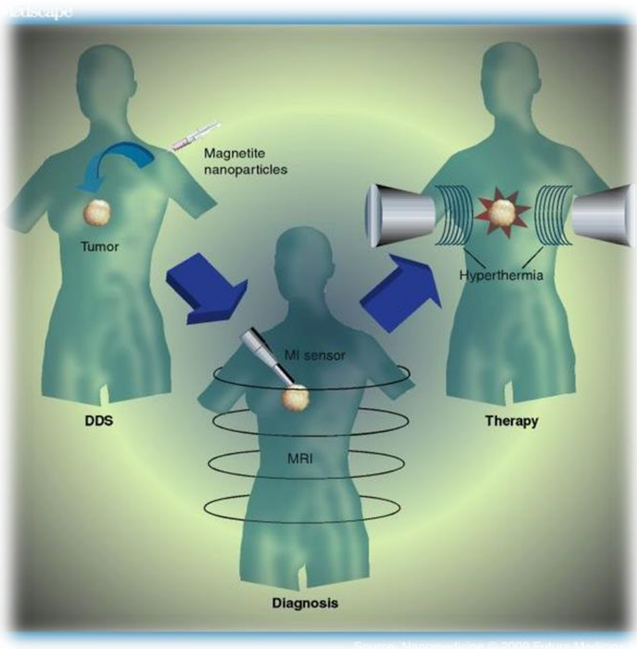

Cancer is a disease that has afflicted mankind over the centuries. Numerous research studies have been carried out to find some treatment, with satisfactory results in various forms. But there are other forms that lead to the death of a large number of people every year, for which apart from conventional therapies (chemotherapy, radiation and surgery) various alternative therapies have been proposed and investigated. One of these is the magnetic hyperthermia which is based on the release heat of nanoparticles when they are found under the influence of an external alternating magnetic field, in order to regionally increase the temperature within the 41-45°C range driving them in apoptotic or even necrotic pathways while the surrounding healthy cells as more resistant to temperature variations are not significantly affected.

Enhancing the performance of nanoparticles in magnetic hyperthermia can come with the arrangement of magnetic nanoparticles in linear chains. Because of the bipolar interactions between the particles, their magnetic characteristics are altered as outlined by the morphology of the hysteresis loop and as the thermal performance in the magnetic hyperthermia is inextricably linked, it appears significantly enhanced as well. The performance of magnetic hyperthermia is quantified with the Specific Loss Power index (SLP) that gives the amount of power per unit of mass (W/g).

In an effort to optimize the already enhanced thermal performance of magnetic chains in magnetic hyperthermia, the present work studies two categories of parameters with the aim of maximizing it in magnetic chain arrays. The arrangement of magnetic nanoparticles in chains is achieved by dispersing them into a hot (84oC) agarose solution of which within a static magnetic field is allowed to cool at room temperature and the nanoparticles remain in the positions they had occupied Guided by the outer static field. Initially, the parameters related to the nanoparticles forming the chains are examined and can affect the ease of formation, size and density of the magnetic chains, leading to significant reinforcement of the collective magnetic response. The particle size (10, 20, 50, 80 nm) and their concentration (1, 2, 4 mg/mL) are two critical particle parameters that determine the success of the formation of magnetic chains, with respect to the intensity of bipolar interactions, and consequently to the thermal performance under alternating magnetic field.

Further enhancing the performance of magnetic nanoparticles can be achieved by configuring related to the alternating field, such as frequency (375, 765 kHz) and its amplitude (30, 60 mT). As revealed for each particle size, there is an optimum concentration that enhances thermal performance, while this performance may be further enhanced according to the frequency and width of the applied field up to 4-5 times the original values of the specific loss power index.