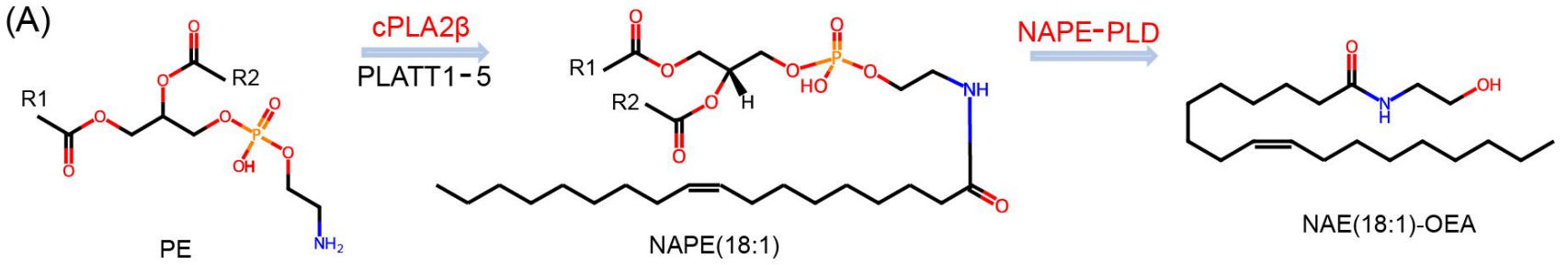
**Oleoylethanolamine (OEA) produced by lipid metabolism is more enriched in Shaziling pigs.**

