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Raffaele Zarrilli

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EDITORIAL

Acinetobacter baumannii virulence determinants involved in biofilm growth and adherence to host epithelial cells

Raffaele Zarrilli

Department of Public Health, University of Naples "Federico II," Naples, Italy

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Acinetobacter baumannii is a gram-negative coccobacillus, which emerged as important global pathogens during the past 20 years, exhibiting resistance to the majority of available antibiotics and disinfectants.[1] *A. baumannii* causes large and persistent outbreaks among hospitalized patients and is able to contaminate biotic and abiotic surfaces, such as vascular and urinary catheters, cerebrospinal fluid shunts, and endotracheal intubation devices.[1] *A. baumannii* strains responsible for epidemics show elevated resistance to desiccation, high biofilm-forming capacity on abiotic surfaces and adherence to host epithelial cells, virulence-related features which might have favored the spread and persistence in the hospital environment.[2,3] Biofilm formation in *A. baumannii* has been shown to be positively correlated with the expression of chaperone–usher type I pili assembly system,[4,5] the outer membrane protein OmpA,[6] the extracellular polysaccharide poly-β-(1,6)-N-acetyl glucosamine (PNAG),[7] a homolog of the staphylococcal biofilm-associated protein (BAP),[8,9] and two recently identified BAP-like proteins (BLP)-1 and (BLP)-2.[10] Also, *A. baumannii* is able to form a tight biofilm structure at air-liquid interface, which is generally referred as pellicle and is associated with the presence of poly-Nacetylglucosamine (PNAG) polysaccharide and csuA/B usher protein of pili assembly system.[11] Moreover, genes involved in motility, iron acquisition, quorum sensing and those encoding efflux system components such as RND efflux pump AdeT are over-expressed during biofilm growth of *A. baumannii* ATCC 17978 cells; disruption or deletion of these genes causes a significant decrease in biofilm formation ability in the corresponding mutant strains.[12] Virulence determinants involved in biofilm growth, including OmpA, BAP, BLP-1 and BLP-2,[6,10,13] regulate adherence/invasion of *A. baumannii* to host epithelial cells, thus explaining the correlation between biofilm formation and adherence to host epithelial cells found in epidemic *A. baumannii* isolates.[2,3]

In this issue of *Virulence*, Álvarez-Fraga and coworkers[14] identify a gene coding for a putative pilus rod, which is responsible for mature biofilm formation and adherence to eukaryotic cells of biofilm hyper-producing *A. baumannii* MAR002 strain.[15] Based on previous studies demonstrating the role of pili proteins on biofilm formation and adhesion to abiotic surfaces in *A. baumannii*,[4,5,11,12] authors have selected the LHp2_11085 gene of MAR002 strain among predicted genes potentially involved in pili formation and over- expressed in biofilm-associated cells compared to exponential planktonic cells. The gene encodes a putative protein homologous to the major type I pilus subunit fimA of *E. coli*[16] and is included into an operon of 4 genes. The inactivation of LHp2_11085 gene results in reduced biofilm formation on plastic surfaces and impairment in the attachment of bacteria to A549 human alveolar epithelial cells. Both phenotypes are reverted by complementation of the knock-out mutant with the parental allele. Also, inactivation of LHp2_11085 gene inhibits the formation of longer type of pili, a pili-like structure found in biofilm hyper-producing *A. baumannii* MAR002 cells but not in biofilm scarce producing *A. baumannii* ATCC 17978 cells. Moreover, the lack of LHp2_11085 gene impairs the ability of *A. baumannii* MAR002 to reduce the viability of A549 cells. Based on their findings, the authors conclude that LHp2_11085 gene is required for the development of mature biofilm structure on abiotic surfaces, attachment of bacteria to human epithelial cells and ability to cause eukaryotic cell death. They speculate that LHp2_11085 gene plays an important role during *A. baumannii* infection and represents a potential target to impair host-pathogen interactions. In further support of this, it has been recently demonstrated that surface exposed

CONTACT Raffaele Zarrilli rafzarri@unina.it Department of Public Health, University of Naples "Federico II", Via Pansini nr. 5, Naples, Campania 80131 Italy.
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proteins involved in biofilm formation are good vaccine candidates against *A. baumannii* sepsis infection.[17] Following on from this, it would be desirable to determine the pathogenic role of LHp2_11085 gene and its potential use as target in an in vivo model of infection such as the larvae of the wax moth Galleria mellonella, which allows to study *A. baumannii* pathogenesis and therapeutics.[18] These studies are required to validate the use of the protein encoded by the LHp2_11085 gene of MAR002 strain as target for antimicrobial strategies against *A. baumannii.*

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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