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Metal-based anticancer compounds: Design, synthesis and biological results

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Metal compounds, as potential drugs, continue to receive great attentionsince the discovery of cisplatin. Cisplatin is used in the treatment of several types of cancers and is found in 50%-70% of all chemotherapy schemes administered to cancer patients. It acts by binding the DNA molecule. Unfortunately metal-based drugs are either inactive or have side-effects when administered to the patients. Several attempts have been made to prepare new metal compoundsthat would show improved efficacies and less toxicity. This has led to a surge of new potential anticancer metallo-drugs, including ruthenium, palladium and gold compounds. In this study several palladium(II) and platinum (II) compounds, employing pyrazoles as ligands, have been prepared as anticancer agents. The results have shown that the platinum(II) compounds induce DNA strand breaks and activates caspase-3 in CaSki, HeLa, and p53 mutant Jurkatcells that leads to apoptosis. Furthermore, a series of phosphinogold(I) dithiocarbamate complexes that show good anticancer activity against human cervical epithelioidcarcinoma (HeLa) cells and better selectivity than cisplatin have also been prepared. The lecturewill highlight the synthetic journey of these compounds, structure elucidation, and some exciting anticancer results.A brief summary of how nanotechnology will be employed to further improve on the efficacy of the compounds, and possibly reduce any side effects, will also be mentioned.

Biography

Frankline K Keter completed his PhD in inorganic chemistry from the University of Johannesburg (2008) and is experienced in synthesis and nanotechnology worklinked to drug discovery and development. He worked as a postdoctoral research fellow at the University of Pretoria, before joiningMintek as a full-time research scientist in the DST/Mintek Nanotechnology Innovation Centre (NIC), Biolabels unit. His work is well captured in a provisional patent and publications in international peer reviewed journals.

Circulating tumor cells as a real time liquid biopsy: Isolation and detection systems, molecular characterization and clinical applications

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Detection of Circulating Tumor Cells (CTC) in peripheral blood can serve as a "liquid biopsy" approach and has thus emerged lately as one of the hottest fields in cancer research. The clinical significance of CTC has been evaluated in many types of solid cancers, and the CTC enumeration test in metastatic breast, colorectal and prostate cancer has been cleared by the FDA almost a decade ago. CTC molecular characterization has a strong potential to be translated into individualized targeted treatments. A variety of analytical systems are continuously been developed for CTC isolation, detection and molecular characterization. The main strategies are based on their separation from peripheral blood mononuclear cells based on CTC density, size and electric charges and protein expression on the cell surface of CTC. A variety of microfluidics and filtration devices has been developed and are currently under evaluation for selection and enumeration of CTCs. CTC detection and molecular characterization systems are mainly based on protein and image-based approaches like classical immunocytochemistry, the FDA cleared CellSearch system, and immunofluorescence, and molecular assays based on the nucleic acid analysis in CTCs like RT-qPCR, multiplex RT-qPCR, and next generation sequencing technologies. Quality control and standardization of CTC isolation, detection and molecular characterization methodologies is very important for the incorporation of CTCs into prospective clinical trials testing their clinical utility. CTC molecular characterization at the single cell level holds considerable promise for the identification of therapeutic targets and resistance mechanisms in CTCs as well as for the stratification of patients and real-time monitoring of systemic therapies. This lecture will be mainly focused on the analytical systems for CTC isolation, enumeration, and detection and the clinical applications of CTC in many types of solid cancer. We also discuss the potential of the molecular characterization of CTCas a liquid biopsy in individualized therapy.