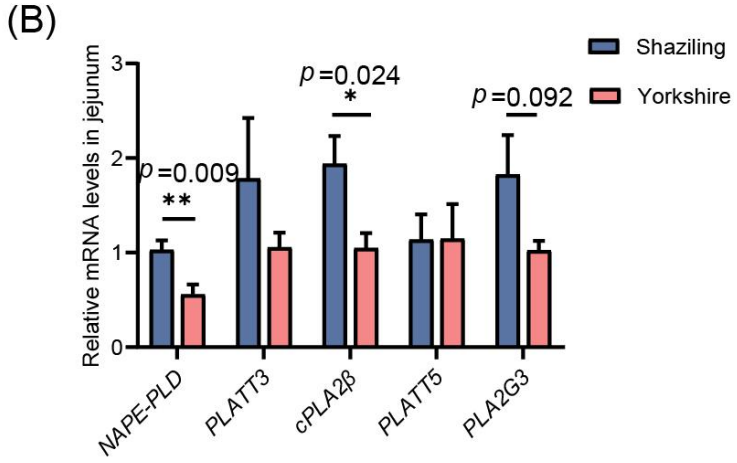


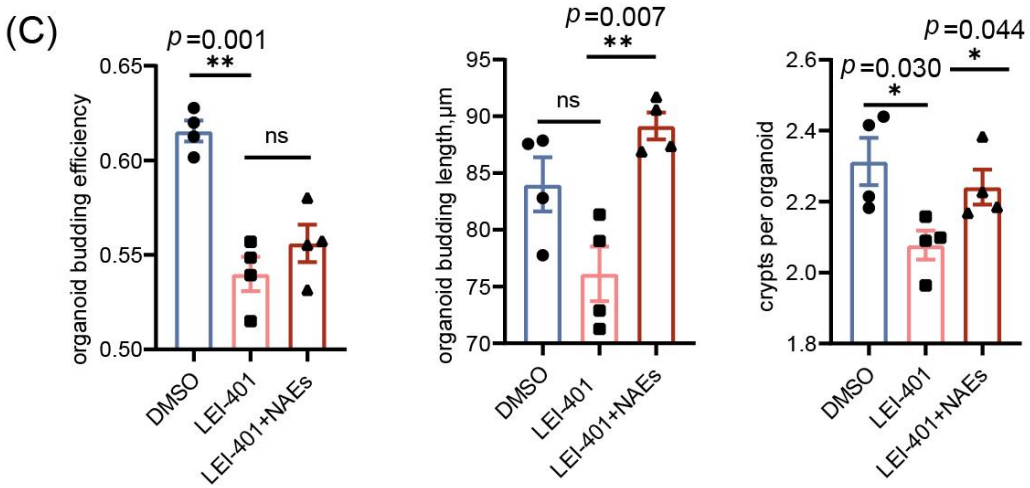



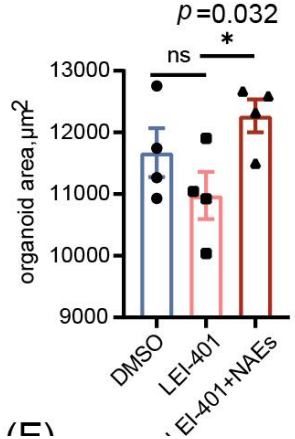
# Results

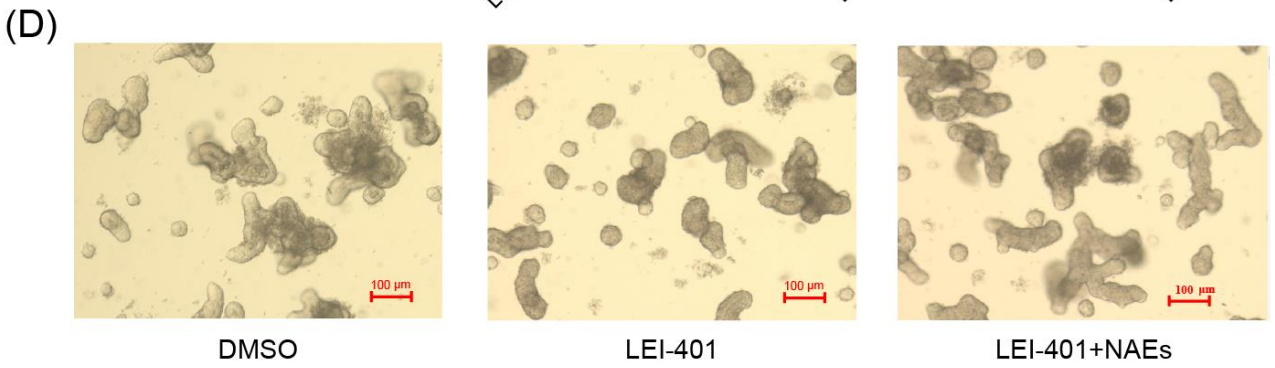
## The critical role of NAE in intestinal development.



