Pharmacognosy in modern pharmacy curricula

Satyajit D. Sarker

Department of Pharmacy, School of Applied Sciences, University of Wolverhampton, Wolverhampton WV1 1LY, England, UK

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Pharmacognosy, derived from the Greek words "pharmakon" (drug) and "gnosis" (knowledge), is probably the oldest modern science, and generally the study of crude drugs of plant and animal origin (in the form of tinctures, teas, poultices, powders, and other herbal formulations), and it incorporates authentication and quality control of such drugs, based on macroscopic and microscopic examinations of crude drugs. The term *Pharmacognosy* was first introduced by the Austrian physician Schmidt in 1811 and then in 1815 by Seydler in a work titled *Analecta Pharmacognostica*.

Like any other scientific area, since the introduction of *Pharmacognosy* some 200 years ago, it has evolved over the years, and now *Pharmacognosy* can be defined as the science of biogenic or naturally derived drugs, pharmaceuticals, and poisons, and it incorporates various modern analytical techniques to authenticate and quality control of crude drugs as well as purified active extracts, fractions, and components, and even medicinal foods. Drug use from medicinal plants has advanced from the formulation of crude drugs to the isolation, identification, and assessment of bioactivity of active compounds in drug discovery, and so has the subject of *Pharmacognosy*. The American Society of Pharmacognosy defines *Pharmacognosy* as "the study of the physical, chemical, biochemical and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources." Modern *Pharmacognosy* involves the broad study of natural products from various sources including plants, bacteria, fungi, and marine organisms.

Pharmacognosy has always been a translational or multidisciplinary science, and during the evolution of the scope of this subject area, phytochemistry and phytochemical analysis have become integral parts of *Pharmacognosy*. Molecular biology has become essential to medicinal plant drug discovery through the determination and implementation of appropriate screening assays directed toward physiologically relevant molecular targets, and modern *Pharmacognosy* also encapsulates all these relevant new areas into a distinct interdisciplinary science.

The emphasis and focus of research in *Pharmacognosy* have changed significantly, from focusing on identification of drugs, including the isolation of active principles, and more recently, the investigation of biological activity. Research into ethnobotany, ethnomedicine, and ethnopharmacology has also become an important element in *Pharmacognosy*.

Pharmacognosy has played a pivotal role in the discovery and development of new drugs and therapies, and has been continuing to do so even today. It also formed the basis of the development of the subject "Pharmacy." However, it is rather unfortunate that *Pharmacognosy* is somewhat neglected nowadays as a major subject area within the modern Pharmacy curricula, especially in the West. For the sake of new hypes of modern medicine, one should not forget the usefulness traditional medicines based on plants. It has never been more important for any modern pharmacist to have proper knowledge about traditional medicines. One of the best examples of the usefulness of not neglecting indigenous herbal remedies is *Artemisia annua* (common name: qinghaosu), which has long been used in China for the treatment of intermittent fever or malaria. Extracts from this plant were studied in the West from the 1980s onward, resulting in the development of a new class of effective antimalarials, the artemisinins.

While the word *Pharmacognosy* may not be that visible in the *Pharmacy* curricula in the UK and USA, some of its contents are still present in various forms and names, e.g.,

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Address for correspondence:
Prof. Satyajit D. Sarker, Department of Pharmacy, School of Applied Sciences, University of Wolverhampton, MA Building, Room: 106, Wulfruna Street, Wolverhampton WV1 1LY, England, UK. E-mail: S.Sarker@wlv.ac.uk

drug discovery from natural products/medicinal plants, herbal therapy, phytotherapy, natural medicines, and phytopharmaceuticals. Despite all odds, the popularity and applications of *Pharmacognosy* are ever increasing in countries like Brazil, China, and India, the emerging giant economies where *Pharmacognosy* research has gained new momentum because of its proven potential in contributing billions of dollars to their economy. Historically, natural products discovered from medicinal plants and their derivatives have provided numerous clinically useful medicines. Despite the challenges facing drug discovery from medicinal plants, natural products isolated from medicinal plants will remain an essential component in the search for new drug candidates.

Current research in drug discovery from medicinal plants involves a multifaceted approach combining botanical, computational, phytochemical, biological, and molecular techniques. It is evident that drug discovery from medicinal plants continues to provide new and important leads against various pharmacological targets including cancer, HIV/AIDS, Alzheimer's, malaria, and pain. Several natural product drugs of plant origin have either recently been introduced or are currently involved in late-phase clinical trials.

Whether we like it or not, *Pharmacognosy* is not a subject of the past, but it has evolved and developed over the years to adapt itself with the changing environment, and is now fit to meet the challenges of the present and the future of drug discovery and development. Thus, the importance of *Pharmacognosy* in *Pharmacy* cannot be overemphasized. *Pharmacognosy* will remain to be a significant and an essential contributor to the knowledge and understanding of drugs and therapies, and thus should be an integral part of any meaningful academic *Pharmacy* programs world over.