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Colossal Magnetic Heat Induction of Magnesium Shallow Doped γ-Fe_2O_3 Nanofluids and Somatically Safe AC Magnetic Field Generator System for Clinical Safe Hyperthermia

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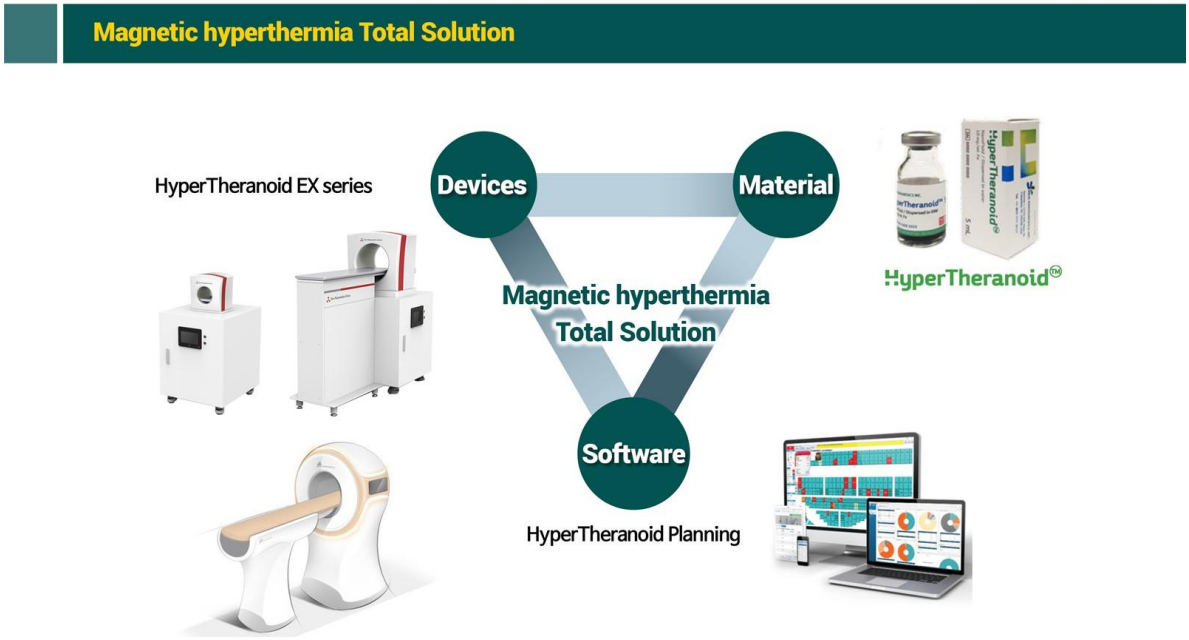
Abstract

Magnetic Nanofluid Hyperthermia (MNH) has been recently paid an enormous attenton as a Renaissance of cancer treatment modality due to its prominently "low side effects" and unbelievably high treatment efficacy compared to conventional chemotherapy and radiotherapy. However, insufficient AC magnetic induction heating power at the biologically and physiologically safe range of AC magnetic field (H_{appl} x f_{appl} < 3.0 ~ 5.0 x 10^9 $Am^{-1}s^{-1}$), and essentially required high in-vitro & in-vivo biocompatibility including biocleanrance with chemical colloidal suspension stability of superparamagnetic nanoparticle (SPNP) hyperthermia agents have still remained as critical issues to be overcome for achieving successful clinical hyperthermia in cancer clinics. Furthermore, development and commercialization of an automatically/precisely controllable and somatically safe AC magnetic induction coil generator for small-, or mid-sized animals (pre-clincal studies) as well as for human patients (clinics) has been considered as another vitally improtant challenge in highly efficient and systematic MNH in cancer clinics.

In this talk, the newly designed and developed commercialized (for research use only) magnesium shallow doped γ-Fe_2O_3 nanofluids (Hypertheranoid™-1) with exceptionally high intrinsic loss power (ILP) in a range of 7 ~ 14 nHm^2kg^{-1}, which is a 50 ~ 100 times higher than that of commercial Fe_3O_4 (i.e, Feridex, ILP = 0.15 nHm^2kg^{-1}) at the H_{appl} x f_{appl} = 1.23 x 10^9 $Am^{-1}s^{-1}$ (H_{appl} = 120 Oe, f_{appl}= 100 kHz) will be primarily discussed, and also our newly commercialized Hyperthreanoid™-EX AC magnetic field generator series, which produce automatically controlled precise and somatically safe AC magnetic field, for small, and mid-size animal cancer treatment for veterinary clinc, and for human patients in cancer clinic. Pesudo bio-enviromental studies, as well as in-vitro & in-vivo MNF studies using Hypertheranoid™-1 nanofluids and Hyperthreanoid™-EX series were conducted to evaluate the bio-feasibility and bio-availability for preclinical and clinical applications. According to all the bioavailability testing results, it was clearly confirmed that the newly developed Hyperthreanoid™ system showed promising hyperthermic effects with extremely high biocompatibility (no in-vitro and in-vivo cytotoxicity) to potentially destroy the solid cancers with extremely minial side effects. Furthermore, Hyperthreanoid™ system provided highly efficacious total solution of a new paradigm of MNF clinical hyperthermia in cancer clinics (See Figure 1).

Figure |



Total solution of Magnetic Nanofluid Hyperthermia (MNFH) to treat solid cancers with exceptionally high treatment efficacy