Current Topics

Pharmacologically Active Constituents from Plants Used in Traditional Medicine

Foreword

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Although traditional medicines have been utilized worldwide for 2000 years or longer, the history of scientific studies on the efficacy of those medicines based on the structures of the chemical constituents of herbal materials spans only a few decades. The recent increase in the use of traditional medicines exemplified by Kampo prescriptions (drugs used in traditional Japanese Kampo medicine) in modern medicine in Japan suggests the importance of such studies for scientific understandings of their effects. On the other hand, the prevalence of intractable diseases including cancer and reemerging infectious diseases call for the development of new types of drugs. Drug development based on naturally occurring, pharmacologically active compounds with novel skeletons has continued, although the methodology currently involves computer-assisted drug design based on the structures of target proteins.

The Current Topics section in this issue of the Biological and Pharmaceutical Bulletin contains reviews of noted studies on the constituents of medicinal plants used in traditional herbal medicines by Japanese and Chinese research groups. The articles indicate the importance of structural studies of those constituents, as well as biological/pharmacological studies based on them, since their structural varieties in different compounds affect their properties greatly.

Professor Hisashi Matsuda and his coworkers summarize their investigations on the constituents obtained from three medicinal plants in their review entitled “Search for New Type of PPARγ Agonist-Like Anti-diabetic Compounds from Medicinal Plants.” They compared the effects of those constituents with those of the known agonist troglitazone and found that hydrangenol and hydrangenic acid from the processed leaves of Hydrangea macrophylla var. thunbergii promoted the accumulation of triglycerides and enhanced adiponectin release from 3T3-L1 cells into medium and the uptake of 2-deoxyglucose by the cells. They also showed inhibitory effects on blood glucose levels in an in vivo study using diabetic model mice. Their continuing studies on the amides of Piper chaba and methoxyflavonols of Kaempferia parviflora are also mentioned.

Professor Katsuko Komatsu and her collaborators developed withanolide-based compounds that are active in neurodegenerative diseases, including Alzheimer’s disease. The withanolides are derived from ashwagandha, an important Ayurvedic medicine used in India, as the plant material. In their review “Effects of Ashwagandha (Roots of Withania somnifera) on Neurodegenerative Disease,” they report that withanolide A and related compounds obtained from ashwaganda promoted neurite outgrowth in human neuroblastoma cells and rat cortical neurons. Subsequently, they found that the administration of withanolides improved murine axon and synapse densities, and that deficits of spatial memory were reduced. Neuroprotective effects and amyloid β reduction in relation to the effects on Alzheimer’s disease were also confirmed. Furthermore, they examined the effects of synthetic denosomnins, which is structurally related to natural withanolides, on spinal cord injury in mice and found that the compound increased astrocyte secretion of vimentin.

Professor Toshiaki Makino documented his work on the compounds responsible for the representative adverse effect after the administration of licorice in his review article “3-Monoglucuronyl Glycyrrhetinic Acid Is a Possible Marker Compound Related to Licorice-Induced Pseudoaldosteronism.” Licorice, comprising the root and stolon of Glycyrrhiza species, has been used in traditional medicines worldwide and is one of the most frequently used crude (herbal) drugs in traditional Japanese Kampo medicine and traditional Chinese medicine prescriptions. However, its constituent glycyrrhizin (or glycyrrhizic acid) is known to cause adverse effects. He explained the metabolism, circulation, and transport processes of glycyrrhizin and its aglycone, glycyrrhetic acid, and demonstrated that the metabolite derived from the conjugation of glycyrrhetic acid in the liver would be a useful marker in plasma and urine for detecting the adverse effects. This type of approach is important not only for clarifying adverse effects but also for understanding the beneficial effects of herbal drugs or their formulations in clinical use.

Professor Chunlin Long is one of the leading researchers on natural product chemistry in P.R. China today. He and his coworkers report on the constituents of medicinal plants used by different ethnic groups in the country. Their studies on pyrrolidinoindoline alkaloids from Selaginella moellendorfii, sesquiterpenoids from Pilea cavaleriei subsp. crenata, and isoquinoline alkaloids from Corydalis saxicola with antiviral activity are examples of their intensive investigations. In the review entitled “Prospecting for Bioactive Constituents from Traditional Medicinal Plants through Ethnobotanical Approaches,” he and his coworkers discuss the strategy of drug development based on traditional medicines from a global perspective. They emphasize the importance of ethnobotany from the viewpoint not only of efficient compound development but also of integrating cultural diversity.

These review articles will stimulate further research in this field. The editor of this Current Topics section acknowledges the authors’ important contributions.