Reaffirming Nature as a Source of Medicinal Raw Materials
Fabio Boylan

Natural products, especially plants, have been used in the treatment of disease for thousands of years, with the first written records on the medicinal uses of plants appearing about 2600 BC from the Sumerians and Akkaidians. The Ebers Papyrus, the best-known Egyptian pharmaceutical record, which documents over 700 drugs, dates from 1500 BC and the first records of the Chinese Materia Medica, describing over 600 medicinal plants, date from about 1100 BC. Today the World Health Organization estimates that approximately 80% of the world’s inhabitants continue to rely on traditional medicine for their primary health care.

The term ‘ethnopharmacology’ was used for the first time in 1967, although the principle behind the discipline was described by the German pharmacologist, Louis Lewin, in his masterpiece Phantastica in 1924. Originally defined as the science behind using natural resources as drugs, ethnopharmacology was defined by Bruhn & Holmsted in 1981 as ‘the interdisciplinary scientific exploitation of biological active agents traditionally used or observed by people’. Ethnopharmacological studies are premised on respect for, and validation of, cultural diversity and local traditional knowledge of medicinal uses of natural resources.

My research at the School of Pharmacy and Pharmaceutical Sciences is focused on:

— Proving the benefits (if any) of the natural medicines being used by disadvantaged communities (poor or absence of primary health care) in Europe, Asia and Americas;
— Discovering the reasons for negative, or even seriously toxic effects arising from the use of the various natural medicines under scrutiny for those communities;
— Being able to advise the communities, in the most basic terms, that there are alternative plants (and/or alternative uses for previously misused plants) that can provide medicine if used in a particular or different manner.

Fighting cancer and arthritis with plant products — With my research group in the School of Pharmacy and Pharmaceutical Sciences, I have been collaborating with researchers in countries around the world to discover and validate the pharmacological actions of different plants in the treatment of serious diseases including cancer and arthritis — diseases which were once associated primarily with developed countries but are now rapidly on the rise worldwide.

Plants have been used in the treatment of cancer since the 1950s, with the discovery and development of the Vinca alkaloids, vinblastine and vincristine, and the separation of the cytotoxic podophyllotoxins. In collaboration with Brazilian researchers, my team has been researching into the pharmacological action of a Palm from the Amazon Forest. We have discovered that fruits from this plant can be divided into different parts, with one part targeting leukaemia and the other benign prostate hyperplasia.

Non-steroidal anti-inflammatory drugs (NSAIDS) are the first line of therapy in, for example, acute gouty arthritis — they work by inhibiting the cyclooxygenase pathway, but not the lipooxygenase activity, and therefore have only limited control on inflammation and may have adverse effects. There is a need to search nature for more specific anti-inflammatory drugs. Working with researchers from Brazil and Serbia, my group has established that Ternanthrin, identified in the essential oil Choisya ternata from a Mexican plant belonging to the family Rutaceae, has displayed excellent pain-killing and anti-inflammatory properties in preliminary studies.

Fabio Boylan received his BSc, MSc and PhD from the Federal University of Rio de Janeiro and joined Trinity’s School of Pharmacy and Pharmaceutical Sciences as a lecturer in 2008. He is now Associate Professor of Pharmacognosy and PI with the School and the Trinity Biomedical Sciences Institute. Recipient of several research grants with collaborators overseas, he has published almost 100 articles in peer-reviewed journals. His research focuses on the validation of the popular use of medicinal plants by different populations by assessing their chemical and pharmacological properties, with the aim of developing safe and effective medicines derived from nature.

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In a separate study, working with Chinese plants, my group was able to validate an extract from *Elsholtzia ciliata* as a natural anti-microbial with important bactericidal and fungicidal actions.

More recently, collaborative work with Kazakh scientists has allowed for the development of monographs of endemic Kazakh plants for inclusion into the Kazakh National Pharmacopoeia, replacing non-native European plants. This research has enabled the development of tools to analyse the chemical compounds in plants, validating their pharmacological actions and guaranteeing their quality control as raw materials. In addition, the quick one-step removal of toxic compounds from the chemical composition of medicinal plants has led to the identification of important pharmacological actions.

The impact of my research is translated by the number of papers published in high impact journals in the area of Natural Products. It also envisages to finding natural templates or scaffolds that can be used as it is or modified to try and understand the relationship between cancer and inflammation. Once translated into the Irish Flora it could attract industries potentially interested in the area of Natural Products to invest in the global understanding of plant derived anticancer and anti-inflammatory agents and the relationship between them. My research also reinforces Ireland as a top nation in drug development based on medicinal plants from overseas.

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