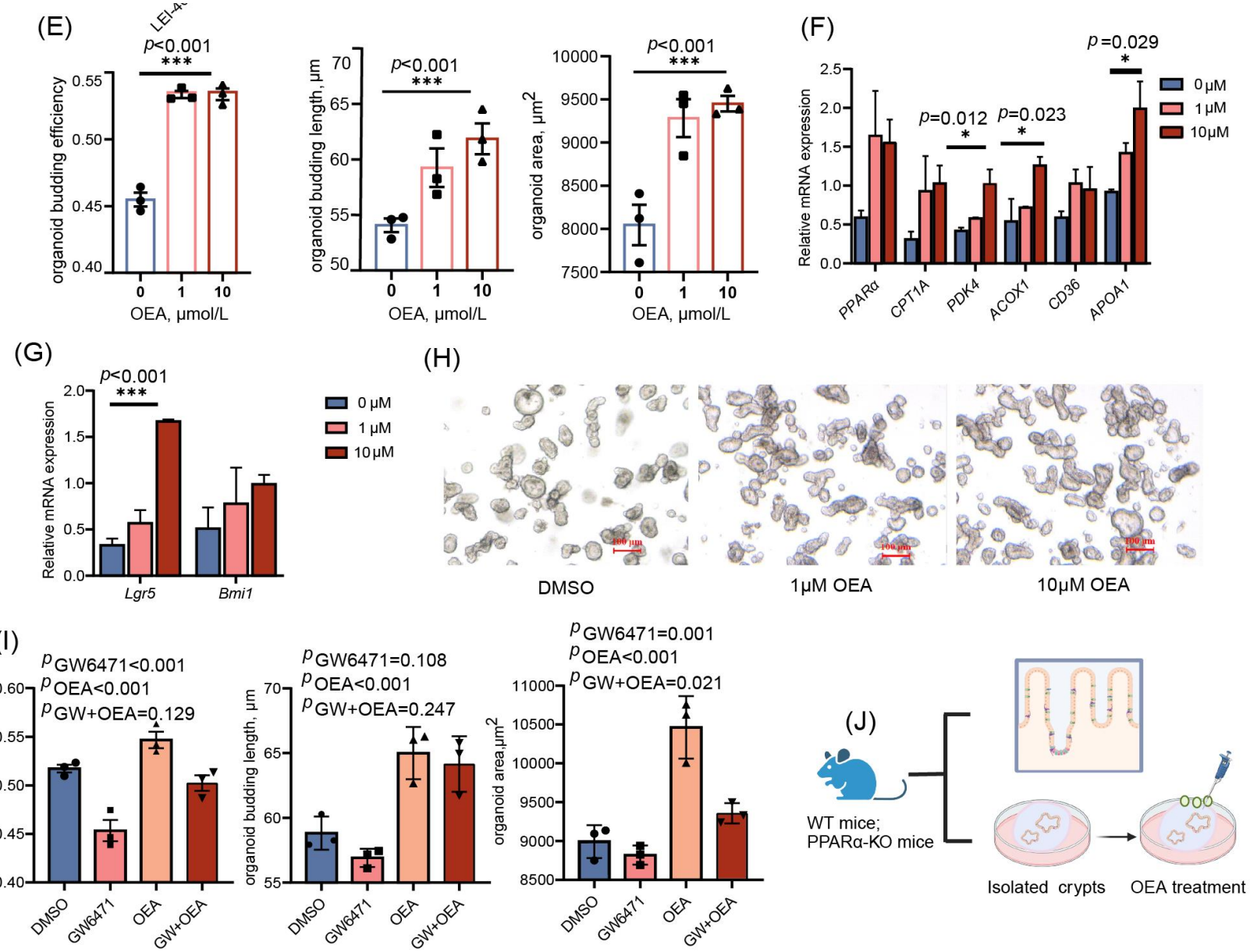



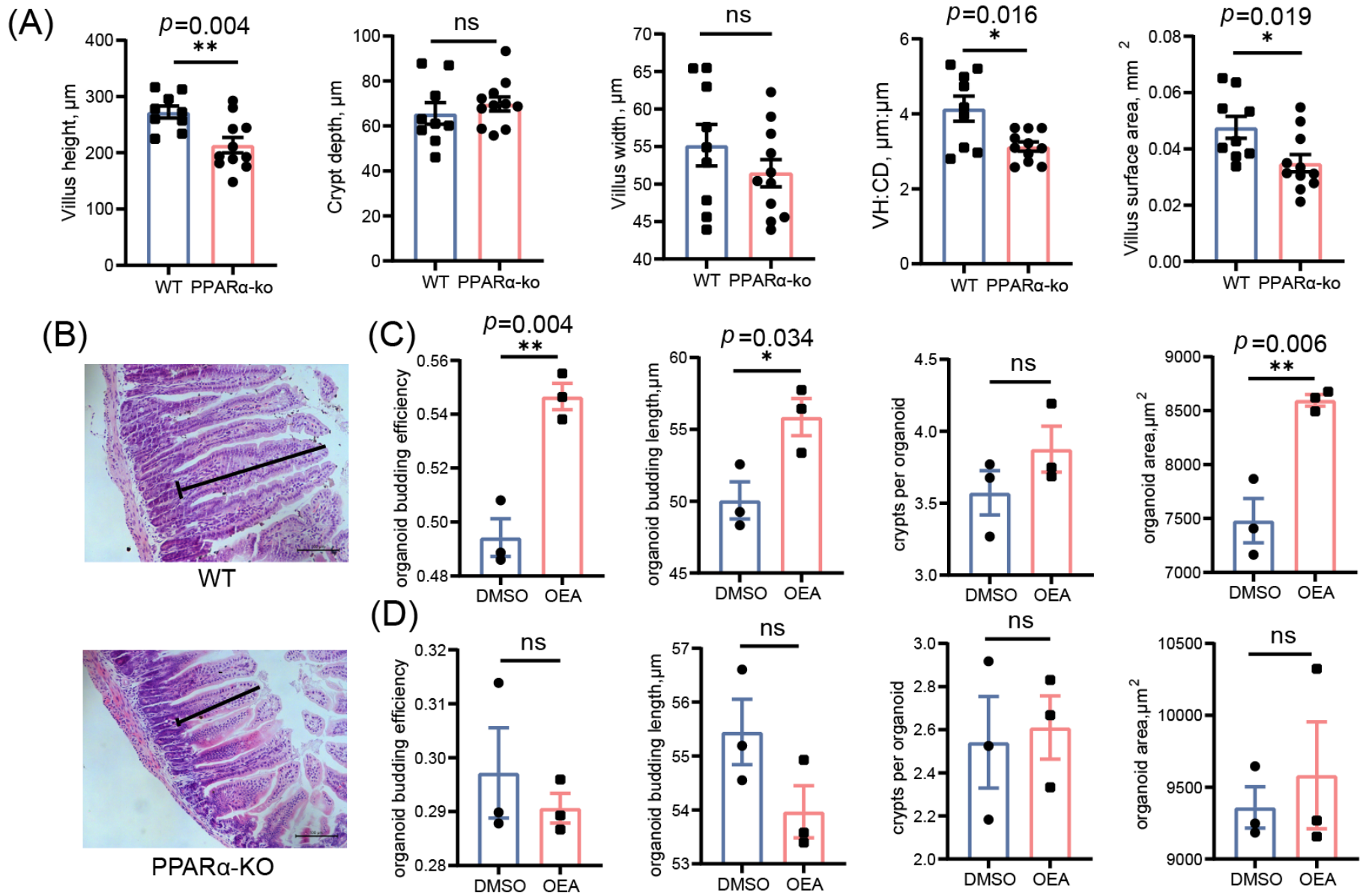
# Results

## OEA regulates intestinal stem cell activity and organoid budding via PPARα signaling pathway.



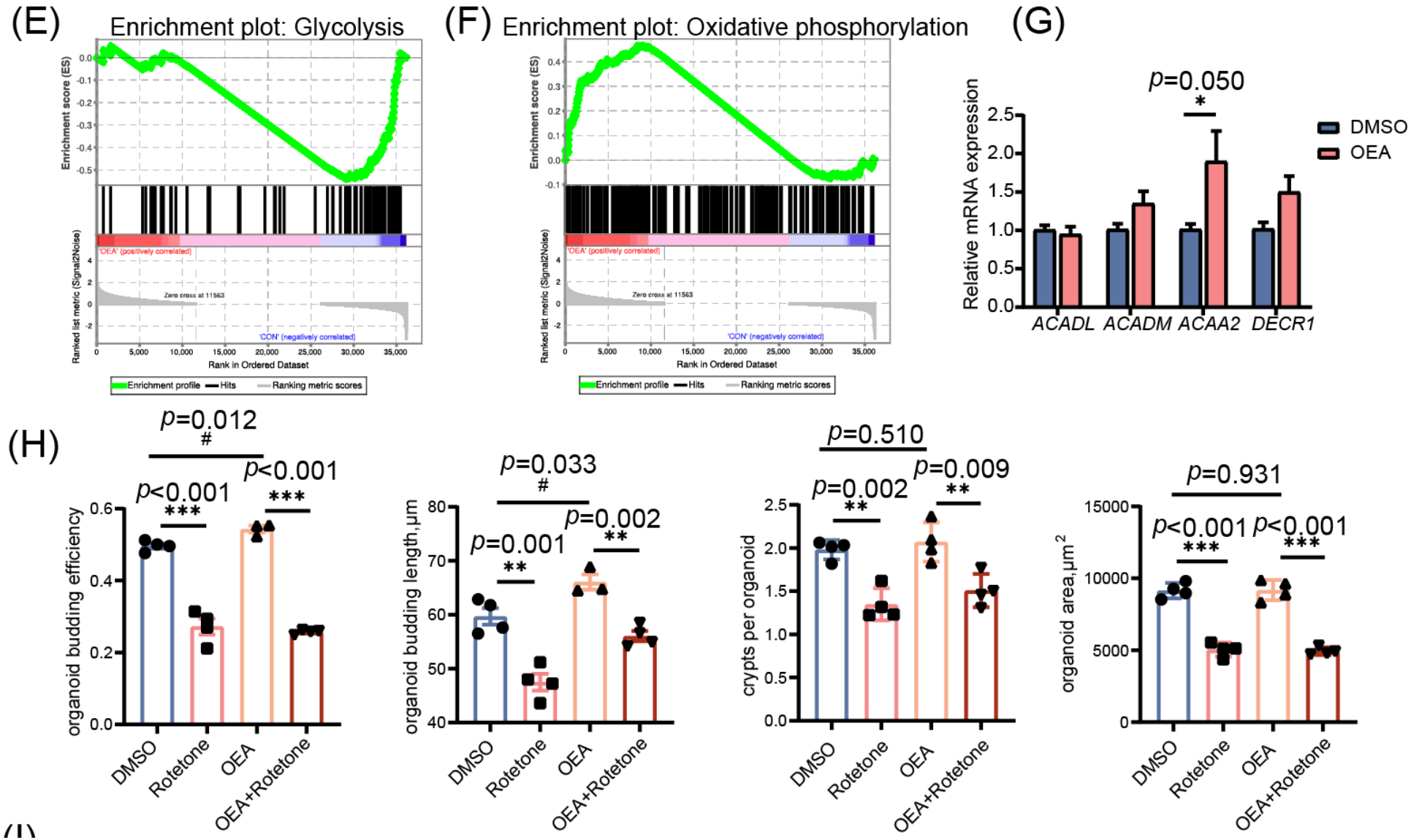
# Results

## The effects of OEA are mediated through PPARα activation.



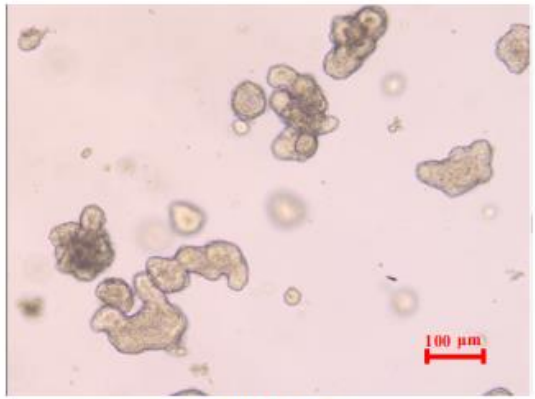
# Results

**In OEA-treated organoids, the glycolysis pathway is downregulated, while oxidative phosphorylation activity is significantly upregulated.**



