Disulfide-Stabilized Tumor-Targeted Cyclic Peptide Nanotubes

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Peptide-based materials have many desirable qualities, such as their biocompatibility, structural tunability, and the ability to incorporate unnatural amino acids into their structure. Cyclic peptide nanotubes (cPNTs) fall into the category of peptide-based nanomaterials and are composed of cyclic peptide subunits which spontaneously form nanotubes through the formation of intermolecular hydrogen bonding. cPNTs have high functionalization potentials and exhibit enhanced cell permeation. When cPNTs insert parallel to cell membranes, this causes disruption of the membrane, leading to cell death. In this study, we prepared disulfide-stabilized tumor-targeted cPNTs to enhance cytotoxicity using peptide nanomaterials (Fig. 1). We report the synthesis of tumour-targeted cPNTs from cyclic peptide monomers tagged with varying amounts of the tumor-homing peptide tLyp-1. cPNTs were prepared using pH-triggered cPNT self-assembly and visualized using transmission electron microscopy (TEM) confirming the formation of cPNTs of 7.6 ± 1.2 nm diameter and 74.7 ± 37.8 nm length. Additional characterization by Fourier transform infrared spectroscopy (FTIR) and dynamic light scattering (DLS) is currently underway as well as cytotoxicity studies in U87MG glioblastoma cells. Tubular nanomaterials exhibit ideal pharmacokinetic profiles and as such, tumor-targeted cPNTs hold untapped potential as a new class of therapeutic nanomaterials.

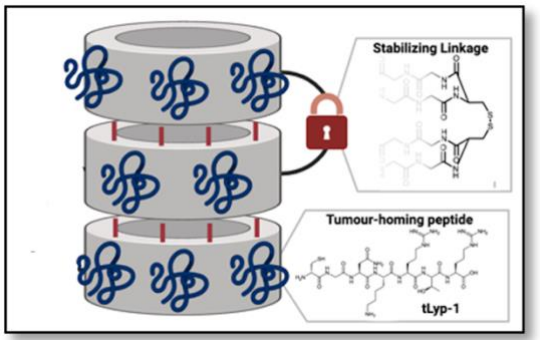

Fig 1: structural features of stabilized, tumour-homing cPNTs