Medicinal plants and microorganisms (e.g., actinomycetes) have been a rich source for new drugs for the last century. So far, ca. 25% of pharmaceuticals have been developed from natural products, which were isolated mainly from medicinal plants. These bioactive constituents may offer interesting subjects of study from the viewpoint of bioorganic chemistry as well as chemical biology and pharmaceutical chemistry. In search of new seeds, which have potential to be developed into new medicines, we have been studying bioactive marine natural products isolated from marine sponges and marine microorganisms together with medicinal plants. We have been engaged in chemical studies on the following subjects.

1) Search for new bioactive natural products guided by constructed new bioassay systems. The following subjects 2) -5) concern with bioactive substances, which we have isolated.
2) Structural elucidation of bioactive substance on the basis of spectral analysis and synthetic method.
3) Asymmetric total synthesis of bioactive substance.
4) Synthetic structure-activity relationship study of bioactive substance to elucidate pharmacophores.
5) Mechanistic study of bioactive substance by the techniques of chemical biology and chemical genetics.

Search for new medicinal leads from natural resources

Bioassay-guided separation
Structure determination (plain, stereo, absolute)

New bioactive natural products
Action-mechanism Structure-activity relationship

New leads for pharmaceuticals

Cortistatin A
(anti-angiogenic substance)

Design and synthesis of analog compound
Asymmetric total synthesis

Constituted bioassay
Search for molecular targeted anti-cancer drugs
1. anti-angiogenic substance
2. anti-metastasis substance
3. cell cycle inhibitor
4. hypoxia-selective growth inhibitor of cancer cells

Search for new drugs of infective diseases
1. anti-dormant mycobacterial substance
2. inhibitor of biofilm formation

Search for new drug of neurodegenerative disease
1. neuroprotective substances from oxidative stress

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