



THE UNIVERSITY of MISSISSIPPI

SCHOOL OF PHARMACY

RESEARCH INSTITUTE OF PHARMACEUTICAL SCIENCES

NATIONAL CENTER FOR

NATURAL PRODUCTS RESEARCH

Background

The Research Institute of Pharmaceutical Sciences (RIPS) is a division of the School of Pharmacy at the University of Mississippi. RIPS is currently comprised of four distinct research entities: the National Center for Natural Products Research (NCNPR), the Center for Clinical and Translational Sciences (CCTS), the Center for Pharmaceutical Marketing and Management (CPMM), and the Pii Center for Pharmaceutical Research.

RIPS was created by an act of the Mississippi Legislature with enactment of the Pharmaceutical Product Development and Utilization Law of 1964. This law read, in part:

'...that the economic progress of Mississippi depends in large measure upon the development and wise use of the natural resources of the state;'

'...that this chapter is specifically designed to establish a program for the discovery and dissemination of knowledge concerning natural drug products...'

'It shall be the function of the institute to conduct a program of research in the properties and uses of natural drug products and the methods of developing these products to useful purposes...'

This visionary RIPS program, partnering with the Departments of Pharmacognosy and Medicinal Chemistry in the School of Pharmacy, evolved over the next three decades, when the NCNPR program launched in 1995. Initial funding for NCNPR came from the state (via RIPS) and the U.S. Department of Agriculture, Agriculture Research Service. Current funding includes these sources, as well as the U.S. Food and Drug Administration, the National Institutes of Health, the Department of Defense, and a number of other grants and contracts from federal and private sources.

Our Mission

The mission of the National Center for Natural Products Research is to:

- Promote the discovery and development of natural products to benefit human health and agriculture
- Advance safe and effective utilization of botanicals for health and medicinal applications
- Assess environmental health and sustainability of natural resources for natural product development

Overview

The NCNPR was created to bring together an alliance of academia, government, and the pharmaceutical and agrochemical industries for research on the discovery, development, and commercialization of potentially useful natural products. It is based within the School of Pharmacy to integrate pharmaceutical science disciplines into the drug development aspect.

The USDA's Agriculture Research Service has its natural products research unit co-located at the NCNPR, creating synergy in the study of agricultural applications and of medicinal plants as alternative crops. The U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition, in its efforts to ensure the quality and safety of botanical supplements used by U.S. consumers, has designated the NCNPR as one of its 'Centers of Excellence.'

NCNPR Active Program Areas

The **Natural Product Discovery and Development** program focuses on the identification of natural products that may be useful in applications in medicine, biotechnology, agriculture, and other sectors. Our scientists study natural products from plants and microbes from terrestrial, freshwater, and marine environments. A large repository of thousands of samples has been established, and these are screened in high-throughput assays to identify the relevant bioactivities. Once these are identified, samples are selected and prioritized to track down the active principles. State-of-the-art purification techniques, analytical methods, and spectroscopic instrumentation assist in the elucidation of the molecules responsible for the activity, and additional tests are applied to evaluate the suitability for further development.

The **Medicinal Plants and Human Health** research program emphasizes a better understanding of the rich heritage we have in medicinal plants that have been traditionally used in our country and in cultures around the world. More than 50,000 plant species have been used by humans for their medicinal and aromatic properties, and about 3,000 of these are traded in international commerce. Many are used in the food, flavor, fragrance, cosmetic, and dietary supplement industries.

Taking advantage of the beneficial properties of these plants, and ensuring their safe and effective use depends on a good understanding of their chemistry, including how chemistry is controlled within the plants and how it is influenced by

genetics, growing conditions, harvesting, and processing. Scientists at the NCNPR work with the FDA and with industry and academic partners to develop scientific approaches and methods that contribute to this field. Medicinal plant resources, from seed banks to greenhouses to field plots, are used to study plant chemistry in relation to genetics, botany, pharmacology, toxicology, and agronomics.

Medicinal plants and other botanicals are sold in the United States as dietary supplements. Though these are not as tightly regulated as drugs, the FDA works to ensure that they are accurately labelled and do not contain harmful or illegal substances. Working with the FDA as one of its 'Centers of Excellence,' NCNPR scientists work on the development of laboratory methods and approaches that facilitate this mission.

In recent years, the FDA has also developed a mechanism by which botanicals can be registered as prescription or over-the-counter drugs. NCNPR scientists are evaluating botanical preparations that may be used as drugs in the treatment of diabetes, cancer, cardiovascular disease, or neurological disorders.

One of our longest standing and most established projects is the study of the chemistry of *Cannabis* (marijuana). The project serves to understand the production of *Cannabis*' many different classes of chemicals and to provide standardized *Cannabis*-derived materials for biomedical research. Several candidates for new drugs from marijuana and new ways to deliver the active chemicals of the plant have emerged from this project.

The **Natural Resources and Environmental Health** program has two major areas of research emphasis: understanding aspects of the environment that affect sourcing and sustainability of natural resources for natural product development, and assessing environmental health and its implications for ecosystem services.

With respect to these emphases, several faculty members based in the NCNPR and affiliates from academic departments in the School of Pharmacy examine environmental factors that regulate the production of natural products. These include predation, competition, pathogenesis, and nutrients. In recent years, natural and anthropogenic stressors have had significant impacts on the health of our environment. The NCNPR and affiliated faculty have taken a leadership role in assessing these perturbations and remediating impacted communities.

Clinical Trials

The School of Pharmacy Research Clinic and the UM Medical Center began a clinical trial on the antimalarial drug primaquine in May 2017. Primaquine is a safe, inexpensive and effective drug that can create negative reactions in people with a genetic deficiency in glucose-6-phosphate dehydrogenase, or the G6PD enzyme. Primaquine is composed of two chemicals that are difficult to separate. Our researchers developed methods to separate the two chemicals, which they hope will help reduce the negative side effects. The clinical trials study the metabolism of the two forms of primaquine in human volunteers without the G6PD enzyme deficiency.

Waters Corporation

NCNPR and the Waters Corporation have partnered to create the Natural Products Training Center. The NPTC will offer training courses using Waters' laboratory analytical instrumentation to promote scientific standards in the advancement of commercially viable natural products. <http://www.waters.com>

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