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Sugar bait-molecule for preferential gold nanoparticle uptake: Development of a novel metabolic based methodology for functional CT imaging

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The main functional imaging technique, FDG-PET, is based on increased glucose metabolic activity in cancerous tissue and provides the ability to discern molecular and cellular alterations associated with pathological conditions, even before structural modifications occur. However, it is prone to non-specificity as glucose uptake is not cancer-specific, it is dependent on availability of short-lived cyclotron radiotracers, and above all, it lacks anatomical information of the functional results. Here we describe a novel method that could provide simultaneous functional and structural imaging capabilities, with the most widely available imaging modality - the CT. We have developed Glucose Functionalized Gold Nanoparticles (GF-GNP), which like FDG, detects glucose metabolic activity while inducing distinct contrast in CT imaging. We have recently discovered, both *in vitro* and *in vivo*, that these GF-GNP exhibit increased uptake in cancer cells compared to the surrounding normal tissue. Remarkably, we found that the increased uptake is selective to a specific intra-molecular glucose site, to which the gold nanoparticle is conjugated. This finding proves that despite the huge size of the GNP, the GF-GNP is being recognized by cancer cells as glucose. Thus, we propose the GF-GNP as a CT contrast agent for detecting glucose metabolic activity.

Biography

Rachela Popovtzer received her B.Sc. degree in physics and philosophy from Bar-Ilan University, her M.Sc. degree in biomedical engineering from Tel-Aviv University and her Ph.D. degree in Electrical Engineering from Tel-Aviv University in 2006. During the years 2006-2008, she was a post doctorate fellow at the University of Michigan with Prof. Raoul Kopelman. Since 2008 she is a senior lecturer at the faculty of Engineering and the Institute of Nanotechnology at Bar-Ilan University in Israel. Her current research focuses on the development of smart nanoprobes for molecular diagnostic and therapeutic applications.

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Martian soil as a potential source of nanoparticles: Study using Martian rigolith simulant

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Nanoparticles are characterized by small size (<50 nm), and by having higher energy. However, they are difficult to find in nature, so they are chemically synthesized. Previous studies using Martian Rigoith simulant (MRS) JSC Mars-1 have demonstrated great spectral similarities to Martian bright region. Thus making this weathered volcanic ash ideal to study physical-chemical properties such as nanoparticles in relation to Martian soil. Most studies on Mars are related to seek relic of life and/or presence of water, but very few have been oriented toward establishing the potential of Martian soil as a repository or source of energy and/or electroconductivity, which is the primary base for life and/or production of materials of economic importance. Therefore, the aim of the denoted investigation was to determine the electrical conductivity of the Martian rigolith simulant based on studies conducted in electrolysis cells under UV and Fe effect, and control conditions, using energy parameters, which include voltage, charge, amperage, resistance, paramagnetism, and redox-potential. These parameters were correlated with particle size, particle weight-volume, and particle surface area of the MRS. The effect of the photon-fenton interaction was noticed in relation to the size of the Martian simulant soil. So, soil samples treated with Fe solutions and under UV radiation showed higher voltage, charge, Ohms, redox potential, and paramagnetism. These results were used to identify the potential of the MRS as a source of nanoparticles. Consequently, suggesting Martian soil as a potential source of nanoparticles, since the red planet is abundant in both UV radiation and iron, in fact the color of the planet is due to this photon-fenton reaction.

Biography

Cuero R. G received his Ph.D. in Microbiology from Strathclyde University, UK, M.Sc. in Plant Pathology from Ohio State University, USA, and a B.Sc. from Heidelberg University, USA. He was a Research Associate of the USDA, Research Scientist and Distinguished Professor at Prairie View A&M University-Member of the Texas A&M University System. Currently, he is Research Director and Founder of The International Park of Creativity. He holds numerous technological inventions in different scientific fields.

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