According to a survey of trends in alternative medicine use that was published in the 11 November 1998 issue of the Journal of the American Medical Association, U.S. consumers were spending as much as $5.1 billion annually on herbal products as of 1997. In addition, about 18% of all prescription drug users reported using herbal remedies or high-dose vitamins along with their prescribed medications, despite the fact that much is currently unknown about the drug interactions and contraindications of the herbal products so readily available to the public.

To compile the monographs, the WHO-UIC team, which also included Harry H. S. Fong, a professor of pharmacognosy in the Program for Collaborative Research in the Pharmaceutical Sciences in the College of Pharmacy, and Norman R. Farnsworth, director of the same program, systematically reviewed literature published around the world since 1975, relying heavily on another highly credible source of information on medicinal herbs, the Natural Products Alert, or NAPRALERT, database. This database, administered by the Program for Collaborative Research in the Pharmaceutical Sciences, contains over 100,000 citations from the world scientific literature on the safety and efficacy of herbal medicines, plants, marine organisms, and fungi. The writing team also reviewed various pharmacopoeias including the European Pharmacopoeia, the Deutsches Arzneibuch, and the Farmakope Indonesia, as well as monographs produced by other bodies such as Commission E, which researches and regulates medicinal herb use under the German government.

The first part of each monograph includes pharmacopoeial summaries of quality assurance—a description of each plant’s botanical features, correct Latin binomial, geographical distribution, methods to identify the plant, purity requirements, chemical assays, and a listing of the major chemical constituents. This information may help with one of the biggest problems with commercially sold herbal remedies, which is that there is little or no standardization of the therapeutic dose of many medicinal plants. As matters stand, herbal products may not contain enough of the purported key ingredient to produce any beneficial effect or the product may not contain the correct part of the plant. In other cases, experts say, remedies may contain herbal ingredients whose dangers outweigh any beneficial properties.

The second part of each monograph describes medicinal uses, pharmacology, contraindications, warnings, precautions, adverse reactions, and dosage. This part is aimed at health care practitioners who may be faced with patients taking herbal products or who may wish to prescribe medicinal herbs themselves, and is written so that the busy clinician can quickly become familiar with each herb’s medicinal properties without having to wade through the entire pharmacology of the plant.

The WHO-UIC team’s work was reviewed by a panel of over 120 authorities from 40 different countries. The panel included academics, experts in the field of herbal medicine, industry specialists, and regulatory authorities, including representatives from the U.S. Pharmacopoeia, which establishes standards to ensure the quality of medicines intended for human and veterinary use. The team has already completed a second volume of 32 additional monographs that is scheduled for publication in early 2000. The researchers and the WHO are discussing the possibility of a third volume.

**EPA Sees the Light on Fluorescent Bulbs**

Finalization by the U.S. Environmental Protection Agency (EPA) of a rule that places mercury-containing fluorescent bulbs under the Universal Waste Rule, regulated by the Resource Conservation and Recovery Act (RCRA), will encourage recycling and proper disposal of the bulbs by making it easier and cheaper to recycle them. The rule will thus reduce the amount of hazardous waste reaching

| Monograph |
|-----------|
| Allium sativum (garlic) |
| Aloe vera |
| Astragalus membranaceus (huang qi) |
| Brucea javanica (Chinese gall) |
| Bupleurum falcatum (thorow-wax) |
| Bupleurum falcatum var. scorzonerifolium |
| Cassia senna (senna) |
| Centella asiatica (gotu kola) |
| Chamomilla recutita (chamomile) |
| Cinnamomum verum (cinnamon) |
| Coptis chinensis (huang lian) |
| Coptis deltoides |
| Coptis japonica |
| Curcuma longa (turmeric) |
| Echinacea angustifolia var. angustifolia (coneflower) |
| Echinacea angustifolia var. strigosa (coneflower) |
| Echinacea pallida (pale purple coneflower) |
| Echinacea purpurea (purple coneflower) |
| Ephedra sinica (ma huang) |
| Ginkgo biloba |
| Glycyrrhiza uralensis (gan cao) |
| Paonia lactiflora (Chinese peony) |
| Plantago afra (psyllium) |
| Plantago asiatica (che qian zi) |
| Plantago indica (black psyllium) |
| Plantago ovata (blond psyllium) |
| Platycodon grandiflorus (balloon flower) |
| Rauwolfia serpentina |
| Rheum officinale (Indian rhubarb) |
| Rheum palmatum (Chinese rhubarb) |
| Thymus vulgaris (common thyme) |
| Thymus zygis (Spanish thyme) |
| Valeriana officinalis (valerian) |
| Zingiber officinale (ginger) |

*Monograph covers varieties and select plant parts of the plants listed above.*
the Universal Waste Rule, consumers can avoid many of the previously more stringent regulatory requirements for storing, transporting, and collecting mercury-containing bulbs. For example, the rule extends the amount of time that companies can accumulate such materials on site and allows them to transport such waste via a common carrier instead of a hazardous waste transporter.

The new rule is aimed at large firms and government agencies, which account for the majority of disposed bulbs. The EPA claims that the rule is expected to save companies more than $70 million per year in compliance costs. Currently, companies who use the mercury-containing bulbs in small quantities are not subject to RCRA waste management standards; if the company produces less than 5,000 kilograms of hazardous waste in one month, wastes may be sent to a municipal solid waste landfill. By placing fluorescent bulbs under the federal Universal Waste Rule, the EPA is encouraging states to regulate such bulbs, providing more consistency between federal and state regulations in the management of this kind of hazardous waste. The new rule takes effect 6 January 2000.

Botanists Plant Ideas

A recently completed project in bioengineering may help alleviate problems of iron and vitamin A deficiency around the world. Scientists at the Swiss Federal Institute of Technology’s Institute of Plant Sciences in Zürich have modified rice grains—a staple of the diet of much of the world’s population—to improve their content of vitamin A and iron. The results of this project were reported at the meeting of the 16th International Botanical Congress, held in August in St. Louis, Missouri. The congress, held every six years, brings researchers together to present new knowledge of the intricate relationship between plants and humans. This year’s meeting shed new light on topics that included plant bioengineering, global bioprospecting, and mapping the plant genome.

Rice grains normally are notoriously deficient in iron and vitamin A, said Ingo Potrykus, a professor of plant biology at the Institute of Plant Sciences. Because rice is the staple food in many developing countries, the lack of these nutrients contributes heavily to iron and vitamin A deficiency in human populations, which can lead to anemia, impaired intellectual development, and immune system dysfunction. About 400 million people are deficient in vitamin A and an estimated 5 million have become blind as a result, according to Potrykus. An even larger number are iron-deficient.

Potrykus and his colleagues have produced beta-carotene (which converts to vitamin A) in rice grains by inserting two genes from the daffodil (Narcissus pseudonarcissus) and one from the bacterium Erwinia uredovora into the rice’s genetic makeup. The resulting rice grains meet requirements for vitamin A in a typical Asian diet. To increase the bioavailability of iron in the rice grain, Potrykus’s team added a ferritin gene from the green bean (Phaseolus vulgaris) and a heat-stable enzyme phytase from the fungus Aspergillus fumigatus to reduce the inhibition of iron absorption. Also, a gene for cysteine-rich protein was added to enhance iron resorption. If the modified rice is proven to have no adverse environmental and human health effects, there are plans to distribute it free of charge through the International Rice Research Institute of Los Baños, the Philippines, and national agricultural research centers.

While Potrykus’s group is concerned with distributing plant products to the world, other research is focused on locating and harvesting medically valuable plant materials from around the world. In West Africa, traditional healers have for many centuries used the fruit and seeds of the...