

# Complementary Alternative

M E D I C I N E

People are looking beyond conventional medical treatments for new ways to treat diseases, stay healthy, feel better, and live longer. Millions have embraced a diverse group of approaches termed complementary or alternative medicine (CAM).

BY PAM FROST GORDER

I'm balanced on my toes and the palms of my hands, my body forming an inverted "V" over my yoga mat. So far, so good, but it's not easy. I break a sweat. My elbows start to quake. "Remember to breathe," calls my instructor from the front of the room. I realize to my astonishment that, in my effort to hold the pose, I actually did forget to breathe.

A few minutes ago, my mind was darting in a thousand different directions—a story I needed to finish, an e-mail I needed to send, a phone call I needed to make. Now, as I struggle to maintain Downward Facing Dog, only one thought rules my head: *Don't fall over.*

Though I'm studying yoga to build strength and coordination, the class is having an unintended effect. It wipes my mental slate clean. When I'm done, I'm more focused and less stressed than when I started. With clinical studies showing links between stress and illness, maybe I'm doing myself a favor.

And it seems that I'm practicing alternative medicine.

Yoga is one of 27 therapies included in a recent survey by the National Center for Complementary and Alternative Medicine (NCCAM) at the National Institutes of Health. In the first comprehensive nationwide survey on the subject, it found that 36% of the American public used complementary and alternative medicine (CAM) in 2002. About 5% of them reported using yoga to improve their health.

Many more take herbal products—and a health risk. Herbal medicines are regulated as dietary supplements—not drugs—under federal law. They get a free pass on the stringent U.S. Food and Drug Administration (FDA) regulations intended to assure that a drug is safe and effective. Are they safe? Do they work? Has anyone gotten sick or died from using the product? What's the correct dose? Is the stuff listed on the label really in the bottle? Are they worth the often-steep price?

For many herbal products, nobody knows.

The center wants more research on CAM so it can advise the government and the public about use of the whole range of treatments. Chemists have a role.

### What is CAM?

Over the years, researchers have used many different terms to describe CAM in the scientific literature. Among them are “questionable,” “unconventional,” “unproved,” “unorthodox,” and “investigative.” When an alternative therapy is used in addition to a conventional therapy, the alternative is called “integrative,” “supplementary,” or “complementary.”

The best definition of alternative medicine may have come from researchers at Beth Israel Hospital and Harvard Medical School, who published their own survey on the prevalence of CAM in the United States in 1993. They defined CAM as “all medical interventions neither taught widely in U.S. medical schools nor generally available in U.S. hospitals.”

That list included acupuncture, chiropractic care, massage, relaxation techniques, imagery, spiritual healing, energy healing, herbal medicines, megavitamin therapy, self-help groups, biofeedback, hypnosis, homeopathy, folk remedies, commercial weight-loss programs, lifestyle diets, exercise, and prayer.

For the new survey, NCCAM broke “lifestyle diets” down into six subcategories: vegetarian, macrobiotic, Atkins, Pritikin, Ornish, and the Zone diet. It also asked people about eight other CAM therapies: Ayurveda, naturopathy, chelation therapy, natural products, deep breathing, yoga, tai chi, and Qi gong.

In short, everything from exercise to Grandma’s homemade chicken soup is alternative medicine. But if these therapies treat disease, they must work through some chemical pathway.

Stephen E. Straus, director of the center, said that chemists play an important role, especially in studying herbal supplements and other natural products.

“Right now we’re in the midst of major

strategic planning for the next five years, and we have brought together biochemists and physical chemists as part of this process,” he said. “It’s important to understand the composition of these natural products, the metabolism, the pharmacology, the basic pathways in the body by which they may work—to understand their activities, their interactions, their potential benefits and potential risks.”

### The Top Ten CAMs

The Beth Israel–Harvard survey quizzed 1,500 Americans and concluded that one in three used CAM therapy. The new NCCAM survey was administered to more than 31,000 people as part of the U.S. Centers for Disease Control and Prevention (CDC) 2002 National Health Interview Survey (NHIS), and it found a similar number—36%. But when prayer for health was included, the number jumped to 62%.

