Keynote Lecture

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Bacterial amyloids in materials sciences and biomedicine

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Bacterial inclusion bodies are insoluble protein aggregates commonly observed during protein production processes and traditionally associated to conformational stresses. Being formed by the recombinant protein, their occurrence minimizes the productivity of soluble protein species [1]. Bacterial inclusion bodies are not mere amorphous protein clusters. Instead, they are structured as a network of non-toxic amyloidal fibers, which confer mechanical stability, in which non-amyloidal protein forms are embedded. Since this fraction of entrapped protein adopts quasi-native conformations, the protein cluster, as a whole, retains the biological activities of the forming protein [2]. Being regular nanoparticles, the physicochemical nanoscale properties of inclusion bodies can be tailored by adjusting the conditions of the bacterial culture or also by the selection of the genetic traits of the producing strain. The combination of mechanical stability, functionality and suitability for functional tailoring has pointed out these protein particles as highly appealing functional materials with intriguing applications as self-immobilized enzymes in biotechnology [3] or as smart biocompatible materials in biomedicine [4]. The fact that inclusion bodies can be produced in GRAS microorganisms such as the gram-positive species *Lactococcus lactis* [5], and their ability to internalize mammalian cells in absence of toxicity and to release functional protein species inside target cells [6] have opened a spectrum of applications of these bacterial amyloids as unexpected drug delivery systems [7, 8].

References:

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