



Addendum: A small molecule produced by *Lactobacillus* species blocks *Candida albicans* filamentation by inhibiting a DYRK1-family kinase

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In the original version of the article¹, we reported that *Lactobacillus*-conditioned MRS medium and laboratory-synthesized 1-acetyl-beta-carboline (1-ABC) inhibit a key virulence trait in the human fungal pathogen *Candida albicans*, namely its ability to undergo yeast-to-hyphal morphogenetic transition. Herraiz et al.² subsequently discovered that the presence of 1-ABC in *Lactobacillus*-conditioned medium is not due to bacterial biosynthesis of the compound, but is instead the result of spontaneous chemical reactions that occur in MRS medium under the high pressure and heat that accompany the autoclave sterilization process.

In light of these findings, we conducted follow-up experiments—summarized in our Reply³—that confirmed that 1-ABC is spontaneously generated during the autoclaving of glucose-containing MRS. However, the concentration of 1-ABC in the medium is not sufficient to block morphogenesis of *C. albicans* without subsequent acidification of the MRS as occurs during the growth of lactobacilli in it. Apparently, our bioassay-guided small-molecule enrichment and isolation process yielded fractions with 1-ABC at concentrations sufficient to block *C. albicans* morphogenesis, a result that was confirmed with pure, synthetic 1-ABC.

In summary, the generation of 1-ABC during autoclaving in combination with acidification of the culture medium during growth of lactobacilli led us to misinterpret results and erroneously conclude that lactobacilli synthesize 1-ABC. However, all other findings in the original version of the article¹, related to the mode of action and therapeutic potential of 1-ABC, remain valid as the experiments were conducted with pure compound.

References

1. MacAlpine, J. et al. A small molecule produced by *Lactobacillus* species blocks *Candida albicans* filamentation by inhibiting a DYRK1-family kinase. *Nat. Commun.* **12**, 6151 (2021).
2. Herraiz, T., Sanchez-Arroyo, A., de las Rivas, B. & Muñoz, R. *Lactobacillus* species do not produce 1-acetyl- β -carboline. *Nat. Commun.* <https://doi.org/10.1038/s41467-024-50683-5> (2024).
3. MacAlpine, J. et al. Reply to: *Lactobacillus* species do not produce 1-acetyl- β -carboline. *Nat. Commun.* <https://doi.org/10.1038/s41467-024-50684-4> (2024).

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