Toshiyuki Moriuchi, J Nanomed Nanotechnol 2014, 5:5
http://dx.doi.org/10.4172/2157-7439.S1.017

OMICS Group Conferences
Accelerating Scientific Discovery

4th International Conference on
Nanotek & Expo

December 01-03, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Control of chiral assemblies through hydrogen bonding properties of amino acids

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In this paper, chirality organization of peptide bioconjugates through hydrogen bondings is described. A variety of ferrocene-peptide bioconjugates as bioorganometallics are designed to induce chirality-organized structures of peptides. The ferrocene is recognized to serves as a reliable organometallic scaffold for the construction of protein secondary structures via intramolecular hydrogen bondings, wherein the attached dipeptide chains are constrained within the appropriate dimensions. The configuration and sequence of the amino acids are demonstrated to play an important role in the construction of the chirality-organized bio-inspired systems under controlled hydrogen bonds. Another interesting feature of ferrocene-dipeptide bioconjugates is their strong tendency to self-assemble through the contribution of available hydrogen bonding donors for helical architectures in solid states. The intramolecular hydrogen bondings and chirality of the histidyl pendant groups on the 2,6-pyridinedicarboxamide scaffold are performed to allow induction of the chiral helicity, creating the left- or right-handed helical molecular assembly by the connection of each helical molecule through continuous intermolecular hydrogen bonds. A urea molecular scaffold is introduced into dipeptides to afford the formation of the chiral hydrogen-bonded duplex, wherein each hydrogen-bonded duplex is connected by continuous intermolecular hydrogen bonds to form a double helix-like arrangement.

Biography

Toshiyuki Moriuchi received his Bachelor's degree in 1991 and his Doctoral degree in 1995 under the supervision of Professor Toshikazu Hirao, both from Osaka University. He became Assistant Professor at Osaka University and was a Postdoctoral Fellow at California Institute of Technology with Professor Jacqueline K. Barton. He was promoted to Associate Professor in 2004. His current research interests focus on the development of novel artificial bioconjugated systems based on self-organization of biomolecules and redox-active π-conjugated systems for functionalized catalysts and materials. He received the Inoue Research Award for Young Scientists in 1997 and HGCS Japan Award of Excellence 2011 in 2012.

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