Formation and Functions of Bacterial Membrane Vesicles

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Membrane vesicles (MVs) are released by both Gram-negative and Gram-positive bacteria and are involved in many biological processes. They also have impact on human health and are applied in vaccine development. We also found that hydrophobic signals used in bacterial communication are released to the environmental and transmitted to other bacteria by MVs[1]. In *Paracoccus* species, MVs supported the hydrophobic signals that do not diffuse well in water to disperse. A single MV particle was calculated to be sufficient enough to regulate gene expression in a cell leading to a novel MV-based mechanism for binary trafficking of the signaling molecule. Given the important functions of MVs, it is also vital to understand their mechanism of biogenesis. We applied super resolution live cell imaging that showed a subpopulation of the cells undergoing explosive cell lysis, generating MVs in *Pseudomonas aeruginosa*[2]. RNA-seq of MV-associated RNA revealed that endolysin gene is critical to trigger explosive cell lysis. This mechanism was fundamentally different from the canonical MV formation model where outer membrane blebbing is involved. Likewise, we found that endolysins are involved in MV formation of a Gram-positive bacteria[3], *Bacillus subtilis* and *Corynebacterium glutamicum*. In contrast to explosive cell lysis in *P. aeruginosa*, endolysin-triggered MV formation in Gram-positive bacteria proceeded through mechanism named bubbling cell death. Our results show that bacteria can form MVs through distinct mechanisms that may be reflected to the function of those MVs.

References

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