Effects of aggregating agents in protein misfolding. An infrared spectroscopy study

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Protein misfolding, which include the formation of amyloid aggregates, insoluble aggregates resistant to degradation, are related to a large number of different diseases, mostly neurodegenerative. In this work, hen egg white lysozyme has been used as model because it is a good characterized protein with ability to form this kind of aggregates if it is exposed to extreme conditions. Usually, the in vitro studies are done in a diluted medium, and the action of the protein at these concentrations differs from what happens inside the cell, mainly because the internal concentration is crowded by numerous macromolecules. The purpose of this research is to prove what occurs to a protein when it forms amyloid aggregates in a crowded medium by different agents (Dextran 40, Dextran 70 and Ficol 70) and at different crowder concentrations (5%, 10% and 20%). In order to characterize what happens with lysozyme when it is forced to form this kind of aggregates, the infrared spectroscopy has been used not only because it is a useful technique for this kind of studies, but also due to the fact that its analysis time is short. Moreover, little quantity of protein is needed and also this technique has a high sensitivity to β structures which characterize the amyloid fibers. As it is shown, the lysozyme aggregates are not formed in the same way in a diluted medium or in a crowded one because the fiber quantity formed decreases, and the kinetic formation differs. These changes arise from the different effect of the crowders at distinct concentrations.