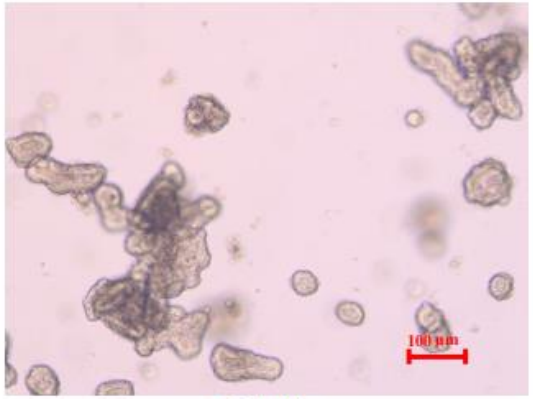
# Results

**Regulation of intestinal stem cell activity by OEA may be mediated through oxidative phosphorylation.**




DMSO

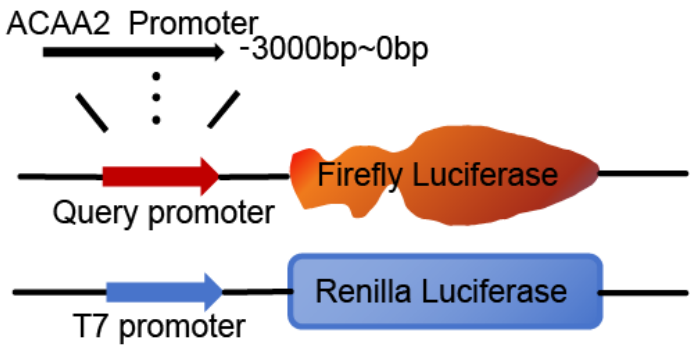

Rotetone



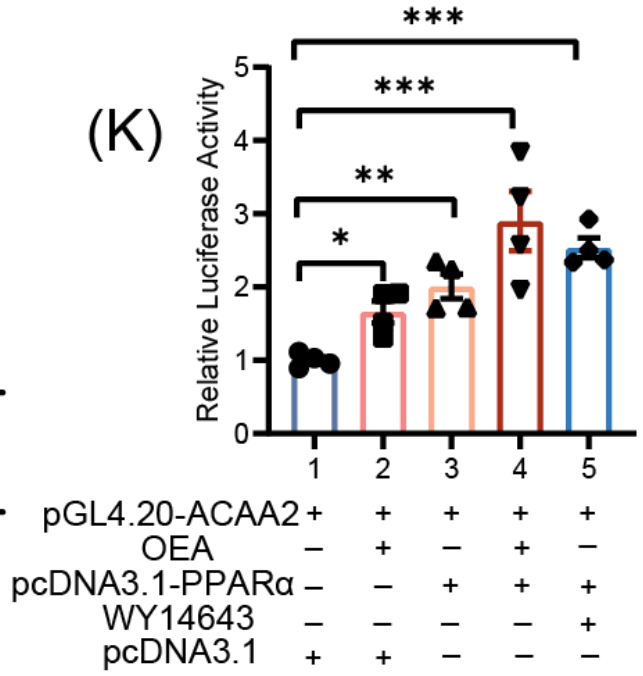

OEA


OEA+Rotetone

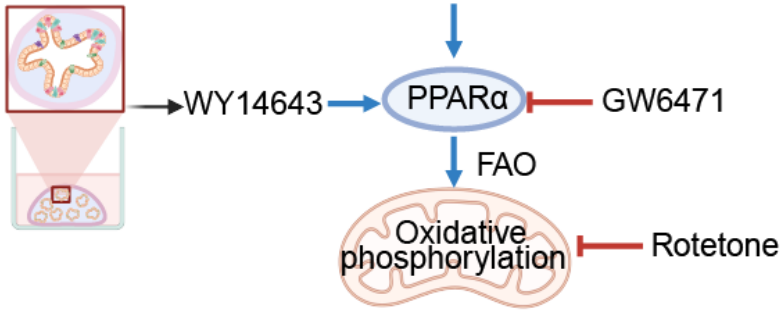
(J)




(K)

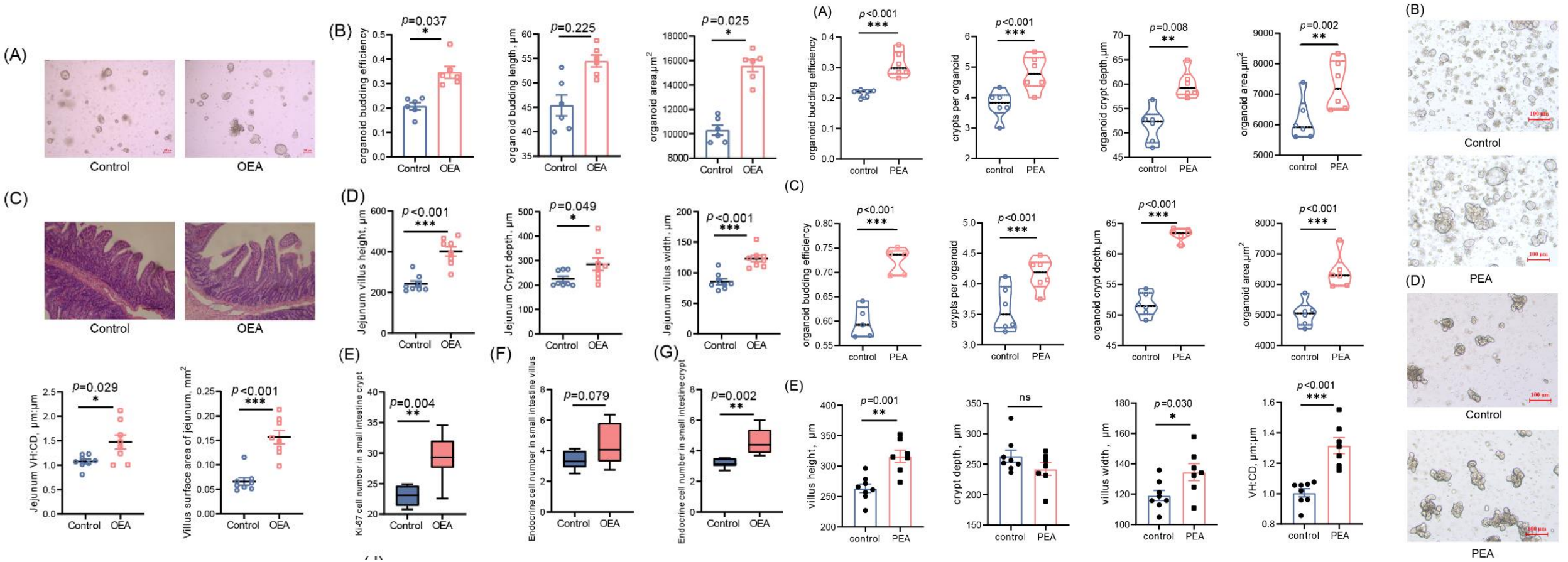



(L)