The top 10 therapies identified in the new NCCAM survey were:

- Prayer by respondent for own health, 43%
- Prayer by others for respondent’s health, 24%
- Natural products (such as herbs, other botanicals, and enzymes), 19%
- Deep breathing exercises, 12%
- Participation in prayer group for respondent’s own health, 10%
- Meditation, 8%
- Chiropractic care, 8%
- Yoga, 5%
- Massage, 5%
- Diet-based therapies (such as Atkins, Pritikin, Ornish, and Zone diets), 4%

To Richard L. Nahin, senior adviser for scientific coordination and outreach at NCCAM, the most surprising result was that 19% used natural products such as herbal supplements—a number that has increased since the 1990s. And the most disturbing was the prevalence of the kava kava plant, a South Pacific shrub that is marketed for relief of stress and anxiety. However, kava kava use has been linked to liver damage. Several countries in Europe have prohibited the sale of kava kava, and FDA has warned



#### NMR FOR CAM

Gilbert Belofsky (ACS ’86), a chemist at the University of Tulsa, uses nuclear magnetic resonance (NMR) spectroscopy to study the natural products that constitute an integral part of complementary and alternative medicine.



RICHARD L. NAHIN



#### CHEMISTRY AND CAM

Stephen E. Straus, director of the NIH Center for Complementary and Alternative Medicine, said that biochemists and physical chemists are involved in the strategic planning process for CAM research.

consumers about the hazard.

Other top supplements included echinacea, ginkgo biloba, and glucosamine. None have been proven effective. NCCAM is sponsoring studies of them for the treatment of colds, dementia, and osteoarthritis, respectively.

Kava kava's rank among top CAM treatments tells Nahin that more research is needed on its role in liver disease, and that people need better information about the dangers of herbal products.

"The public makes the assumption that because something is natural, something is safe," said Nahin. "In fact, a number of studies have shown that natural products can be unsafe when used inappropriately or when used with pharmaceutical drugs where there may be interactions."

St. John's wort, for instance, is an herbal supplement purported to treat depression, but it can have harmful interactions with prescription antidepressants. It can also decrease the effectiveness of oral contraceptives. The FDA recently banned the herbal weight-loss supplement ephedra because of its deadly role in heart attacks and strokes.

"That's not to say that over-the-counter drugs or prescription drugs can't be unsafe at certain times, because we know they can be," Nahin continued. "But their risks are defined. And at least for prescription drugs, there is a practitioner involved in the decision-making process." People who self-medicate should inform their doctors, and doctors should ask whether their patients are using CAM, he said.

People are using CAM for other chronic conditions, including back pain, neck pain, anxiety, and clinical depression. They often turn to alternative medicine for conditions that are difficult to treat with traditional medicine. And most people self-treat without professional guidance.

"What we see is that a sizable percentage of the public puts their personal health into their own hands," said Edward J. Sondik, director of the National Center for Health Statistics (NCHS). His office developed the survey in concert with NCCAM.

Many respondents believed CAM would boost the effects of conventional medical

treatments, while others were just curious and thought it would be interesting to try. But almost a third of the people believed that conventional medical treatments would not help their health problems. A smaller number felt that conventional medicine was too expensive.

### How Can Chemists Help?

Clearly there is money to be made selling alternative medicine. Americans spent \$10.3 billion on CAM in 1990, and estimates put the current figure at more than \$50 billion per year. But is there money for doing research on alternative medicine?

With an anticipated 2005 budget of approximately \$121 million, NCCAM is currently funding hundreds of grants for research, education, conferences, and training. It supports more than 20 research centers around the country.

Initially, NCCAM's major investments were in clinical research. But the center is now placing greater emphasis on basic research. Straus said the new survey would help set priorities for future funding.

"We at the national center will be relying heavily on the results of this survey to help increasingly guide our research and research training investments," he said. "We prioritize those practices and products that are widely used by the public, and for which there are greater suggestions already that there is some benefit and activity."

So chemists should expect that much research funding would go for the top supplements, including echinacea, ginkgo biloba, glucosamine, ginseng, garlic, ginger, St. John's wort, and kava kava.

Researchers may wonder what sets a study of alternative medicine apart from a study of a more mainstream therapy.

