

Screening the Herbal Pharmacy

Searching for new anti-cancer drugs, scientists at the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) are systematically analyzing the constituents of medicinal plants used in traditional Chinese medicine.

Curing cancer with natural products – a case for shamans and herb women? Not at all, for many chemotherapies to fight cancer applied in modern medicine are natural products or were developed on the basis of natural substances. Thus, taxanes used in prostate and breast cancer treatment are made from yew trees. The popular periwinkle plant, which grows along the ground of many front yards, is the source of vinca alkaloids that are effective, for example, against malignant lymphomas. The modern anti-cancer drugs topotecan and irinotecan are derived from a constituent of the Chinese Happy Tree.

Looking for new compounds, doctors and scientists are increasingly focusing on substances from plants used in traditional medicine. About three quarters of the natural pharmaceutical compounds commonly used today are derived from plants of the traditional medicine of the people in various parts of the world. The chances of finding new substances with interesting working profiles in traditional medicinal plants are better than in common-or-garden botany.

In his search for active ingredients, Professor Dr. Thomas Efferth of the DKFZ has been concentrating on herbal remedies from traditional Chinese medicine with particularly well documented application range. Working together with colleagues in Mainz and Düsseldorf, Germany, Graz, Austria and Kunming in China, he launched a systematic compound search in 76 Chinese medicinal plants that are believed to be effective against malignant tumors and other growths. First results of this study have now been published.

Extracts from 18 of the plants under investigation were found to substantially suppress the growth of a cancer cell line in the culture dish. "With this success rate of about 24 percent, we are way above the results that could be expected from searching through large chemical substance libraries," Thomas Efferth explains.

The scientists proceeded to chemically separate, step by step, all active extracts, tracing the active component after each separation step by cell tests. The chemical structure of the compounds is analyzed using nuclear magnetic resonance and mass spectroscopy. "We are combining natural substance research with advanced analytical and molecular-biological methods", Efferth explains. "Plant constituents that seem particularly promising are immediately subjected to further tests." Such constituents include, for example, substances derived from the Rangoon Creeper, an ornamental plant with red flowers, or from Red-Root Sage. The latter contains three ingredients with powerful anti-tumor activity. The substances were found to suppress the growth of a specific tumor cell line that is particularly resistant to many commonly used cytotoxins due to overproduction of a transport protein in the cell wall. In contrast, a whole range of standard anti-cancer drugs fail to be effective against this cell.

„We can expect to find many interesting, yet unknown working mechanisms among the chemically highly diverse natural substances. Currently, we are aligning the effectiveness of the substances on 60 different cancer cell lines with the gene activity profiles of these cells. Thus, we can determine the exact gene products that are the cellular targets of our compounds. Thereby, it may be possible to discover whole new Achilles' heels of the cancer cell," said Efferth describing the next steps.

Thomas Efferth, Stefan Kahl, Kerstin Paulus, Michael Adams, Rolf Rauh, Herbert Boechzelt, Xiaojiang Hao, Bernd Kaina and Rudolf Bauer: Phytochemistry and Pharmacogenomics of Natural products derived from traditional Chinese medica with activity against tumor cells. *Molecular Cancer Therapy* 7 (1) 2008, page 152

The task of the Deutsches Krebsforschungszentrum in Heidelberg (German Cancer Research Center, DKFZ) is to systematically investigate the mechanisms of cancer development and to identify cancer risk factors. The results of this basic research are expected to lead to new approaches in the prevention, diagnosis and treatment of cancer. The Center is financed to 90 percent by the Federal Ministry of Education and Research and to 10 percent by the State of Baden-Wuerttemberg. It is a member of the Helmholtz Association of National Research Centers (Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V.).

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