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Development of self-assembled nanocarriers for colon cancer

Erumalla Venkatanagaraju
Christ University, India

Background: Treatment of cancer with the aid of nanotechnology has been a field of intense research over the past few years. Although advantages of nanocarriers include improved pharmacokinetics, encapsulation of cytotoxic agents and enhanced accumulation of therapeutics in the tumor microenvironment, the scope of improving selectivity through design of target specific nano-vehicles has been the most sought after avenues of nanomedicine research.

Objective: Objective of this current work was to discover novel soft nanostructures with the capability of specifically targeting colorectal cancer.

Materials & Methodology: Studies have shown that colorectal cancer is the third leading cause of death worldwide. Arginine based peptide nanotubes (soluble) and fibers (gels) have been synthesized by solid phase peptide synthesizer and developed as nanocarriers of small molecular drugs.

Results: These soft nanostructures were installed with target specific moieties like gastrin releasing peptides (receptors overexpressed in cell surface of several malignant tissues, particularly in colon cancer).

Conclusion: A unique process of co-assembly has been employed to develop these superior nanocarriers. Briefly, Bombesin (7-14) (Q-W-A-V-G-H-L-M) was tagged to amyloid 17-21 Aβ residue (R-L-V-F-F-A-L) and co-assembled with untagged RLVFFAL sequences to generate a novel class of target specific nanotubes. Also, Rhodamine was tagged to these sequences (Rh-L-V-F-F-A-L) to investigate the mechanism of cellular uptake of the nanostructures through confocal microscopy. Similarly, Fmoc based gelators featuring arginine were developed and then functionalized with Bombesin (7-14) sequences. Drugs like Campothecin, Curcumin and Irinotecan were loaded on to these soft nanostructures. Finally, the cytotoxicity of these soft nanostructures and their efficacy to deliver cargo (drugs) was probed in HT-29 cell lines (overexpressing GRP cell lines).

evnrazbiotech@gmail.com