Drug Delivery Strategies

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Drug Delivery Strategies

Direct Introduction of anticancer drugs into tumour

- *Injection Directly into the tumour*
- *Tumour necrosis therapy*
- *Injection into the arterial blood supply of cancer*
- *Local injection into the tumour for radiopotentiation*
- *Localized delivery of anticancer drugs by electroporation (Electrochemotherapy)*
- *Local delivery by anticancer drugs implants*

Routes of Drug delivery

- *Intraperitoneal and Intrathecal*
- *Nasal and Oral*
- *Pulmonary inhalation*
- *Subcutaneous injection or implant*
- *Transdermal drug delivery*
- *Vascular route: intravenous, intra-arterial*

Drug Delivery Strategies

Systematic delivery targeted to tumour

- *Heat-activated targeted drug delivery*
- *Tissue-selective drug delivery for cancer using carrier-mediated transport systems*
- *Tumour-activated prodrug therapy for targeted delivery of chemotherapy*
- *Pressure-induced filtration of drug across vessels to tumour*
- *Promoting selective permeation of the anticancer agent into the tumour*
- *Two-step targeting using bispecific antibody*
- *Site-specific delivery and light-activation of anticancer proteins*

Drug delivery targeted to blood vessels of tumour

- *Antiangiogenesis and Angiolytic therapy*
- *Drugs to induce clotting in blood vessels of tumour*
- *Vascular targeting agents*
- *Special formulations and carriers of anticancer drugs*
- *Albumin based drug carriers and Carbohydrate-enhanced chemotherapy*

Drug Delivery Strategies

Delivery of proteins and peptides for cancer therapy

- *Fatty acids as targeting vectors linked to active drugs*
- *Microspheres , Monoclonal antibodies*
- *Polyethylene glycol (PEG) technology*
- *Single-chain antigen-binding technology*

Transmembrane drug delivery to intracellular targets

- *Cytoporter , Receptor-mediated endocytosis*
- *Transduction of proteins and Peptides*
- *Vitamins as carriers for anticancer agents*

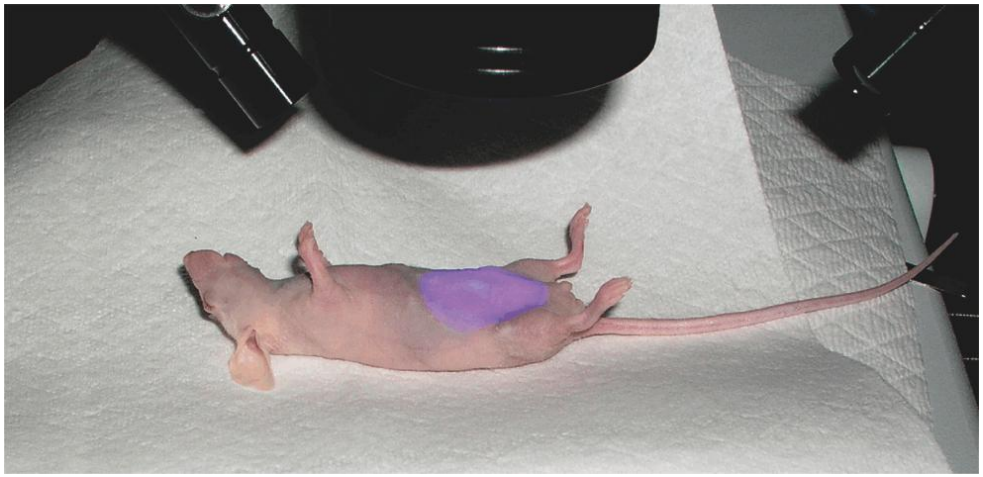
Biological Therapies

- *Antisense therapy, Gene therapy, RNA interference*

Treatment Approaches

Thermal approach of NPs:

- Aims at curing cancer growth by producing heat.
- The NPs consist of a dielectric or semiconductor core and a conducting shell and heated using infrared radiation or are targeted to a desired location through the use of appropriate chemical schemes, for example antigen-antibody binding. And further irradiated to produce localised heating effect.
- The common NPs employed for this therapy consist of a silica core and a gold shell or a gold sulfide core and a gold shell.



