Chapter 6

Summary and Future Outlook

SUMMARY

1. The goal of the thesis was to address the two major problems of cancer therapy- (i) non-targeted nature of drug delivery and (ii) development of MDR.
2. We have selected biocompatible precursors like cyclodextrin, dextran and curcumin for the synthesis of nanocarriers.
3. Multi stimuli responsive nanocarriers were synthesized for triggered release and receptor specific ligands were utilized for targeted delivery to tumor site.
4. The carriers were enabled to release multiple drugs for combinatorial therapy

The work was started with development of multifunctional nanoconjugates by surface functionalization of magnetic nanoparticles in the second chapter while in the third chapter carbon nanotubes were employed as the core to equip the nanoconjugates for PTT.

However due to the rising toxicity concerns associated with CNTs and MNPs, the later part of the thesis was aimed at the synthesis of biocompatible polymer amphiphiles which self-assemble into nanoarchitectures. In chapter four, Dextran was selected as the hydrophilic segment to construct spherical and tubular nanoarchitectures. Due to pH and enzyme responsive characteristics these carriers would escape endosomal degradation. The effect of shape on drug loading, release, cellular internalization and hence the tumor regression was also analyzed. The nanoarchitectures also assisted in reducing the notorious cardiotoxicity of doxorubicin.

In the chapter five, prodrug strategy was adapted for hierarchical disassembly of the curcumin derived micelles in response to pH and enzyme. The curcumin derived amphiphile self-assembled into stable micelles that can encapsulate DOX in its hydrophobic core. The micelles can release both curcumin and DOX in a sequential manner.

All the three class of nanocarriers obtained were analyzed for their anticancer drug release potential by preclinical evaluations. In-vitro studies were performed on cancer as well as non-cancer cell lines to demonstrate the non-toxicity of carriers, their internalization, as well as sustained and targeted drug release.

FUTURE OUTLOOK

The development of self-therapeutic nanomaterials that can cause apoptosis of cancer cells without the requirement of any external stimulation or the loading of any extra therapeutic compounds can be undertaken.