



Weizmannia coagulans XY2 Mitigates Copper Neurotoxicity via Gut-Brain Axis Modulation of Tryptophan Metabolism and Oxidative-Inflammatory Crosstalk

Yufang Gao, Xiaodong Zheng, Fujie Yan*

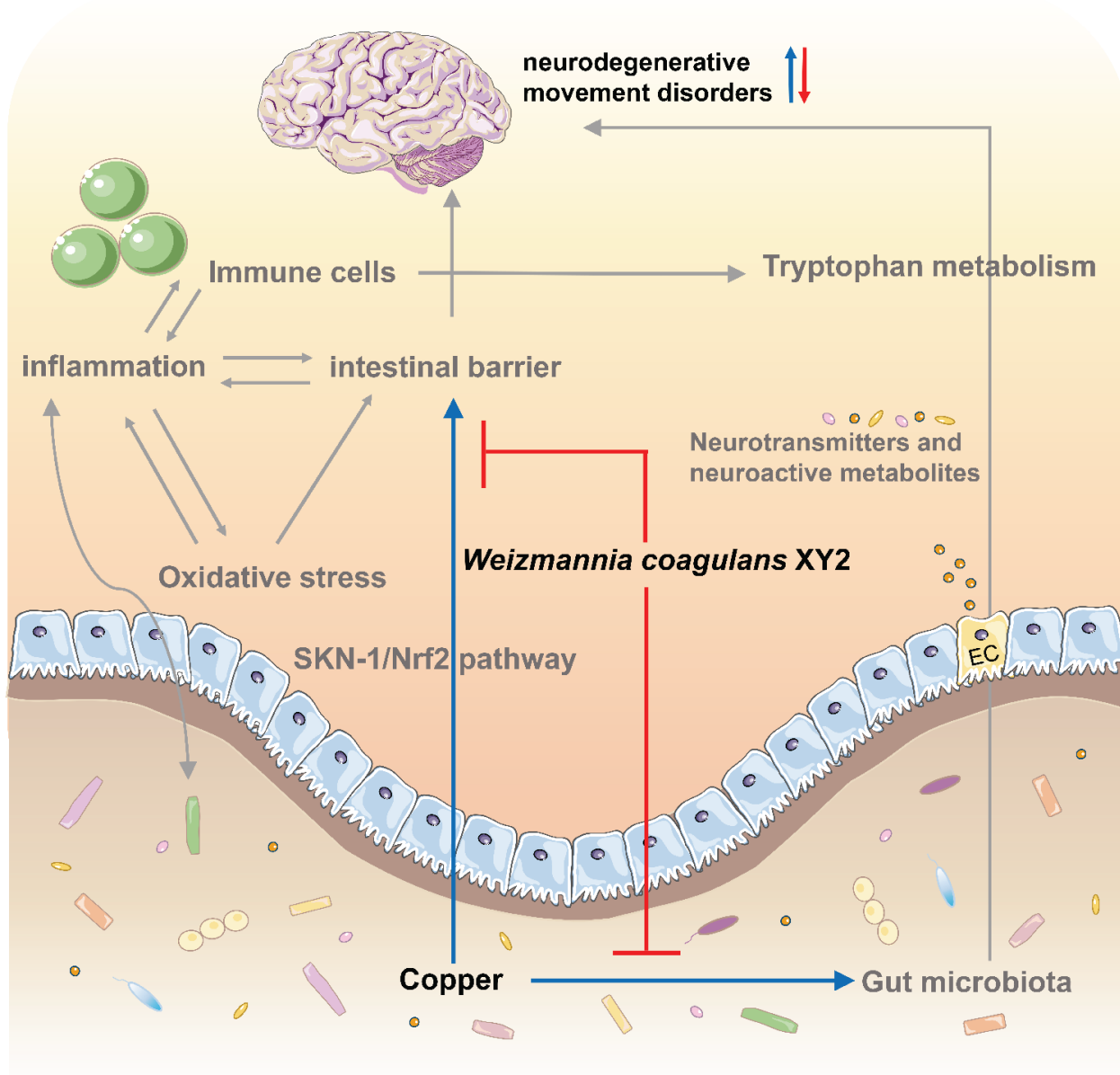
Department of Food Science and Nutrition, College of Biosystems Engineering and Food Science, Zhejiang University, Hangzhou, China



