Department of Chemistry

Departmental Seminar Series: Biodiscovery Month

You are cordially invited to a face-to-face lecture presented by

Patrick Mc Millan

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Date: Friday, 25th August 2023
Time: 11:30 am
Venue: The Orbital (Room 3-1 Chemistry Building)

Development of a natural product library using hyphenated techniques and evaluation of its constituents as potential anti-cancer agents

Historically, natural products have been used in medicinal practices for centuries, with the earliest recorded usage dating back more than five thousand years. Natural products are still seen as a rich source of chemically diverse and novel therapeutic compounds with often excellent drug-like qualities. Since 1981, the FDA has approved over 800 natural products for the treatment of various communicable and non-communicable diseases ranging from viral and bacterial infections to cancer and Alzheimer's disease. Cancer remains one of the world's top killers, with breast and lung cancer ranking amongst the top, with an estimated 2.26 million and 2.2 million new cases reported in 2020, respectively. South Africa's rich multicultural heritage has led to the development of extensive knowledge systems on medicinal plants with over 2 000 indigenous plant species actively used in traditional medicinal practices. South Africa's flora is considered one of the world's most chemically diverse and yet remains largely unexplored and untapped in terms of drug discovery. This provides a competitive advantage for South Africa to be at the forefront of natural product drug-lead discovery. However, South Africa has fallen behind due to the inaccessibility to modern technologies for standardisation and purification of natural products. To overcome the difficulties and slow turnaround time of natural product drug discovery, the creation of a South African natural product library aims to expedite the identification, isolation and structural characterisation of potential drug leads by incorporating innovative and modern High-Throughput Screening techniques. The effectiveness of the library platform was demonstrated by evaluating a selection of South African medicinal plants for their anti-cancer potential against numerous cancer cell lines. Thirty-four South African medicinal plant species (representing 21 plant families) were extracted, fractionated and standardised using the natural product library platform. The standardised extracts and fractions were screened in a high-throughput manner against lung cancer (A549-JSS Academy of Higher Education and Research, India), breast and colorectal cancer (MCF7 & Caco2-Nelson Mandela University) and lastly prostate cancer (DU145, PC3 & 22Rv1- Institut Curie, France). Of the many hits investigated, the compounds mikanin 3-O-sulfate (MCF7: IC_{50} = 146.2 µM, Caco2: IC_{50} = 65.36 µM) and chelerythrine (DU145: IC_{50} = 1.85 µM, PC3: IC_{50} = 3.30 µM) were identified to possess promising anticancer activity. Based on the high hit rate and turnaround time at which these compounds were identified and isolated, the natural product library platform has shown great potential for expedited novel drug lead discovery.

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