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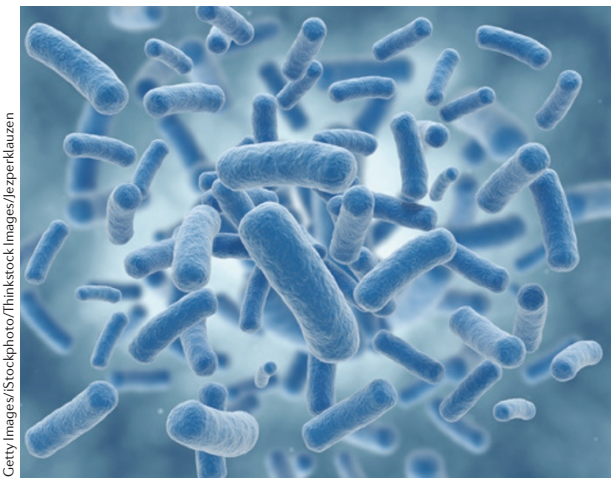
MICROBIOME

Taking advantage of quorum sensing

> AI-2 … enables the initial expansion of Firmicutes in the antibiotic-treated gut microbiota

The use of antibiotics can alter the composition of the commensal gut microbiota, which increases host susceptibility to infection by opportunistic pathogens. Now, a study shows that manipulating the levels of the quorum sensing signalling molecule autoinducer 2 (AI-2) in the mouse gut can promote growth of specific members of the microbiota that are important during recovery from antibiotic-induced dysbiosis.

The mouse gut microbiota comprises multiple bacterial species that predominately belong to the Bacteroidetes and Firmicutes phyla.



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Treatment with streptomycin causes a severe reduction in the overall bacterial diversity in the mouse gut; in particular, Firmicutes are almost completely depleted, whereas the relative abundance of Bacteroidetes is enriched.

As the communication between different bacterial species can influence the composition of the gut microbiota, Thompson, Oliveira *et al.* investigated the potential of using quorum sensing signals to modulate the bacterial composition of the mouse gut following antibiotic treatment. The authors generated an *Escherichia coli* strain that overproduces AI-2 — which is an interspecies quorum sensing signal — by deleting *lsrK*, which encodes a signal kinase that regulates AI-2 retention and degradation; the absence of LsrK led to the accumulation of extracellular AI-2. Notably, this *E. coli* mutant was able to stably colonize the gut of antibiotic-treated mice, which resulted in an alteration of the overall composition of bacterial species in the gut and a substantial increase in the abundance of Firmicutes, which had been severely reduced due to the antibiotic treatment.

Finally, the authors compared the potential of Firmicutes and Bacteroidetes to produce AI-2 by analysing the presence of orthologues of the *E. coli* AI-2 synthase LuxS in sequenced bacterial genomes. Interestingly, more than 80% of the genomes from bacteria belonging to Firmicutes contained putative LuxS orthologues, whereas less than 20% of Bacteroidetes genomes encoded such genes. The increased potential of Firmicutes to synthesize AI-2 led the authors to propose a model in which AI-2 production by the mutant *E. coli* strain enables the initial expansion of Firmicutes in the antibiotic-treated gut microbiota; this triggers a positive feedback loop in which increased availability of AI-2 promotes the expansion of AI-2 producers.

Collectively, these data demonstrate the potential of using bacteria that produce quorum sensing signals to modulate the composition of the gut microbiota following antibiotic treatment.

Cláudio Nunes-Alves

ORIGINAL RESEARCH PAPER Thompson, J. A., Oliveira, R. A. *et al.* Manipulation of the quorum sensing signal AI-2 affects the antibiotic-treated gut microbiota. *Cell Rep.* **10**, 1861–1871 (2015)

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