Yufang Gao, Xiaodong Zheng, Fujie Yan. 2025. *Weizmannia coagulans* XY2 Mitigates Copper Neurotoxicity via Gut-Brain Axis Modulation of Tryptophan Metabolism and Oxidative-Inflammatory Crosstalk. *iMetaOmics* 2: e70066. <https://doi.org/10.1002/imo2.70066>



Highlights

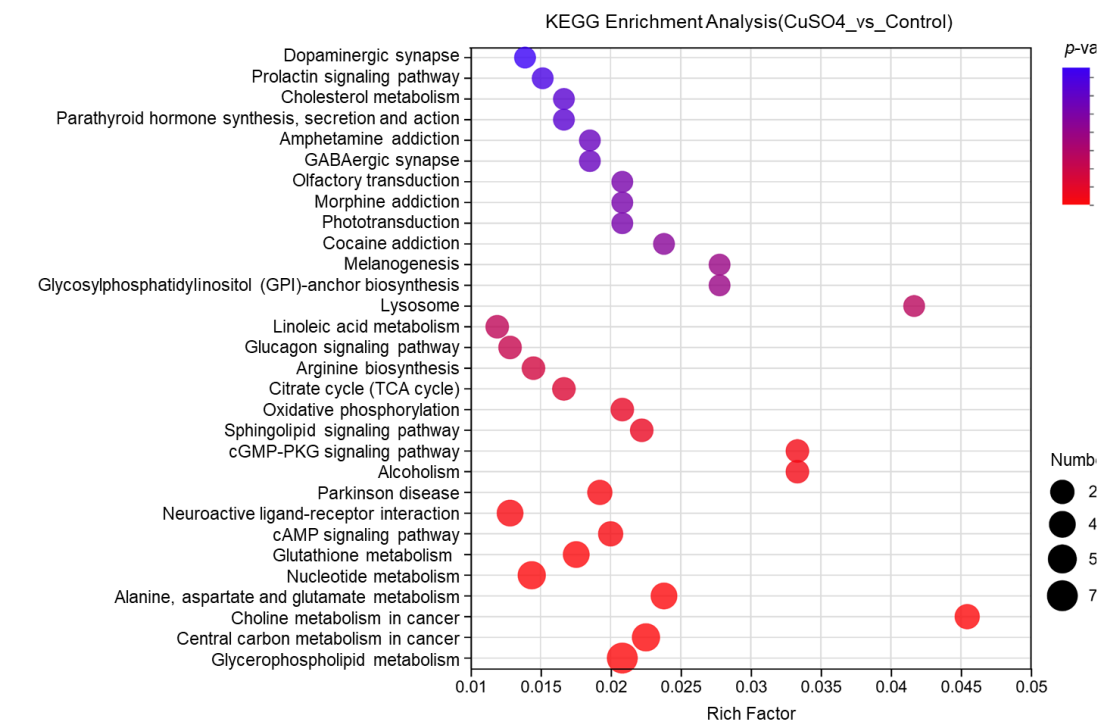


- Copper interferes with tryptophan metabolism and 5-HT levels by modulating intestinal flora.
- Intestinal barrier breakdown and inflammatory response trigger nerve damage under copper exposure.
- *W. coagulans* XY2 alleviates copper-induced neurotoxicity by targeting a multi-dimensional “tryptophan metabolism-antioxidant defense-gut-brain axis” network.



Results

(A)



(B)

