National Cancer Institute

Office of Cancer Complementary and Alternative Medicine

ANNUAL REPORT ON

COMPLEMENTARY AND ALTERNATIVE MEDICINE

FISCAL YEAR

2010

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Institutes of Health

DIRECTOR'S MESSAGE

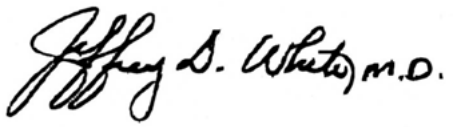
The research the National Cancer Institute (NCI) supports, both in our own laboratories and at institutions worldwide, is focused on the ultimate goal of helping cancer patients. That mission – achieved through rigorous science – extends to NCI's program on complementary and alternative medicine, also known as CAM.

It is with great pleasure and pride that we once again provide NCI's research partners, physicians, policymakers, cancer patients, and the advocacy community with this sixth annual review of NCI's extensive accomplishments in advancing evidence-based CAM interventions and therapies.

Among the highlights of NCI's CAM-related activities in fiscal year (FY) 2010, was the collaboration between NCI, the National Institutes of Health's Office of Dietary Supplements (ODS), and the National Center for Complementary and Alternative Medicine (NCCAM) to co-fund two Botanical Research Centers. The Botanical Research Centers Program aims to promote collaborative, integrated, interdisciplinary study of botanicals, particularly those found as ingredients in dietary supplements, and to conduct research with high potential for being translated into practical benefits for human health. The two centers co-funded by NCI are located at the University of Illinois at Urbana-Champaign and the University of Missouri. The NCI-funded centers will research botanical products used in the fight against cancer, specifically breast and prostate cancer.

NCI's commitment to CAM research and clinical practice has been steadily supported, coordinated, and expanded by the Office of Cancer Complementary and Alternative Medicine (OCCAM) over the years. OCCAM's goal is to increase NCI's ability to extend the search for effective therapies into areas that show promise, but which often are not thoroughly explored in conventional biomedical research.

I hope you find this report helpful and informative. I also hope that it will generate an enhanced dialogue – especially between patients and health care professionals – about the appropriate uses of CAM interventions in conjunction with conventional medicine. Cancer patients deserve credible, unbiased information about any intervention or treatment regimen they are considering. It is our duty to conduct and support the science that makes wise and informed decisions possible.



Jeffrey D. White, M.D.
Director
Office of Cancer Complementary
and Alternative Medicine
Division of Cancer Treatment and Diagnosis
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The following acronyms are used throughout this report:

NCI	National Cancer Institute
FY	Fiscal Year
CAM	complementary and alternative medicine
OCCAM	Office of Cancer Complementary and Alternative Medicine
NIH	National Institutes of Health
DCB	Division of Cancer Biology
DCCPS	Division of Cancer Control and Population Sciences
DCP	Division of Cancer Prevention
DCTD	Division of Cancer Treatment and Diagnosis
CCR	Center for Cancer Research
DCEG	Division of Cancer Epidemiology and Genetics
BRC	Botanical Research Center
ODS	Office of Dietary Supplements
NCCAM	National Center for Complementary and Alternative Medicine
MOU	Memorandum of Understanding
ERP	Extramural Research Program
COP	Communications and Outreach Program
CRISP	Case Review and Intramural Science Program
ARRA	American Recovery and Reinvestment Act
FOA	funding opportunity announcement
CARRA	Consumer Advocates in Research and Related Activities
BCS	Best Case Series
PDQ®	Physician Data Query®
CIS	Cancer Information Service
CRTA	Cancer Research Training Award

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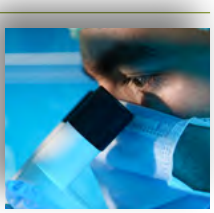
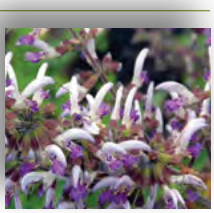
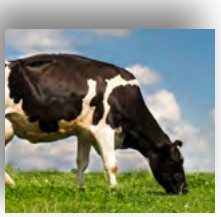






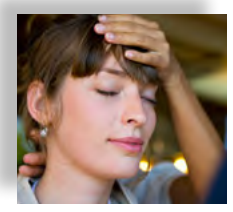


Figure 1. Major Categories of CAM Therapies

Alternative Medical Systems

Definition: Alternative medical systems are built upon complete systems of theory and practice. Often, these systems have evolved apart from and earlier than the conventional medical approach used in the United States.

Examples: Acupuncture, Ayurveda, Homeopathy, Naturopathy, Traditional Chinese Medicine, Tibetan Medicine

Energy Therapies

Definition: Energy therapies involve the use of energy fields. There are two types:

- **Biofield therapies** are intended to affect energy fields that purportedly surround and penetrate the human body. The existence of such fields has not yet been scientifically proven.

  Examples: Qi gong, Reiki, Therapeutic touch

- **Electromagnetic-based therapies** therapies involve the unconventional use of electromagnetic fields, such as pulsed fields, magnetic fields, or alternating current or direct current fields.

  Examples: Pulsed electromagnetic fields, Magnet therapy

Exercise Therapies

Definition: Exercise therapies include health-enhancing systems of exercise and movement.

Examples: T'ai chi, Yoga asanas

Manipulative and Body-Based Methods

Definition: Manipulative and body-based methods in CAM are based on manipulation and/or movement of one or more parts of the body.

Examples: Chiropractic, Therapeutic massage, Osteopathy, Reflexology

Mind-Body Interventions

Definition: Mind-body medicine uses a variety of techniques designed to enhance the mind's capacity to affect bodily function and symptom.

