Prion Protein and Prion Diseases

Suehiro Sakaguchi
Nagasaki University
Graduate School of Biomedical Sciences
PRESTO, Japan Science and Technology Agency

Prion diseases, including Creutzfeldt-Jakob disease (CJD) in humans and scrapie and bovine spongiform encephalopathy (BSE) in animals, are a group of devastating neurodegenerative disorders transmitted by unconventional infectious agents called prions. Many lines of recent evidence strongly indicate that BSE prions could be transmitted orally to humans via contaminated food, causing a new variant type of CJD in young people.

Prions are thought to be mainly composed of the proteinase K-resistant, amyloidogenic isoform of prion protein, designated PrP^{Sc}. PrP^{Sc} is generated by conformational conversion of the normal cellular isoform of PrP (PrP^{C}), a membrane glycoprotein most abundantly expressed in neurons. The exact mechanism of the conversion has not been fully understood. It has been postulated that a prion or PrP^{Sc} invading the body first associates with PrP^{C} and then converts the structure of the associating PrP^{C} into the structure for PrP^{Sc}. This constitutive conversion of PrP plays a pivotal role in the pathogenesis of the diseases via causing massive accumulation of PrP^{Sc} in the brain.

I will discuss the roles of PrPs in the pathogenesis of prion diseases and then present current data regarding prion vaccines.

Keywords:
PrP^{C}: The cellular isoform of prion protein normally expressed in various tissues, especially most abundantly in the central nervous system.

PrP^{Sc}: The abnormal isoform of prion protein specifically detected in the tissues affected by prion diseases, such as the central nervous system and the reticular-endothelial system.