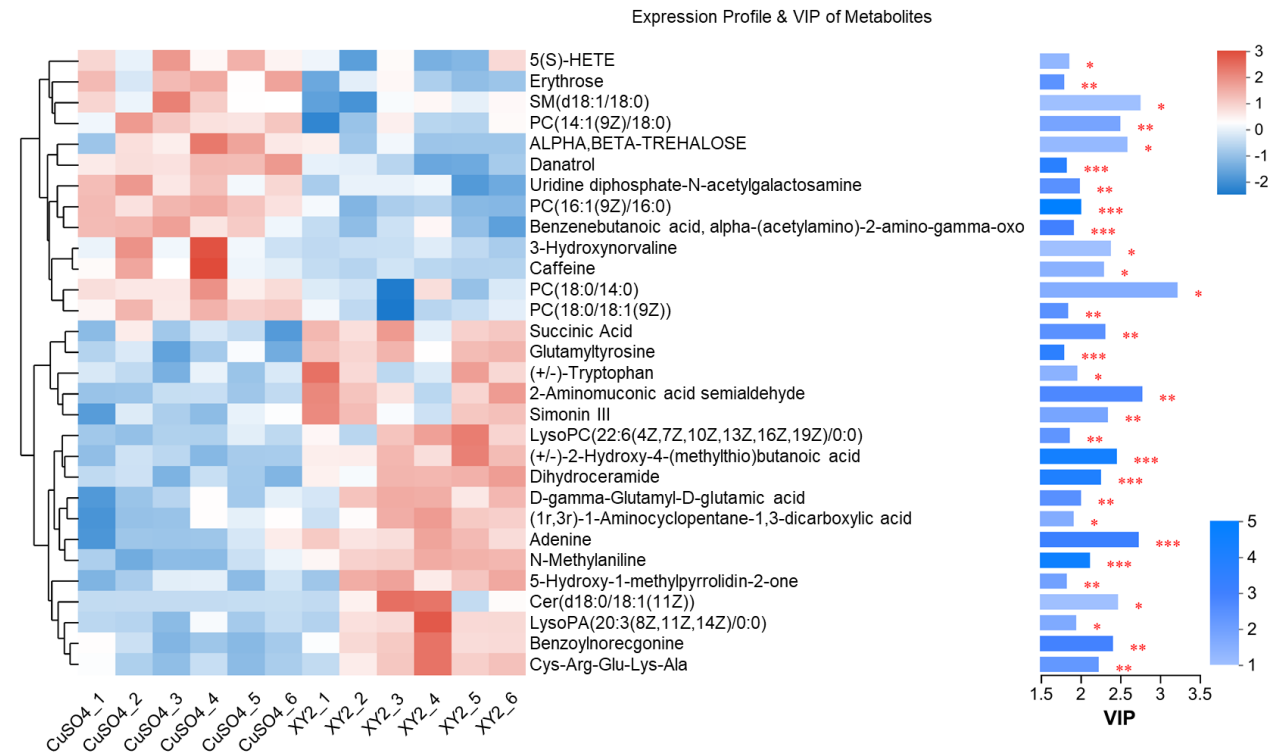


Figure 1. Tryptophan metabolism was a key pathway for *W. coagulans* XY2 to inhibit copper toxicity.



