

Functional characterization of TasA and TapA in the formation of the amyloid fiber in *Bacillus subtilis*

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Introduction

Functional amyloids are a very heterogeneous family of amyloid proteins widespread in nature, from humans to bacteria. Unlike their “pathogenic” relatives, implicated in several neurodegenerative diseases, functional amyloids play important roles in several biological processes. In *Bacillus subtilis*, the protein TasA forms amyloid-like fibers that serve as a scaffold for the rest of the components of the extracellular matrix. Along with TasA, the auxiliary protein TapA promotes and accelerates TasA fiber assembly. Most amyloid proteins contain regions within their sequence in which their aminoacid composition make them prone to aggregation. However, the sequence determinants in TasA or TapA involved in the assembly of the amyloid fiber, its structure and function still remains elusive.

Objectives

To identify and characterize regions of TasA or TapA important for amyloid fiber assembly and functionality in *Bacillus subtilis* biofilms.

Materials & methods

An *in silico* study was performed in order to define amyloidogenic regions within TasA and TapA sequences. This analysis revealed several regions of interest and was followed by *in vitro* experiments using synthetic peptides corresponding to the analyzed regions. We used several biophysical techniques in combination with transmission electron microscopy to study their possible amyloid properties.

Results

Of the predicted amyloidogenic regions of TasA, only two polymerized with enrichment of beta-sheets, characteristic of amyloid proteins. A similar behavior was found in a sequence of the N-terminal half of TapA, which has been previously demonstrated to be determinant in the functionality of TapA.

Conclusion

Our findings support the utility of the *in silico* prediction for the search of amyloidogenic domains in proteins. The aggregative properties of all peptides and the additional amyloid-like features of some of them are suggestive of their relevance in the amyloid properties of TasA and suggest in some cases, their putative implication in the TasA-TapA interaction.

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