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Early diagnosis of colorectal cancer using gold nanoparticles – a pilot study

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Abstract

Introduction: Colorectal cancer (CRC) is ranked amongst the top three most diagnosed cancers in humans worldwide. Colorectal cancer is the fourth most common cancer in South Africa and the sixth most common cause of death. If diagnosed during the early stages, the 5year relative survival rate can be as high as 90%. However, in most cases, the diagnosis is only made at a later stage when the cancer has metastasized, as the detection depends on the symptoms and non-specific screening. Many attempts have been made to achieve an early detected of CRC.

Aim: To induce CRC in rats to investigate the use of targeted gold nanoparticles (AuNPs) as a diagnostic tool for CRC.

Methods: Ten Wistar rats were injected with 1,2-dimethylhydrazine (DMH), 25 µg/Kg bodyweight once per week, for 5 consecutive weeks to induce CRC. This was followed by an incubation period of 22 weeks. At the end of the incubation period, AuNPs were synthesized using Turkevich's citrate reduction method, and conjugated with peptide p.L. The rats were then injected intraperitoneally with p.L-PEG-AuNPs to detect CRC. Six rats were kept as controls and did not receive any treatment.

Results: Five injections of DMH did not induce CRC in the rats.

Conclusion: Even though CRC could not be induced using

DMH in this study, 14 nm p.L-AuNPs were synthesize successfully.

Biography

He hold a Bachelor of Medical Science degree and Honour's in Physiological Science. Both these qualification were obtained at Walter Sisulu University. He also submitted and potentially graduating for Master's in Nanoscience (Nanobiomedical science) in April 2020. These Master's were carried out in two cooperating university, University of Western Cape (for the first year of course work) and Nelson Mandela University (for research). In the process, He has done research in different fields. This includes cardiology research (investigating arterial stiffness), respiratory research (investigating the effects of smoking and exercise) and cancer research (using nanotechnology to study colorectal cancer).

He have worked as an academic and laboratory intern, employed by National Research Foundation (NRF) placed at Nelson Mandela University in the department of Biochemistry, Microbiology and Physiology. That includes basic lab safety measures, cleaning of lab equipment, centrifuging, autoclaving, mixing of chemicals, synthesizing and characterizing nanoparticles, and following laboratory protocols.

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