Results

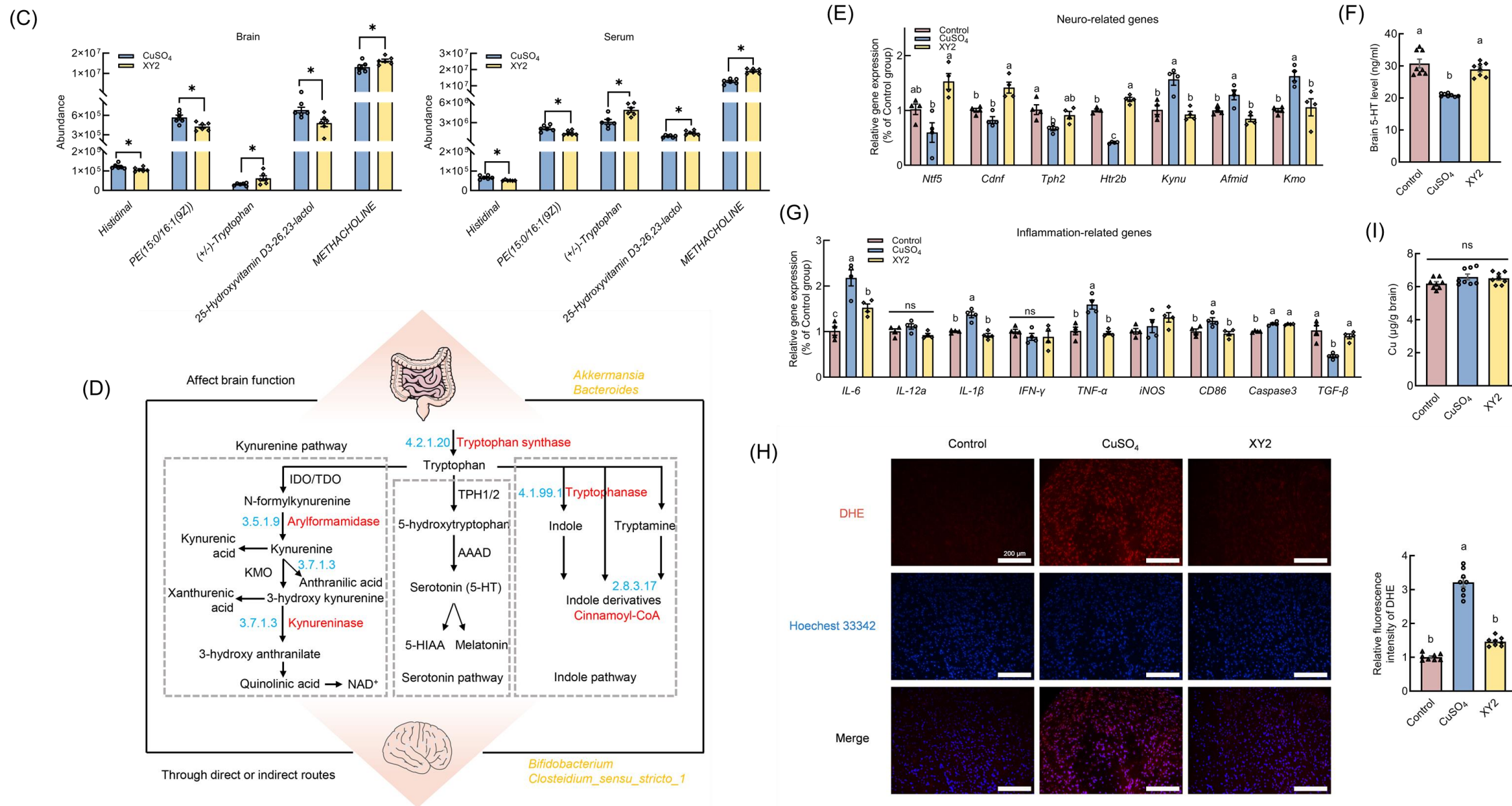
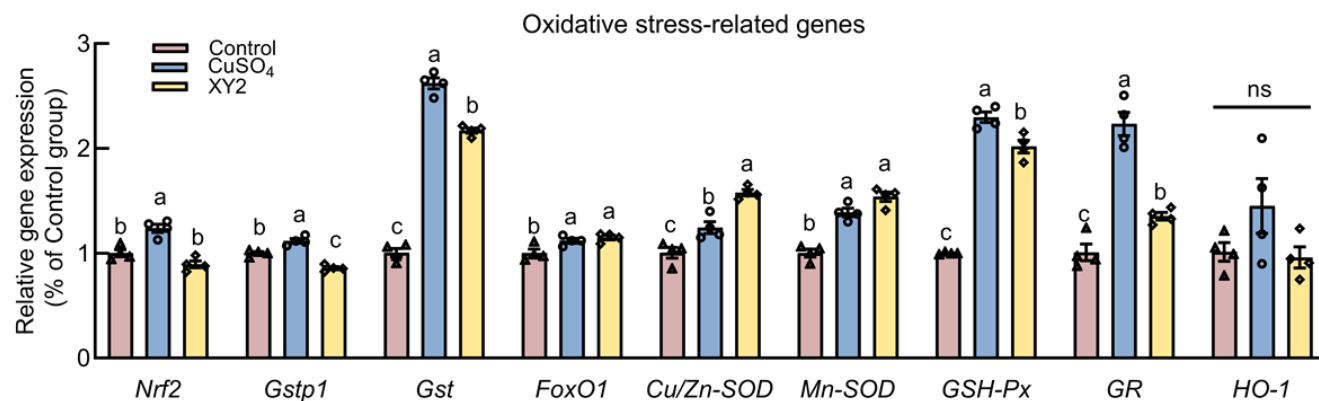


Figure 1. Tryptophan metabolism was a key pathway for *W. coagulans* XY2 to inhibit copper toxicity.