Treatment Approaches

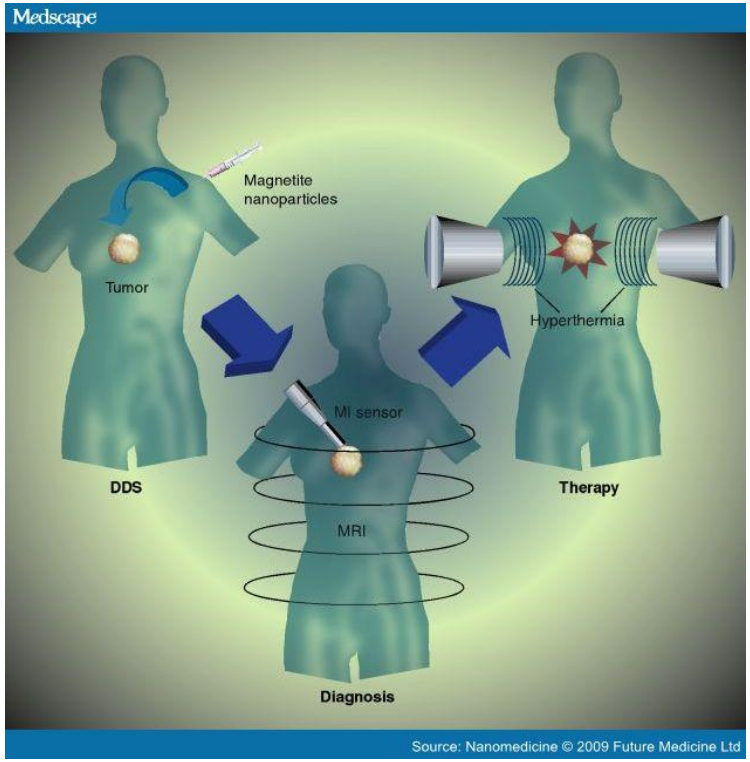
pH responsive nanoparticles:

- *NPs responsive to the pH gradients are promising for drug delivery in case of solid tumors. Having an acidic extracellular environment .*
- *pH-responsive NPs consist of a corona and a core, one or both of which respond to the external pH to change their soluble/insoluble or charge states.*
- *The NPs are designed with their lower critical solution temperature (LCST) being dependent on the ambient pH. This value is above the nominal physiological temperature of 37° C at pH 7.4, but decreases to a temperature below the physiological temperature with a small decrease in pH.*
- *The resulting change in LCST causes the core-shell nanoparticles to deform and precipitate in an acidic environment, triggering the release the chemotherapeutics at low pH.*
- *In addition, a biological signal has been conjugated to the shell of the nanoparticles, which can recognize tumor cells. This system may be able to target drugs to tumor cells and release the drugs intracellularly.*

Treatment Approaches

Nanoparticles used in combination with radiations:

- This approach discloses a method/system utilizing interaction of electromagnetic pulses or ultrasonic radiation with nanoparticles for enhancement of drug delivery in solid tumors.
- These particles can be combined to antibodies to target the antigens existing in the tumor vasculature.
- Cavitation induced by ultrasonic waves results in perforation of tumor blood vessels, and perforation of cancer cell membrane, providing enhanced delivery of macromolecular therapeutic agents from blood into cancer cells with minimal thermal and mechanical damage to normal tissues.



Treatment Approaches

Nano emulsion:

- *This involves making an emulsion in which nanoparticles of the diagnostic or therapeutic agent are suspended.*
- *Advantages: therapeutic or diagnostic nanoparticles so produced can be utilized for intravascular injections to treat systemic diseases.*
- *Extra vascular injections containing these particles can provide controlled release of the drug at the site of injection for prolonged drug effects, and minimize multiple dosing.*
- *Improved drug transport across absorption barriers such as mucosal gastrointestinal barriers, nasal, pulmonary, ophthalmic, and vaginal membranes, and other distribution barriers, such as the blood--tissue and blood--tumor barriers of various organs and tissues.*
- *Improved oral bioavailability of poorly absorbed drugs*

Summary

- *Nanotechnology has large potential in detection and treatment of cancer in its incipient stage.*
- *The potential arises due to the ability of NP entering inside the cells and access to the chromosomes/FNA molecules.*
- *Certain nano structures like nanocantilevers, nanopores, nanotubes, nanoshells and quantum dotes are prospective structures that would help in detecting and treatment of cancers.*
- *Dendrimers are to serve detection, treatment and signaling that the cells are Killed.*
- *Still there are many challenges that are to be met before use of NT becomes a reality.*
- *Toxicity of the NP is an issue that is to be resolved through legislative and regulatory means.*

THANK YOU