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Discrimination of Prion Strains Using Luminescent Conjugated Polyelectrolytes

Prion diseases comprise a group of fatal transmissible spongiform encephalopathies affecting humans and animals. They occur in distinct ‘strains’ characterized by different incubation periods, clinical features and lesion profiles. In order to explain the existence of prion strains, the protein-only hypothesis proposes that the causative agent represents multiple conformations of the aggregated protein PrP\(^{\text{Sc}}\), derived from the normal cellular protein PrP\(^{\text{C}}\) by transmission of its aberrant folding. Subtle structural variations in brain deposits of animals infected with distinct prion strains have been demonstrated using luminescent conjugated polyelectrolytes (LCPs). The flexible polythiophene backbone bearing a series of conjugated bonds and ionic side chains allow the polymers to adapt their geometry to the structure of the plaques, thus altering their optical properties. In this study, the ability of the polyelectrolytes to discriminate prion deposits of different strains in brain homogenate was tested. However, with the available protocols and equipment this could not be achieved, although progress towards the detection of oligomers was made. These experiments indicate that other polyelectrolytes in brain tissue such as nucleic acids might be sequestering the LCP due to higher affinity compared to the protein plaques or that an amplification system is needed to detect the binding of the polymer to the prion aggregates.