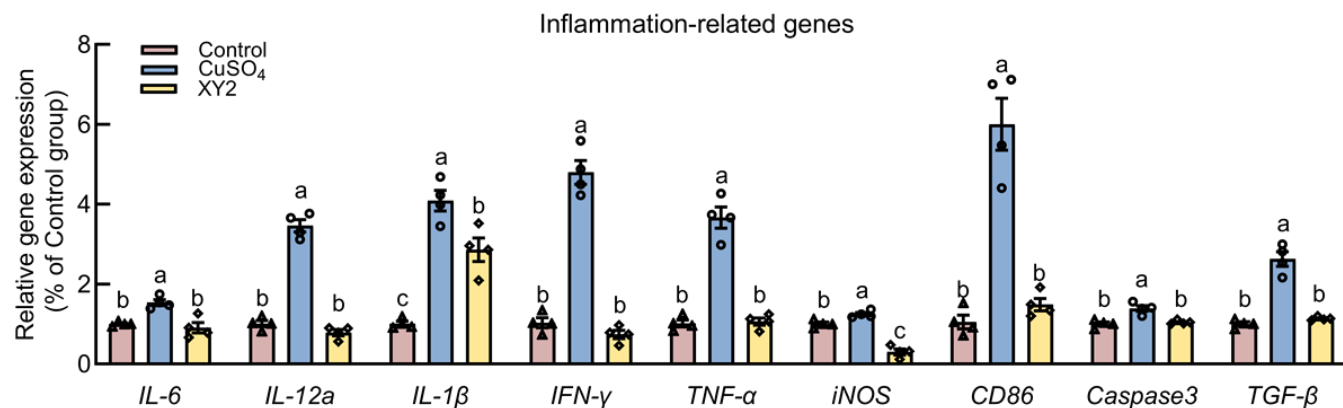


Results

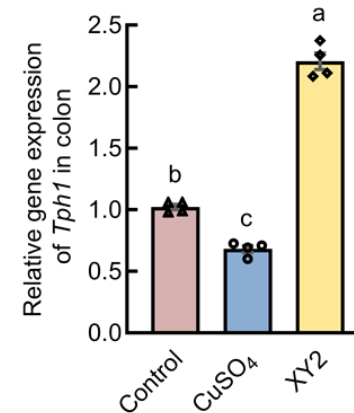
(A)



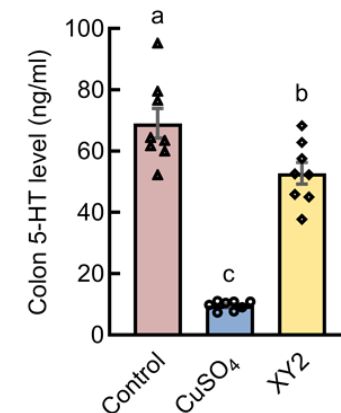
(B)



(C)



(D)



(E)

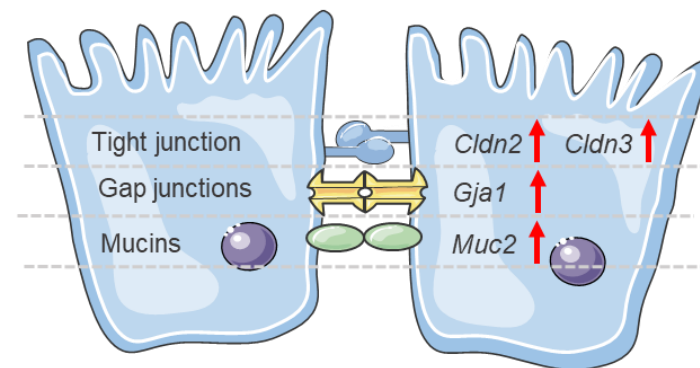
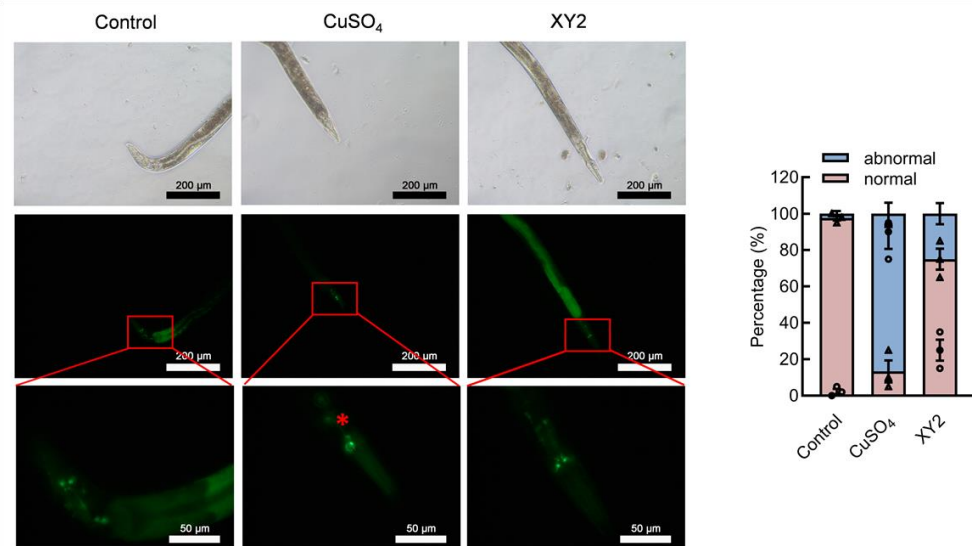


