CHARACTERIZATION AND EVALUATION OF DOXORUBICIN TAGGED MAGNETIC NANOPARTICLES FOR HYPERTHERMIA

Ms. Rashmi Rao B. (1MS07BT041)
Ms. Roshna Rajan George (1MS07BT064)
Mr. Vijai S. Narasimha (1MS07BT067)

Guides.

Dr. Chandra Prabha M. N. (Internal guide)
Mr. Lokesh K.N. (Co-guide)

Dr. Rajeev A. G (External guide)
Dr. Ramesh K. P. (External guide)

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DEPARTMENT OF BIOTECHNOLOGY
M.S. RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institution, Affiliated to VTU)
BENGALURU – 560 054

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Miss. Rashmi Rao B., Miss. Roshna Rajan George, Mr. Vijai S. Narasimha

ABSTRACT

The aim of the project was to establish a unique method to fabricate a complex containing Drug-Magnetic iron oxide nanoparticles (MION) conjugates for targeted cancer therapy by hyperthermia to overcome the harmful side-effects of the prevalent and traditional ones.

MIONs were synthesized by the method of co-precipitation using salts of iron as precursors and were coated with different polymers to enhance dissolution and stability. The MIONs were then tagged to chemically modified heparin–Deoxycholic acid (HepDOCA) conjugate which was initially complexed to the anticancer drug Doxorubicin (DOX). Each of these conjugates was characterized by XRD, SEM and DLS. To observe the effect of formulations, hyperthermia treatment was performed by an inductor RF coil setup on *E.coli* (DH5-α strain) and the growth rate of bacteria along with the protein released upon cell lysis was monitored.

Particle size of MION was found to be 39.78nm by XRD studies. DLS results showed that HepDOCA – DOX was stable and diameter was found to be 74.21nm. SEM images provided additional evidence to prove that the particle sizes were in support of the above mentioned sizes. Confirmatory tests of plotting growth curves and plating of samples subjected to heat treatment showed that the formulations were detrimental to cells due to the dual activity of our complex i.e. by drug cytotoxicity of HepDOCA – DOX and by thermal cytolysis due to the action of alternating magnetic field on MIONs.

It was confirmed that HepDOCA – DOX-MION complex imparts damage to *E.coli* cells by the magneto-thermo-cytolysis on application of alternating magnetic field as well as chemo-cytolysis. Thus this process of hyperthermia using the above formulation can be extended to destroy the malignant cells with minimal side effects.