

Nanotechnology and biopharmaceutics: molecular engineering of self-assembling therapeutic peptides for intrinsic nano-formulation

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From hormone therapeutics to antimicrobial peptides, small sequences represent an important class of therapeutics. However, their intrinsic physical, chemical and biological stability issues require the use of formulation to achieve appropriate pharmaceutical properties. Using non-covalent self-assembly of therapeutic peptides to ensure stability and provide long release profiles was demonstrated two decades ago by the breakthrough anticancer formulation Somatuline Autogel®; a subcutaneous slow-release hydrogel only containing the therapeutic Lanreotide peptide self-assembled into reversible nanotubes (1).

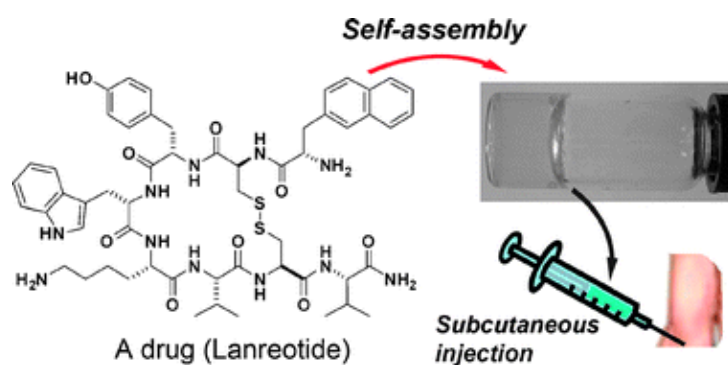


Figure 1 – Molecular self-assembly in marketed Somatuline Autogel® formulation (1).

In this talk, the knowledge gained during Lanreotide self-assembled hydrogels development (1) will introduce the current state-of-the art in molecular engineering for desirable self-formulation properties. Especially, recent advances in sequence design for peptide reversible self-assembly (2) and the rational design of self-assembling ultrashort antimicrobial peptides will be presented (3).

(1) a) Valéry C. et al. 2003. *Proc. Natl. Acad. Sci* 100: 10258-10262. b) Zhao F. et al. 2009. *Chem Soc Rev* 38: 883-891. c) Valéry C. et al. 2011. *Soft Matter* 7: 9583-9594. d) Wolin E.M. et al. 2016. *J. Gast. Cancer* 47: 366-374. e) Pieri L. et al. 2022. *Proc. Natl. Acad. Sci. USA* 119: e2120346119.

(2) a) Tarabout C. et al. 2011. *Proc. Natl. Acad. Sci.* 108 (19), 7679-7684 b) Valéry C. et al. 2013. *Chem. Comm.* 49 (27), 2825-2827. b) Cardoso P. et al. 2021. *Biophys. Rev.* 13: 35-69.

(3) a) Glossop H.D. et al. 2019. *Biomacromol.* 20: 2515-2529. b) Cardoso P. et al. 2021. *Biophys. Rev.* 13: 35-69. c) Cardoso P. et al. 2022 *Front Chem.*, in press.

