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Heating enhancement efficiency of magnetic iron oxide (Fe_3O_4) nanoparticles for magnetic fluid hyperthermia applications (anti-cancer therapy)

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Magnetic Fluid Hyperthermia (MFH) has been proposed as a potential non-invasive technique for cancer treatment due to its markedly low side effects compared to conventional radiotherapy or chemotherapy. It is based on conversion of electromagnetic energy into heat by super paramagnetic iron oxide (Fe3O4) Nanoparticles (NPs). The current clinical system comprises Fe3O4 NPs coated with aminosilane which has obtained clinical approval in the European Union (2009) and has been tested on patients with prostate carcinoma and glioblastoma multiforme. There are however some critical challenges associated with the current clinical system such as low magnetization and low induction heating power (Specific Absorption Rate; SAR) at a biological safe range of induced magnetic field and its non-targeting nature which makes it inapplicable for treatment of deep-seated tumors.

Biography

David Harding (PhD) is a Professor of Chemistry at Massey University, Palmerston North, New Zealand. His BSc Honours project study (University of Canterbury, New Zealand) was published and involved triazine derivatives as potential herbicides and/or insecticides. This set a life-long ambition to apply chemistry to bio-applications. He worked for Eli Lilly and Company (UK labs). His activities also involved Elanco. The compounds made were screened widely for bio-application. After gaining a PhD from the University of Western Ontario, London, Ontario, Canada, he returned to NZ. His synthesis and/or bioactivity studies have involved peptide synthesis, purification of bio-actives from various bodily fluids and analysis of the components. He developed the Sulfo-Cope rearrangement and the HCIC (hydrophobic charge induction) technique for purifying genetically engineered chymosin from milk for the then Genencor. He also was involved in the purification of HGH (human growth hormone) and HSA (human serum albumin) for Genentech Inc. His current drug delivery activities include relief of pain in the temporomandibular joints as well as transdermal pain relief. His oral drug delivery programme has expanded to address the problem of gastric nematodes in ruminants.

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