"CAM must be held to the same rigorous research standards as held for new conventional therapies," Nahin said. "As such, many of the research methods and designs used to study conventional medicine should also be used to study CAM."

Studying a natural product is more difficult than studying a single, synthetic drug, he explained, because natural products

may contain many different compounds. Because CAM practitioners often believe that the synergy between different constituents makes the product work, researchers must study both the individual constituents and the whole preparation. This requires quality control of the products from the time they are grown and harvested through the manufacturing process.

Recommended dosages are useless if pills don't contain the same amount of the active ingredient. With herbal medicines classified as dietary supplements, manufacturers may not apply the same strict quality control used for drugs. Indeed, studies have shown that the quality and quantity of the active ingredient in herbal medicines can vary widely from pill to pill and bottle to bottle.

"The primary area where chemists could contribute to the scientific investigation of CAM is through the analyses of natural products," Nahin said. "Specifically, these products should be analyzed for their commonly accepted or supposed active ingredients; for their chemical constituents; and for contamination by pesticides, heavy metals, and synthetic drug adulterants. In addition, chemical fingerprints need to be determined for each of these products."

### CAM Chemical Prospecting

At the University of Tulsa in Oklahoma, chemist Gilbert Belofsky (ACS '85) fingerprints natural products using nuclear

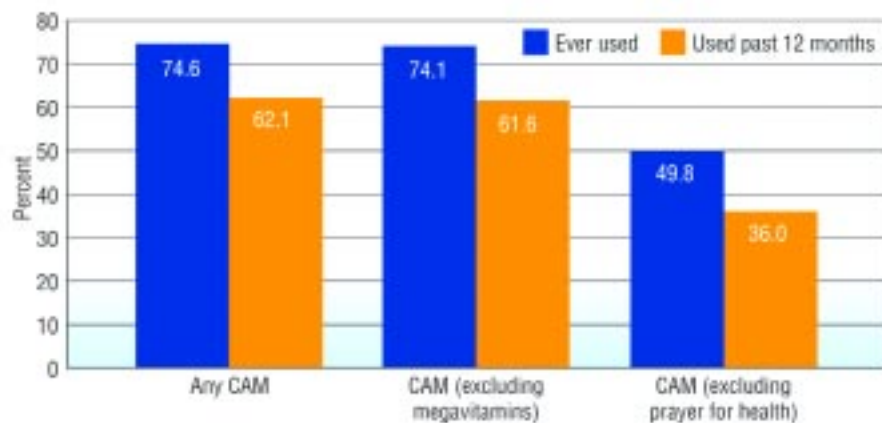


#### DALEA VERSICOLOR

Chemists are studying plants, such as this *Dalea versicolor*, to find out whether they contain compounds that could be useful medicinally.

