Physics > Biological Physics

Computational Studies of the Structural Stability of Rabbit Prion Protein Compared to Human and Mouse Prion Proteins

Jiapu Zhang

(Submitted on 25 Jul 2011)

Prion diseases are invariably fatal and highly infectious neurodegenerative diseases affecting humans and animals. The neurodegenerative diseases such as Creutzfeldt-Jakob disease, variant Creutzfeldt-Jakob diseases, Gerstmann-Str$\ddot{a}$ussler-Scheinker syndrome, Fatal Familial Insomnia, Kuru in humans, scrapie in sheep, bovine spongiform encephalopathy (or 'mad-cow' disease) and chronic wasting disease in cattle belong to prion diseases. By now there have not been some effective therapeutic approaches to treat all these prion diseases. Dogs, rabbits and horses were reported to be resistant to prion diseases. By the end of year 2010 all the NMR structures of dog, rabbit and horse prion proteins (X-ray for rabbits too) had been finished to release into protein data bank. Thus, at this moment it is very worth studying the NMR and X-ray molecular structures of horse, dog and rabbit prion proteins to obtain insights into their immunity prion diseases.
The author found that dog and horse prion proteins have stable molecular dynamical structures whether under neutral or low pH environments, but rabbit prion protein has stable molecular dynamical structures only under neutral pH environment. Under low pH environment, the stable α-helical molecular structures of rabbit prion protein collapse into β-sheet structures. This article focuses the studies on rabbit prion protein (within its C-terminal NMR, Homology and X-ray molecular structured region RaPrP$^\text{C}$ (120-230)), compared with human and mouse prion proteins (HuPrP$^\text{C}$ (125-228) and MoPrP$^\text{C}$ (124-226) respectively). The author finds that some salt bridges contribute to the structural stability of rabbit prion protein under neutral pH environment.

Comments: Contributed as an invited Book Chapter to "Neurodegenerative Diseases / Book 2, Raymond Chuen-Chung Chang (eds.), INTECH Open Access Publisher, 2011, ISBN 979-953-307-672-9"

Subjects: **Biological Physics (physics.bio-ph)**; Biomolecules (q-bio.BM)

Journal reference: Advanced Understanding of Neurodegenerative (2011) pp. 301-310

Submission history

From: Jiapu Zhang [view email]

[v1] Mon, 25 Jul 2011 03:55:51 GMT (4118kb)