

Therapeutic potential of honey for gut microbiota: insights from metagenomic and literature-based analyses

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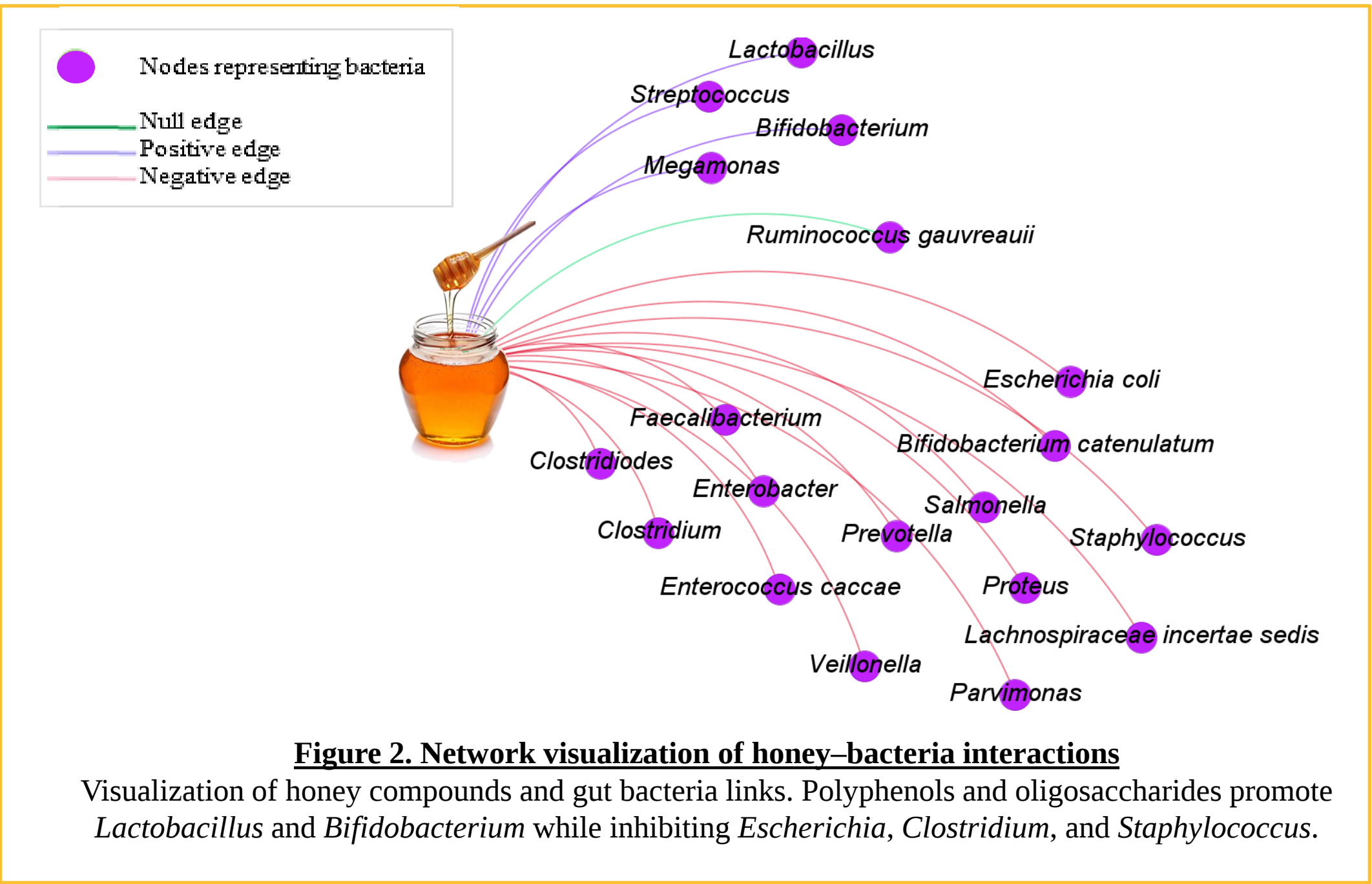
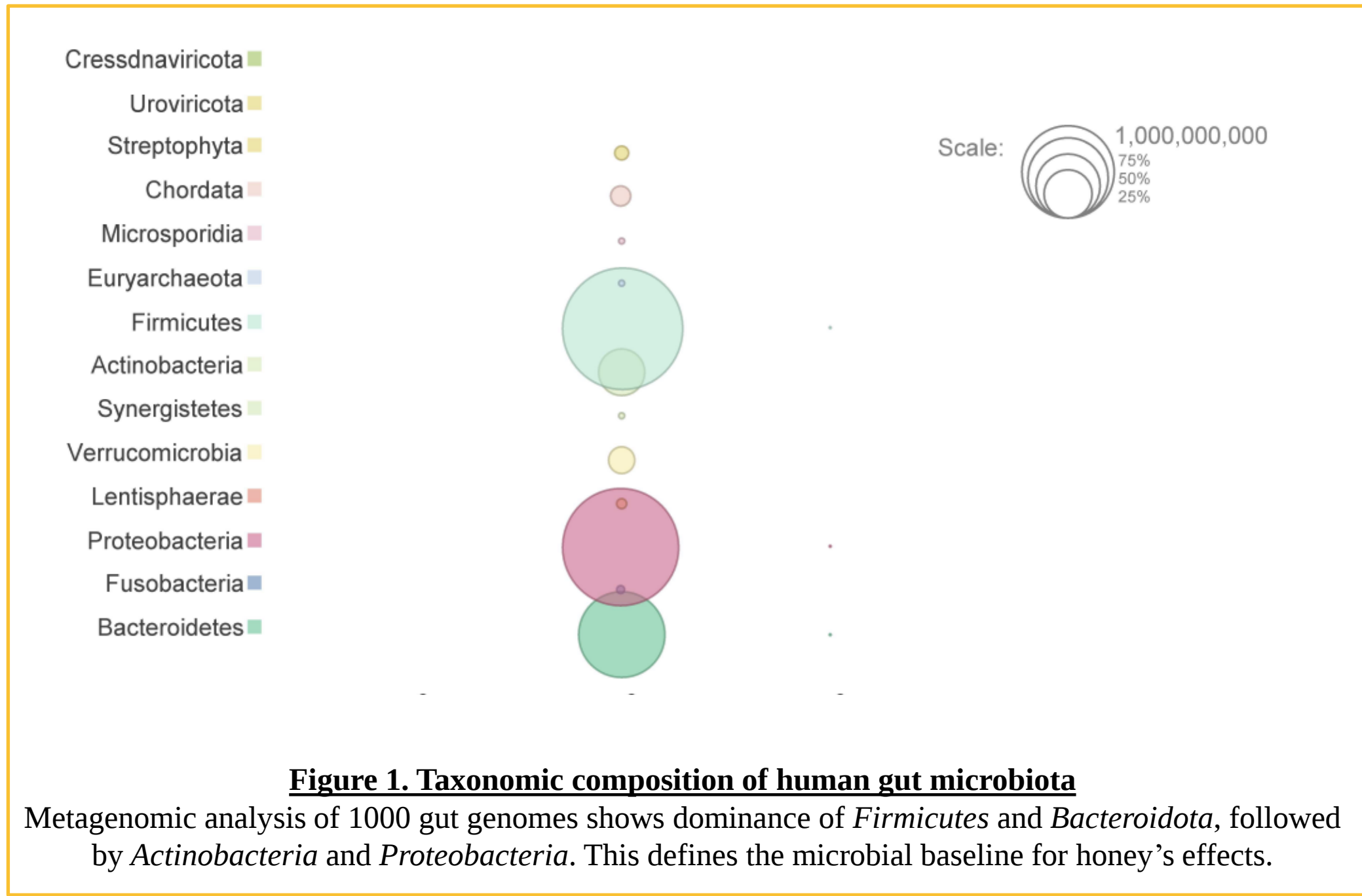
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Introduction