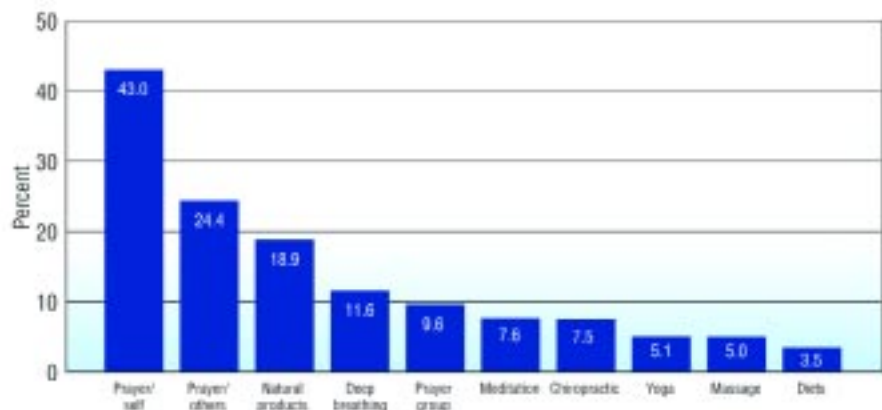
GILBERT BELOFSKY, UNIVERSITY OF TULSA

## CAM Use by U.S. Adults—2002

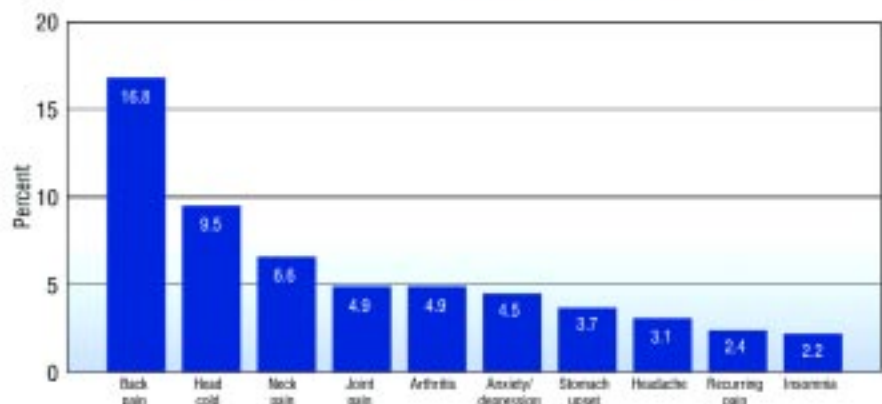


GRAPHS COURTESY OF NCCAM

## 10 Most Common CAM Therapies—2002



## Disease/Condition for Which CAM Is Most Frequently Used\*



\*These figures exclude the use of megavitamin therapy and prayer.

magnetic resonance (NMR) spectroscopy. Where earlier forms of spectroscopy left some uncertainty about a chemical's structure, NMR gives direct evidence. If the product can be crystallized—many form oils or amorphous solids instead—X-ray crystallography can also be a key analytical tool.

Plants have long supplied active ingredients for drugs. But natural products research has changed over the years. Penicillin's discovery in 1928 fostered much research on fungi. In the last 20 years, natural products researchers have cast a sharper eye on marine products and “extremophiles,” organisms that thrive in extreme environments. “The idea is that a unique organism produces unique products,” Belofsky said. “So we're always looking for new organisms and working with biologists to find them.”

Belofsky likens his research to prospecting. He spends much of his time in the deserts of the American southwest, gathering unique plants. It's a calmer life than some of his colleagues endure, as they scuba dive in dangerous waters or traverse remote jungles—what he calls “real Indiana Jones stuff.”

“I don't have stories of being shot at like some of the people in my field do,” he added.

And patience is essential.

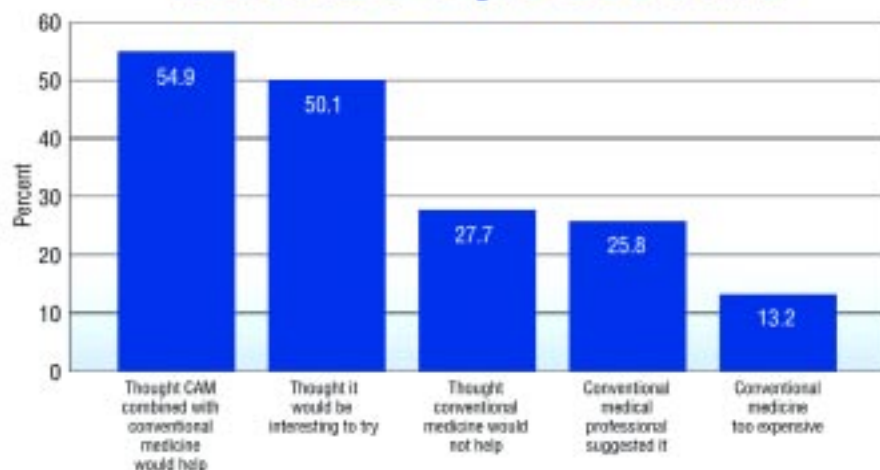
“If this was a Hollywood movie, I would mix up a formulation and try it out on myself,” he laughed. “But we're just the beginning of the pipeline.” It's a long and perilous trip from drug discovery to pharmacy shelf. “Some people will only have one compound that makes it that far in their whole career,” Belofsky said. “You can't expect when you go in the lab every day that you're going to accomplish something like that.”

