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PRESCRIPTION

IN THIS ISSUE

PHARMACOGNOSY; THE KNOWLEDGE ABOUT DRUGS AND THEIR NATURAL SOURCES

The word pharmacognosy consists of two Greek words: pharmakon, which means 'a drug', and gnosis, which means 'knowledge'. In this field of science, researcher deals with the secondary metabolites found in many plants, animals, and microbial natural sources.

The history of medication is as recent as human civilization. Herbal medicines, as a major remedy in the ancient system of medicine, have been employed in medical practices since antiquity. The first records of knowledge documentation were produced by Shen Nung (a Chinese emperor) in 2500 BC, describing different recipes of drug preparation from more than 300 medicinal plants for the management of numerous human diseases. Records had it that the use of plants (herbs) as medicine started gaining momentum around 500 BC, though prior to this period, their use was not limited to healing but believed to possess spiritual (ritual) power as well.

The early medicines of Pharaohs (3000 BC), the Greeks (460–370 BC), and the Romans (37 BC) relied mainly on plants for therapy. Disoscorides, a Greek physician of the first century AD was the writer of the first Materia Medica (78 AD). It described 600 medicinal plants and those of the Middle Ages exemplified by the Arab Physicians (Rhazes 865–925; Avicenna 980–1037). The Ayurveda concept appeared and grew between 500 and 2500 BC in India.

Medicinal plants have a vital role in the discovery of new drugs. The development of morphine, quinine, reserpine, ephedrine, etc., from Papaver somniferum, Cinchona spp., and Rauwolfia serpentina as the first set of drugs from medicinal plants brought much popularity and attested to their acceptance and potential use across different parts of the world.

Plant-based drugs provide an outstanding contribution to modern therapeutics. Vinblastine isolated from the Catharanthus roseus is used for the treatment of Hodgkin's choriocarcinoma, non-Hodgkin's lymphomas, leukemia in children, testicular, and neck cancer. Vincristine, also isolated from the same plant, is recommended for acute lymphocytic leukemia in childhood advanced stages of Hodgkin's lymphoma, small cell lung, cervical, and breast cancer. Phophyllotoxin is isolated from Phodophyllum emodi (Berberidaceae) and used against small lung cancer cells and lymphomas (testicular cancer).

Etoposide and teniposide, isolated from one of the Podophyllum species are used to treat testicular and lung cancer.

Nothapodytes nimmoniana (Icacinaceae) is traditionally used in Japan for cervical cancer treatment, and the main active compound of this plant is camptothecin. Taxol, a well-known secondary metabolite from Taxus brevifolius (Taxaceae), is used for the treatment of lung cancer and ovarian cancer. A mixture of harringtonine and homo harringtonine isolated from Cephalotaxus fortunei (Cephalotaxaceae) has been used well in China for the treatment of acute chronic myelogenous leukemia and myelogenous leukemia. Elliptinium, isolated from Bleekeria vitensis (Apocynaceae), is marketed for breast cancer treatment.

Pharmaceutical research expanded to include a massive screening of microorganisms for new antibiotics, inspired by the discovery of penicillin. Few drugs developed from natural sources have undoubtedly revolutionized medicine like antibiotics (penicillin, tetracycline, erythromycin), antiparasitics (avermectin), antimalarials (quinine, artemisinin), lipid control agents (lovastatin and analogs), immune suppressants for organ transplants (cyclosporine, rapamycins), and anticancer drugs (paclitaxel, irinotecan).

The development of a new drug involves the identification of new chemical entities (NCEs), having the required characteristic of drug ability and medicinal chemistry. These NCEs can be sourced either through chemical synthesis or through isolation from natural products. Initial success stories in new drug discovery came from medicinal chemistry inventions, which led to the need for the development of a higher number of chemical libraries through combinatorial chemistry.

This approach, however, was proven to be less effective in terms of overall success rate. The second source of NCEs for potential use as drug molecules has been natural products. Before the advent of high throughput screening and the post-genomic era, more than 80% of drug substances were purely natural products or were inspired by molecules derived from natural sources (including semisynthetic analogs).

Pharmacognosy has always been a field of multidisciplinary science, and during the expansion of the orbit of this area, phytochemistry, phytomedicine, and phytochemical analysis have become important parts of this field.

The molecular biology field has become an important area for medicinal plant drug discovery analysis through the determination and application of convenient screening assays directed physiologically related molecular targets, and modern pharmacognosy encapsulates all these relevant new research areas into a distinct interdisciplinary natural product science.

The insistence and focus of research in pharmacognosy have alternated significantly, from focusing on isolation and structure elucidation of drugs, including the information of active constituents, along with their biological activity as well as structure-activity relationship (SAR) studies. Advanced research in the fields of ethnomedicine, ethnobotany, and ethnopharmacology has also become an essential element in the orbit of pharmacognosy. Pharmacognosy deals with an important association between medicinal chemistry and pharmacological studies. In recent years, due to the fast development of advanced phytochemistry and pharmacological testing ways and methods, new plant-derived drugs are finding their way into medicine as a single phytochemical, rather than in the mixture form of traditional herbal preparations.

Presently, drug discoveries are increasing rapidly after adopting traditional/folk medicine-based uses/approaches to increase results and safety concerns. Thus, different sub-branches of pharmacognosy, such as analytical, industrial, and clinical have been established as a modern and professional offshoot of specialized pharmacognosy to meet the most productive advancements and collaborations in this field. Furthermore, molecular, metabolomic, and genomic pharmacognosy have been introduced as the new and promising targets of research for accommodating future supply and demands in biomedicine, molecular biology, biotechnology, and analytical chemistry of traditional natural medicines and folk medicinal plants. Interdisciplinary combined and collaborative research work is essential for optimizing the development of traditional biomedicines and pharmacognosy fields of research, education, and techniques.

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