Figure 2. *W. coagulans* XY2 inhibited copper-induced neurotoxicity through the gut-brain axis.

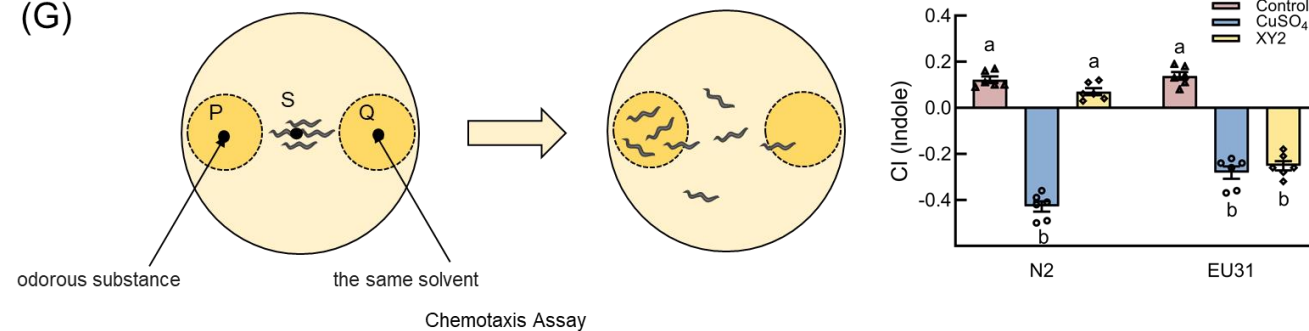


Results

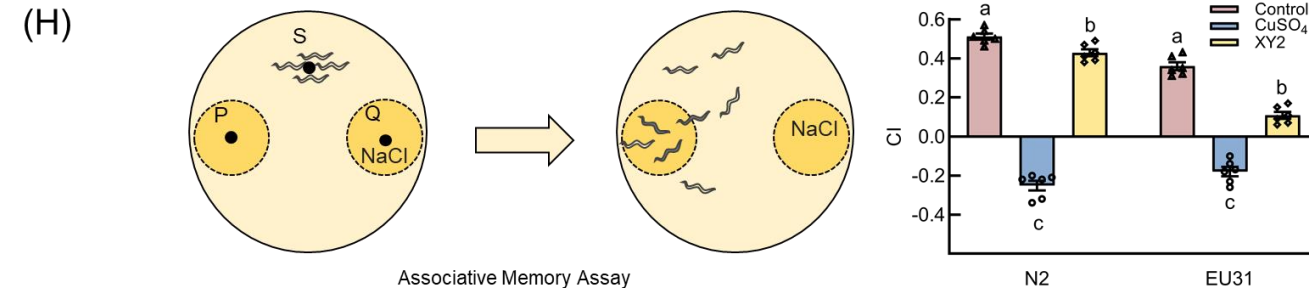
(F)



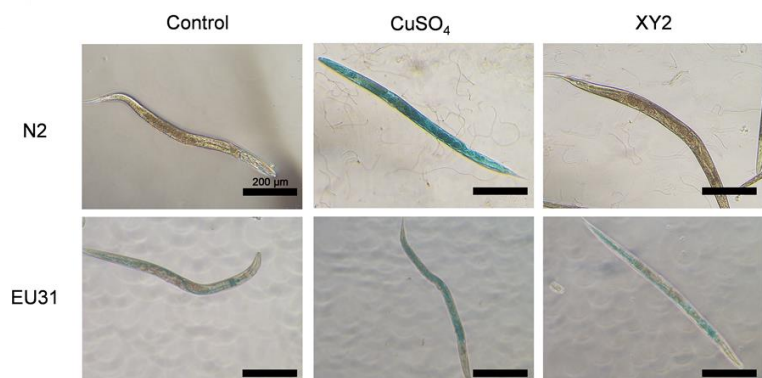
(G)