Honey is widely recognized for its therapeutic potential due to its rich composition in fructose, glucose, and indigestible oligosaccharides that beneficially modulate gut microbiota (1). These compounds reduce infections and inflammation by inhibiting pathogens such as *Escherichia*, *Clostridium*, *Staphylococcus*, *Proteus*, and *Veillonella* (2–4). Polyphenols and flavonoids, abundant in honey, stimulate beneficial genera like *Lactobacillus* and *Bifidobacterium* (5–7) and strengthen the intestinal barrier (8). They also reduce oxidative stress and platelet activation (9). Polyphenols reach the colon, showing stronger modulatory effects than fructo-oligosaccharides absorbed in the upper tract (2).

Objective: To explore honey’s modulatory effect on the human gut microbiota using a combined literature-based and metagenomic approach. A narrative review (2010–2024) was complemented by metagenomic analysis of 1000 human gut genomes (IMG/M database) through MEGAN Ultimate Edition, and microbial interaction visualization using Gephi v0.10.1.



Conclusion

Honey acts as a functional food that enriches probiotic bacteria such as *Lactobacillus* and *Bifidobacterium* (5–7) while inhibiting pathogenic taxa (*Escherichia*, *Clostridium*, *Staphylococcus*, *Proteus*, *Veillonella*) (2–4). These bioactive compounds strengthen the intestinal barrier and reduce oxidative stress (8,9), promoting microbial balance and gut health. Beyond intestinal effects, honey shows neuroprotective, gastric, and anticancer potential (10–18), highlighting its broad therapeutic value.

References

- Aly et al., 2017. DOI: 10.1097/MPG.0000000000001597
- Jiang et al., 2020. DOI: 10.1155/2020/6432942
- Schell et al., 2022. DOI: 10.3389/fnut.2022.957932
- Sachdev et al., 2021. DOI: 10.1007/978-3-030-73077-2_12
- Firman et al., 2016. DOI: 10.1016/j.anaerobe.2016.10.004
- Li et al., 2020. DOI: 10.1039/D0FO00713G
- Rodríguez-Daza et al., 2021. DOI: 10.3389/fnut.2021.689456
- Kaulmann & Bohn, 2016. DOI: 10.1155/2016/9346470
- Olas, 2020. DOI: 10.3390/nu12020283
- Mijanur et al., 2014. DOI: 10.1155/2014/958721
- Azman & Zakaria, 2019. DOI: 10.22038/IJBMS.2019.14027
- Cienciosi et al., 2018. DOI: 10.3390/molecules23092322
- Kala et al., 2020. DOI: 10.1007/978-981-15-6799-5_12
- Ali et al., 2020. DOI: 10.1007/978-981-15-7305-7_6
- Masad et al., 2021. DOI: 10.3390/nu13041269
- Celebioglu et al., 2021. DOI: 10.1016/j.fbio.2021.101020
- Sha et al., 2022. DOI: 10.1016/j.yexcr.2021.112948
- Haza & Morales, 2013. DOI: 10.1002/jsfa.6129

