STRUCTURAL VARIABILITY OF PRION PROTEIN AMYLOID FIBRILS DEPENDS ON AGITATION INTENSITY

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Aggregation of amyloid proteins to form amyloid fibrils is associated with certain neurodegenerative diseases such as Alzheimer's or prion diseases. Despite the great efforts of scientists to understand all the features of the occurrence mechanism of these diseases, many questions in this field remain unanswered. The amyloid protein aggregation process is often influenced by various environmental factors, including solution pH, ionic strength, or protein concentration. Different secondary structures of fibrils are frequently formed under varying aggregation conditions, but polymorphism of resulting fibrils can also be observed under identical conditions. In this study, we investigate whether the agitation intensity of samples can influence the formation of different fibril strains.

Prion protein aggregation was conducted under identical conditions (60°C, 2 M guanidine hydrochloride, 50 mM phosphate buffer pH 6.0, with 3 mm glass bead), with only the agitation intensity of the samples changed (100-600 rpm). To assess the variability in the secondary structure of the resulting fibrils, 24 samples were analyzed for each condition. Fourier transform infrared spectroscopy was employed to investigate the secondary structure of the fibrils after aggregation, and atomic force microscopy was used to determine the morphology of fibrils with different secondary structures.

The research results indicate that the agitation intensity of the samples affects the variability of the formed amyloid fibrils. Analysis of the Fourier transform infrared spectra revealed that the lowest variability in the sample structures occurred at 400 rpm, resulting in the formation of only one fibril strain. These fibrils also exhibited different binding modes of the fluorescent dye thioflavin-T and displayed stability under denaturing conditions.