The divergent path of homochiral and heterochiral tripeptides for self-assembly into hydrogels

Ana M. Garcia1, Daniel Iglesias1, Evelina Parisi1, Katie E. Styan2, Lynne J. Waddington2, Caterina Deganutti1, Rita De Zorzi1, Mario Grassi3, Michele Melchionna1, Attilio V. Vargiu4\*, and Silvia Marchesan1\*

*1Department of Chemical & Pharmaceutical Sciences, University of Trieste, Trieste, Italy*

*2CSIRO Manufacturing, Clayton, Victoria, Australia*

*3Department of Industrial Chemistry, University of Trieste, Trieste, Italy*

*4Department of Physics, University of Cagliari, Monserrato, Italy*

Supramolecular hydrogels based on short peptides are attracting wide interest in the nanomaterials and nanomedicine fields.1,2 These simple molecules possess the advantages of being easily and low-cost prepared by solid-phase synthesis when compared with longer peptides, whilst still being still able to mimic large protein bioactivity. In this context, chirality has emerged as a useful tool to modulate peptide self-assembly, since the introduction of a D-amino acid in a L-tripeptide sequence can yield to hydrogel formation while it does not happen to the homochiral counterpart.3 In this work, a series of hydrophobic tripeptide sequences (both the homo- and the heterochiral analogues) are presented to show how chirality can guide the formation of supramolecular structures from simple building blocks. The rational design of the tripeptides and their supramolecular behavior are both supported by experimental and computational studies, including XRD data. Hydrogel stiffness and their supramolecular organization have been assessed by rheometry, circular dichroism and infrared spectroscopy. The morphology of these materials have been studied by transmission electron microscopy and atomic force microscopy. Furthermore, their performance as hydrogel biomaterials have been demonstrated by cell viability studies. Overall, this investigation reveals the divergent path of heterochiral and homochiral tripeptides for self-assembly into macroscopic hydrogel biomaterials.

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