Biochemical and genomic analyses of unique *Paenibacillus agaridevorans* strain isolated from murine host

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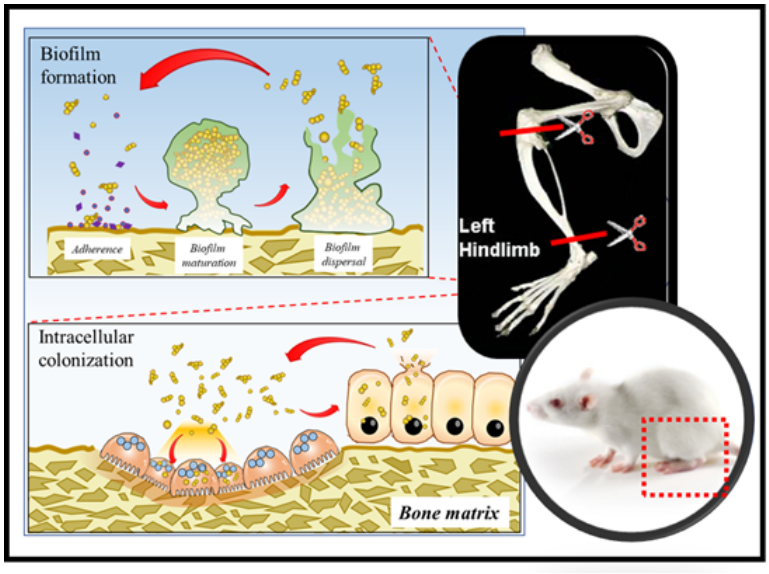
Abstract: The human microbiome is the sum of all microbiota that reside on or within the human body, playing an essential role in our daily lives. However, little is known about the bone microbiome, mainly since microbial communities are generally considered unable to grow within bone matrices. We isolated a unique microbial colony that generates a transparent zone and shallow fossa on the Mueller Hinton plate during our investigation of the bone microbiota of rat tibia and femur. Based on the 16S rRNA sequencing result, it was found that this microbial isolated strain belongs to *Paenibacillus agaridevorans*. *P. agaridevorans* is generally found in soil samples rather than animal hosts, prompting us to study its various biochemical properties and potential applications. These studies include the complete genome sequence analysis, biochemical analysis (e.g., anaerobic growth, agarase, amylase activity, motility, endospore staining, biofilm formation, antibiotics susceptibility tests), and immunohistochemistry. The isolated *P. agaridevorans* was found to be an obligate anaerobe, attributing to the microbial ability to grow in the bone matrix. Additionally, under the anaerobic environment, the microbe is more inclined to adopt the biofilm lifestyle thus increasing its tolerance to antimicrobial agents and the host immune system. These preliminary data suggest that this *P. agaridevorans* strain can live within bone matrices but understanding how its impacts on bone health needs further investigations.

Graphical abstract:



Keywords: Bone microbiome; *Paenibacillus agaridevorans*; biochemical analysis; genomic analysis; immunohistochemistry.

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