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The silver bullet: using silver doped lanthanum manganite to selectively target deadly brain cancer

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Introduction
Treatment of deadly cancers that are deep-seated within sensitive healthy tissue is limited to adequate targeting strategies. More specifically, brain and central nervous system cancers can be the most aggressive, have higher mortality rates and lower accessibility to chemotherapeutic drugs. This study introduces the first in-depth analysis doped lanthanum manganite (LAGMO) nanoparticles (NPs) as a brain cancer selective chemotherapeutic and radiation dose enhancer

Method
The magnetic, chemical and biological properties of LAGMO NPs at silver dopant levels of 0-10% were investigated. 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, live cell imaging and a cancer cell selectivity investigation.

Results
Neutron diffraction revealed that 10% LAGMO NPs exhibit residual ferromagnetism at 300 K suggesting potential hyperthermia cancer treatment strategies. Biocompatibility studies of LAGMO NPs with cancerous and non-cancerous cells displayed completely cancer cell selective toxic response while non-cancerous cell growth was promoted. Clonogenic assays revealed a significant decrease in long-term survival of cancer cells with NPs and radiation therapy compared to radiation alone.

Conclusion
LAGMO NPs have potential to significantly improve targeted cancer treatment strategies. Their unique magnetic properties introduce a potential to induce cancer cell hyperthermia alongside radiation treatment and improve clinical outcomes. Furthermore, they promote non-cancerous cell growth while severely damaging cancer cells alongside radiation.

References
Khochaiche, Abass, et al. "First extensive study of silver-doped lanthanum manganite nanoparticles for inducing selective chemotherapy and radio-toxicity enhancement." Materials Science and Engineering: C 123 (2021): 111970.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

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