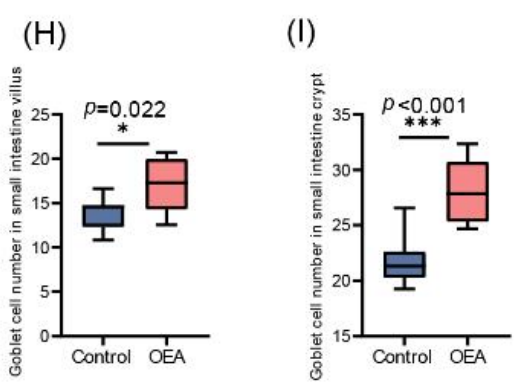
# Results

## Dietary supplementation with OEA and PEA improved primary intestinal organoid budding and increases villus size.



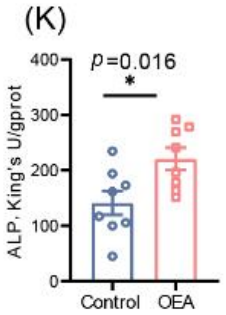
# Results

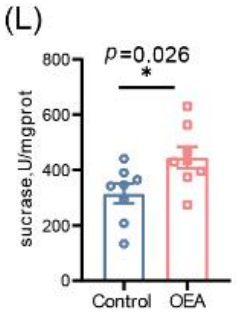
## Dietary supplementation with OEA and PEA significantly enhanced nutrient absorption.

