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First extensive study of lanthanum manganite nanoparticles to target deadly brain cancer

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Introduction
The ability to successfully target deep-seated tumours in sensitive areas of the body is limited to adequate targeting strategies. More specifically, brain and central nervous system (CNS) cancers can be the most aggressive, have higher mortality rates and lower accessibility to chemotherapeutic drugs. A proposed solution to target these concerns is through introducing high atomic number (Z) nanoparticles (NPs) such as silver-doped lanthanum manganite (LAGMO) to aid in common treatments such as radiation therapy. These NPs can bypass the blood brain barrier and are capable of increasing the damage from the radiation due to their high-Z. Most importantly they have potential to cause cancer cells to undergo hyperthermia (a cell death precursor) as the NPs heat up in their environment due to their Curie temperature being in the hyperthermia range of interest.

Methods
Magnetic, chemical and biocompatibility characteristics of LAGMO NPs at silver-doping levels of 0-10% were examined. Magnetic and chemical phases of LAGMO NPs were analysed with neutron diffraction using the ECHIDNA High-Resolution Powder Diffractometer. Biocompatibility and combinational treatment strategies involved in vitro biological endpoint clonogenic assays and a cancer cell selectivity investigation.

Results
Neutron diffraction revealed that only 10%-LAGMO NPs exhibit residual ferromagnetism at 300 K compared to other doping levels, suggesting that Curie temperature can be adjusted to the hyperthermia range of interest according to the levels of silver content in the NP. This indicates the potential to induce hyperthermia to cancer cells. Comparative studies on LAGMO NP's biocompatibility with cancer and healthy cells demonstrated healthy cell growth boost and increased cancer cell death suggesting complete cancer cell selectivity. Clonogenic assays also revealed significantly increased cancer cell death with NPs and radiation therapy compared to radiation alone.

Conclusion
LAGMO NPs have immense potential to be used for targeted cancer treatment strategies. They also have the potential to induce cancer cell hyperthermia alongside treatment with radiation due to their magnetic and chemical properties. Furthermore, they have been shown to boost healthy cell growth and severely damage cancer cells alongside radiation.

Speakers Gender

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Level of Expertise

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Do you wish to take part in the poster slam

Yes

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