(H)



(I)



(J)

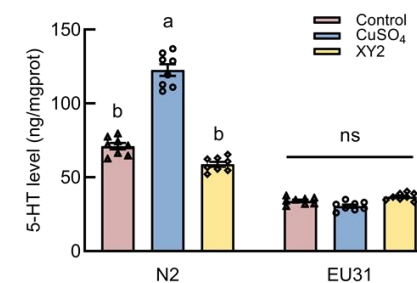


Figure 2. *W. coagulans* XY2 inhibited copper-induced neurotoxicity through the gut-brain axis.



Results

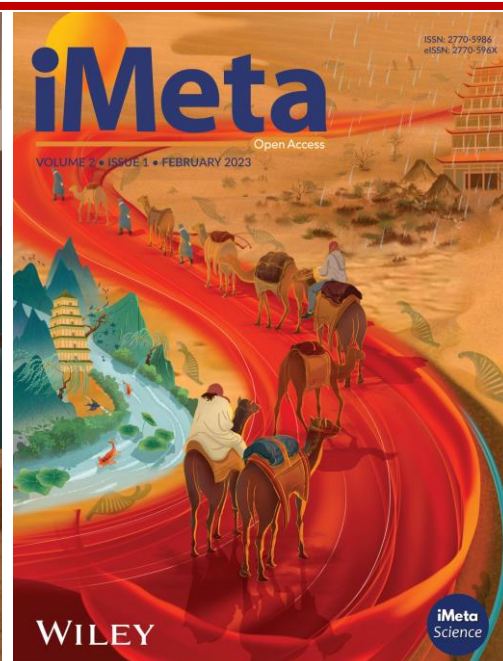
- ❑ *W. coagulans* XY2 confers neuroprotection against copper toxicity through a gut-brain axis. It regulates tryptophan metabolism, enhances antioxidant defense, and maintains intestinal barrier integrity.
- ❑ *W. coagulans* XY2 boosts serotonin production, inhibits the neurotoxic kynurenine pathway, and promotes neuroprotective indole production to improve neural function.
- ❑ *W. coagulans* XY2 also activates the SKN-1/Nrf2 antioxidant pathway and preserves intestinal barrier function to prevent oxidative-inflammatory damage.
- ❑ These findings provide experimental evidence for probiotic-mediated heavy metal detoxification via gut-brain axis, extending beyond established models of copper-induced mitochondrial dysfunction. This work delivers a safe, multi-targeted strategy against copper-driven neurodegeneration with significant translational potential.

Yufang Gao, Xiaodong Zheng, Fujie Yan. 2025. *Weizmannia coagulans* XY2 Mitigates Copper Neurotoxicity via Gut-Brain Axis Modulation of Tryptophan Metabolism and Oxidative-Inflammatory Crosstalk. *iMetaOmics* 2: e70066. <https://doi.org/10.1002/imo2.70066>

iMeta: To be top journals in biology and medicine



WILEY



“***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.

“***iMetaOmics***” launched in 2024, with a **target IF>10**, and its scope is similar to ***Nature Communications*, *Cell Reports*, *Microbiome*, *ISME J*, *Nucleic Acids Research*, *Briefings in Bioinformatics***, etc.

“***iMetaMed***” launched in 2025, with a **target IF>15**, similar to ***Med*, *Cell Reports Medicine*, *eBioMedicine*, *eClinicalMedicine*** etc.



Society: <http://www.imeta.science>

Publisher: <https://wileyonlinelibrary.com/journal/imeta>

iMeta: <https://wiley.atyponrex.com/journal/IMT2>

Submission: iMetaOmics: <https://wiley.atyponrex.com/journal/IMO2>

iMetaMed: <https://wiley.atyponrex.com/journal/IMM3>



[iMetaScience](#)



[iMetaScience](#)



office@imeta.science

imetaomics@imeta.science



[Promotion Video](#)

Update
2025/7/6