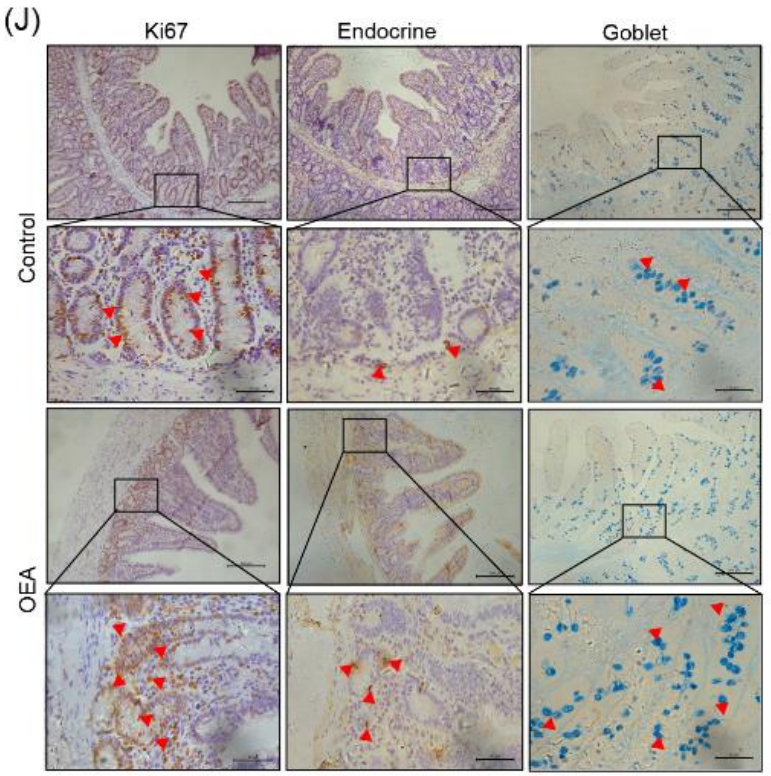


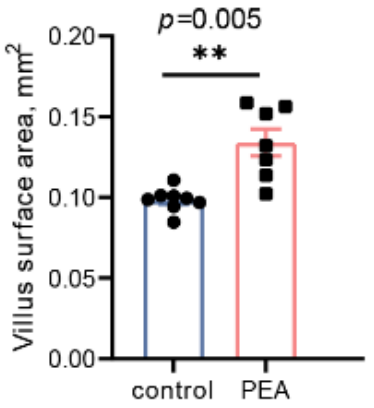


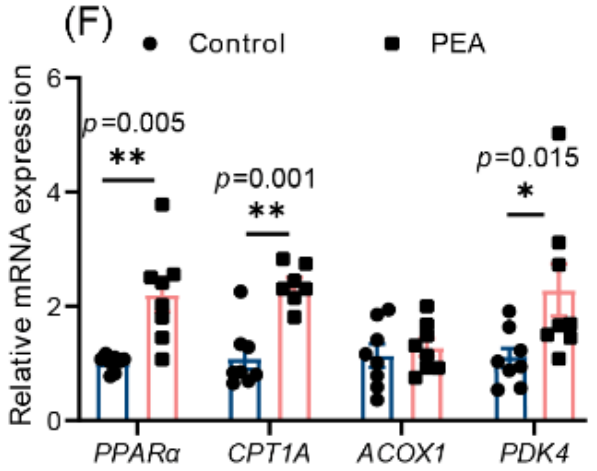


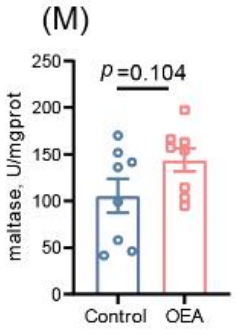


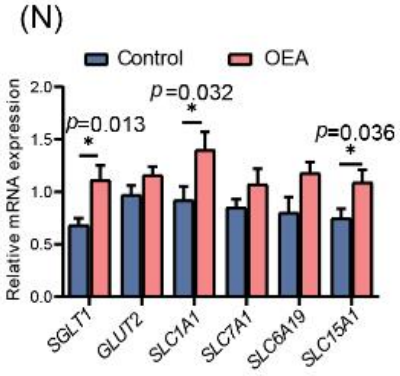



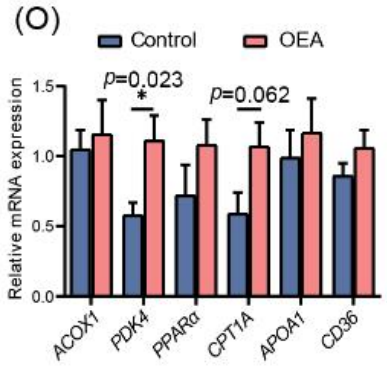



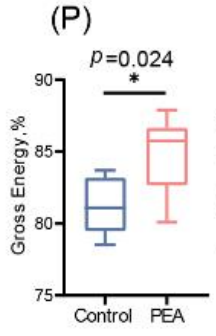



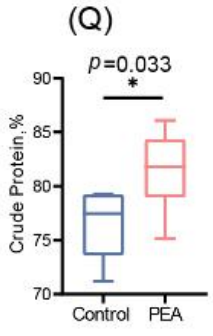



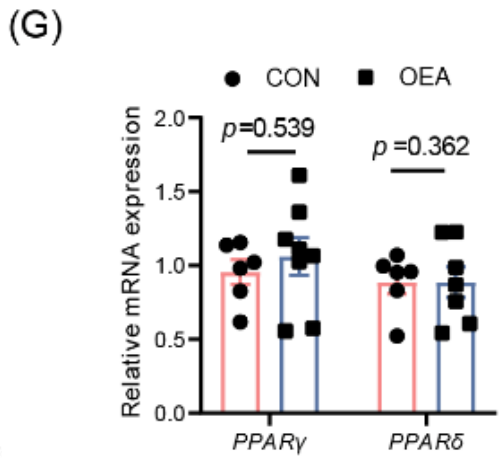



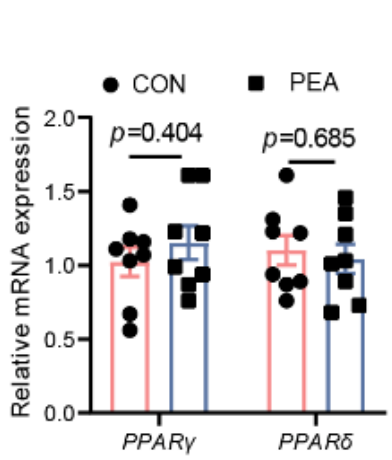



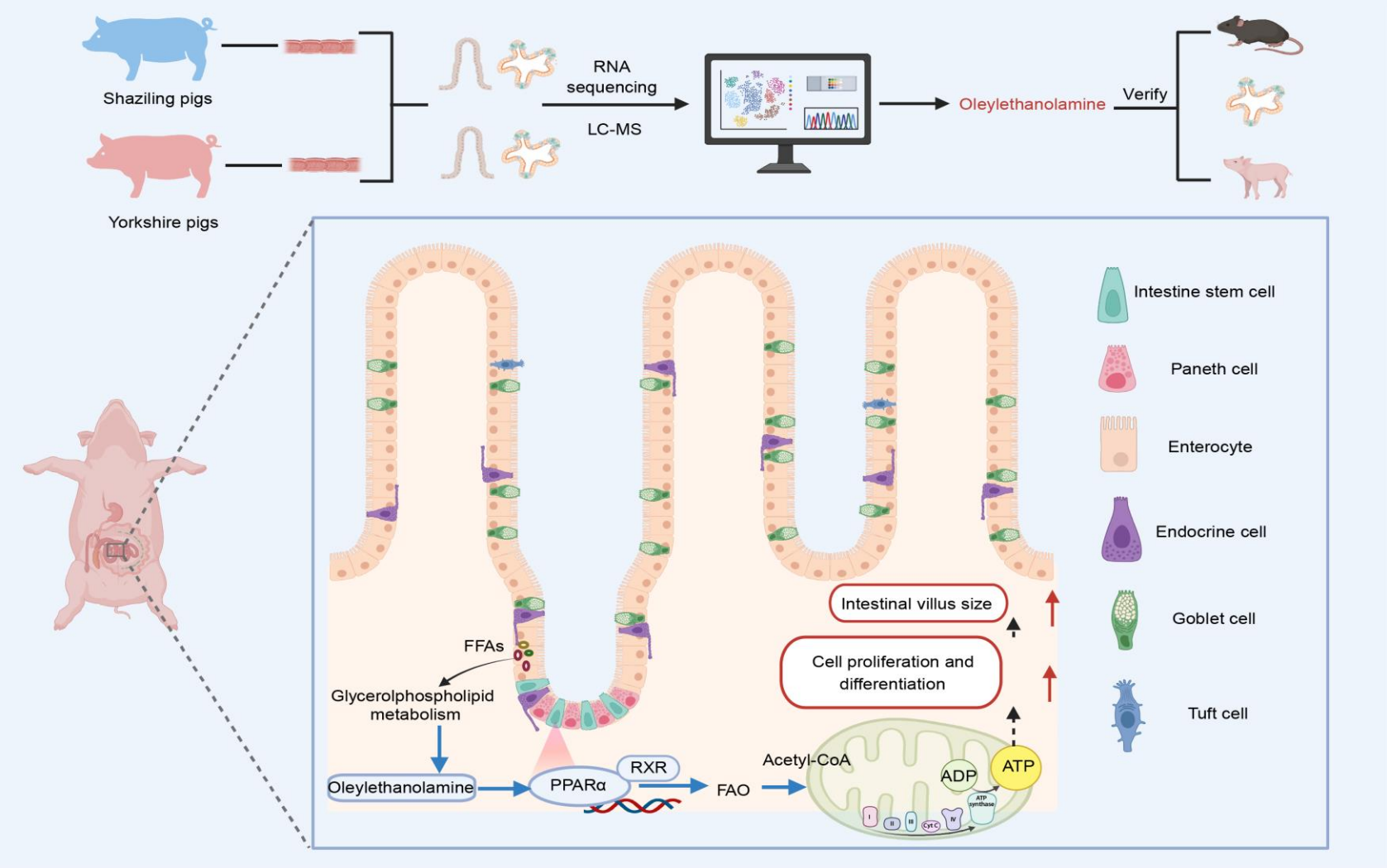



# Summary




- **Species-specific lipid metabolism fundamentally links fatty acid metabolic pathways to variations in intestinal villus development.**
- **Oleoylethanolamide regulates intestinal stem cell activity and villus size through the PPARα-oxidative phosphorylation axis.**
- **Dietary N-acylethanolamines enhance intestinal villus size and nutrient digestibility as potential feed additives.**