### Drawing a Baseline

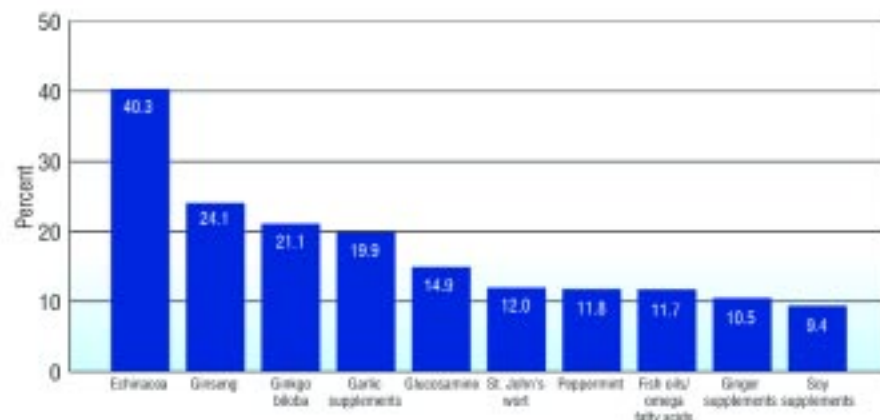
NCCAM will probably repeat the survey in five years, when Nahin and his coauthors—Patricia Barnes and Eve Powell-Griner of NCHS and Kim McFann of NCCAM—hope to uncover further details about CAM use.

Barnes, a biostatistician, noted that the CAM study was done as part of the National Health Interview Study, making it possible to link the results to demographic

## Reasons People Use CAM



## Top 10 Natural Products Used by Adult CAM Users—2002



information, such as race, gender, economic background, and marital status.

Perhaps their greatest accomplishment is providing a baseline for future research. If other studies follow its lead and adopt a consistent definition of CAM and use consistent terminology, research as a whole can only benefit. The health and safety of a growing percentage of the population depends on it.

Experts think this growing trend toward alternative therapies stems from Americans' desire to take more control of their own health. We want to understand how to stay healthy, what makes us sick, and how to get well quickly.

Who knows? Someday I may come across a study showing that yoga releases endorphins or other compounds that reduce stress and pack a feel-good effect. Then I'll know the science behind my favorite new pastime. Until then, I'll just clear my mind, swing into Downward Facing Dog, and keep trying not to fall over.

Woof, woof! ●

*When away from her yoga mat, Pam Frost Gorder writes on science and medical topics from Columbus, OH. The research for this article left Gorder impressed with the range of CAM currently in use and the research projects planned to evaluate it.*

## Getting good information

Plenty of information is available about alternative medicine. Reliable, credible information, however, can be in short supply. Some articles read like advertisements, promise results that seem too good to be true, and are based on testimonials rather than controlled clinical trials. The "It-worked-for-me-it-can-work-for-you-too!" approach usually means there's no hard data to back up the claims.

A medical library at a university or hospital is a good place to start. Some hospitals employ special counselors who help patients sort through available resources.

A standard text is the *Physicians' Desk Reference for Herbal Medicines*, which lists about 700 herbs and provides safety guides and dosages—two pieces of information often missing from the packaging of herbal supplements.

On the Internet:

- Dr. Koop.com ([www.drkoop.com](http://www.drkoop.com)) and WebMD ([www.webmd.com](http://www.webmd.com)) are two titans of public medical information. Both contain extensive material on CAM.

- The University of Texas M.D. Anderson Cancer Center Complementary/Integrative Medicine Education Resources ([www.mdanderson.org/departments/cimer/](http://www.mdanderson.org/departments/cimer/)).
- The National Institutes of Health ([http://health.nih.gov/result.asp?disease\\_id=26](http://health.nih.gov/result.asp?disease_id=26)).
- CAM on PubMed ([www.nlm.nih.gov/nccam/camonpubmed.html](http://www.nlm.nih.gov/nccam/camonpubmed.html)).
- MedlinePlus ([www.nlm.nih.gov/medlineplus/](http://www.nlm.nih.gov/medlineplus/) and [www.nlm.nih.gov/medlineplus/alternativemedicine.html](http://www.nlm.nih.gov/medlineplus/alternativemedicine.html)).

—PFG