Qianqian Wang, Lanmei Yin, Zhaobin Wang, Jun Li, Xianglin Zeng, Qiye Wang, Jianzhong Li, et al. 2026. Oleoylethanolamide regulates intestinal stem cell activity and villus size via PPARα signaling pathway. ***iMetaOmics*** 3: e70078. https://doi.org/10.1002/imo2.70078

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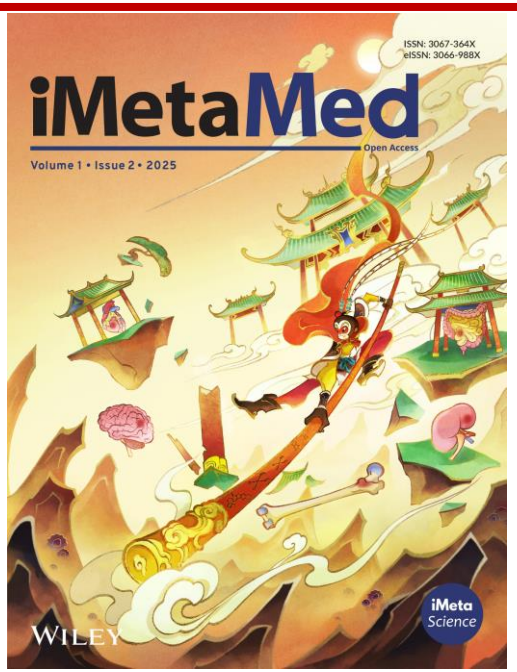



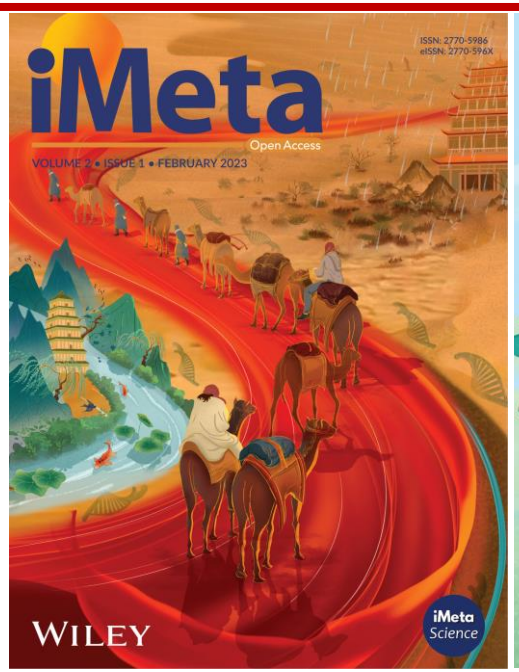




"***iMeta***" launched in 2022 by iMeta Science Society, impact factor (IF) **33.2**, ranking top 65/22249 in world and 2/161 in the microbiology. It aims to publish innovative and high-quality papers with broad and diverse audiences. **Its scope is similar to *Cell*, *Nature Biotechnology/Methods/Microbiology/Medicine/Food***. Its unique features include video abstract, bilingual publication, and social media with 600,000 followers. Indexed by **SCIE/ESI**, **PubMed**, **Google Scholar** etc.

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