Examples: Meditation, Hypnosis, Art therapy, Biofeedback, Imagery, Relaxation therapy, Support groups, Music therapy, Cognitive-behavioral therapy, Aromatherapy

Nutritional Therapeutics

Definition: Nutritional therapeutics are an assortment of nutrients and non-nutrients, bioactive food components used as chemo-preventive agents, and specific foods or diets used as cancer prevention or treatment strategies.

Examples: Macrobiotic diet, Vegetarianism, Gerson therapy, Kelley/Gonzalez regimen, Vitamins, Soy phytoestrogens, Antioxidants, Selenium, Coenzyme Q10

Pharmacological and Biologic Treatments

Definition: Pharmacological and biologic treatments include the off-label use of certain prescription drugs, hormones, complex natural products, vaccines, and other biological interventions not yet accepted in mainstream medicine.

Examples: Antineoplastons, 714X, Low-dose naltrexone, Immunoaugmentative therapy, Laetrile, Hydrazine sulfate, Melatonin

Sub-category: Complex Natural Products

Definition: Complex natural products are an assortment of plant samples (botanicals), extracts of crude natural substances, and un-fractionated extracts from marine organisms used for healing and treatment of disease.

Examples: Herbs and herbal extracts, Mistletoe, Mixtures of tea polyphenols, Shark cartilage

Spiritual Therapies

Definition: Spiritual therapies are therapies that focus on deep, often religious beliefs and feelings, including a person's sense of peace, purpose, connection to others, and beliefs about the meaning of life.

Examples: Intercessory prayer, Spiritual healing

INTRODUCTION

This report highlights the National Cancer Institute's initiatives and annual expenditures in complementary and alternative medicine (CAM)* research. It is intended as a way for NCI to communicate its progress in this area of medical research to all interested stakeholders including cancer researchers, CAM practitioners, health care providers, advocacy organizations, cancer patients and the general public.

Similar to the previous reports, this publication provides an overview of the NCI-supported work in this field along with details on selected projects in the areas of cancer CAM relating to communication, training and conferences, and research. For more information on specific projects included in this report please visit the NIH Research Portfolio Online Reporting Tools (RePORTER) database (http://projectreporter.nih.gov/reporter.cfm) and search the grant or project number.

This report highlights projects, grants, and cooperative agreements supported by each of the Institute's extramural grant funding divisions – Division of Cancer Biology (DCB), Division of Cancer Control and Population Sciences (DCCPS), Division of Cancer Prevention (DCP), and the Division of Cancer Treatment and Diagnosis (DCTD), along with projects from NCI's intramural laboratories in the Center for Cancer Research (CCR) and the Division of Cancer Epidemiology and Genetics (DCEG). These projects represent a variety of CAM categories, cancer types, research types, and grant mechanisms. Also included in the report is a breakdown of NCI's CAM research portfolio. In FY 2010, NCI's research expenditures for CAM were an estimated $114,460,116 for the funding of 406 CAM research projects. In addition, during FY 2010, NCI used $6,646,594 in funds from the American Recovery and Reinvestment Act (ARRA) to award 27 CAM research grants.

As this report on cancer CAM indicates, we at the NCI are committed to an integrated approach to bring together all of the many resources and approaches necessary to decrease the frequency, destructiveness, and lethality of cancer. We believe that evidence-based CAM techniques, systems, and products can have an important role in reaching that worthwhile goal.

* CAM is often defined as any medical system, practice, or product that is not thought of as "western medicine" or standard medical care. Complementary medicine is used along with standard medicine, also called conventional medicine. Alternative medicine is used in place of standard treatments. CAM treatments may include dietary supplements, megadose vitamins, herbal preparations, acupuncture, massage therapy, magnet therapy, spiritual healing, and meditation. (See Figure 1, on page 4 for the major categories of CAM therapies.)

NCI CAM Research Funding Portfolio Analysis:
FY 2010

THE CAM PORTFOLIO ANALYSIS PROCESS

How much money does NCI spend on CAM research each year? This is one of the questions most frequently posed to OCCAM. Researchers, cancer patient advocates, proponents of CAM, and Congress are interested in the answer, and OCCAM is responsible for gathering the data needed to report the total CAM expenditures budget figure each year.

It is a common misconception that OCCAM manages all of the CAM projects for NCI. The vast majority of CAM projects are managed by other programs and laboratories throughout the Institute. After the close of the fiscal year, NCI's Division of Extramural Activities (DEA) provides OCCAM with a list of funded grants and cooperative agreements coded as containing some component of CAM research. Similarly, NCI's two intramural components, the Center for Cancer Research (CCR) and the Division of Cancer Epidemiology and Genetics (DCEG), provide lists of their potentially relevant projects. Also, a list of contracts identified as potentially containing CAM research is provided. OCCAM staff review each project to confirm they are accurately classified as CAM research. Then aspects of each project are identified allowing their placement into sub-categories based on the type of research and CAM intervention investigated.

NCI's total CAM expenditure figure includes money awarded for intramural projects (projects conducted within NIH facilities and labs), extramural grants (projects conducted outside of NIH), cooperative agreements, contracts, and supplements. It is important to note the reported figure for total NCI CAM expenditures for a fiscal year only includes projects for which NCI is the primary funder.

Total Estimated Cancer CAM Research Expenditure

In FY 2010, NCI invested $114,460,116 for 406 intramural and extramural research projects relevant to CAM. For the purpose of the FY 2010 analysis, the following types of funding are included: intramural projects and extramural grants, cooperative agreements, contracts, and supplements (Figure 3).

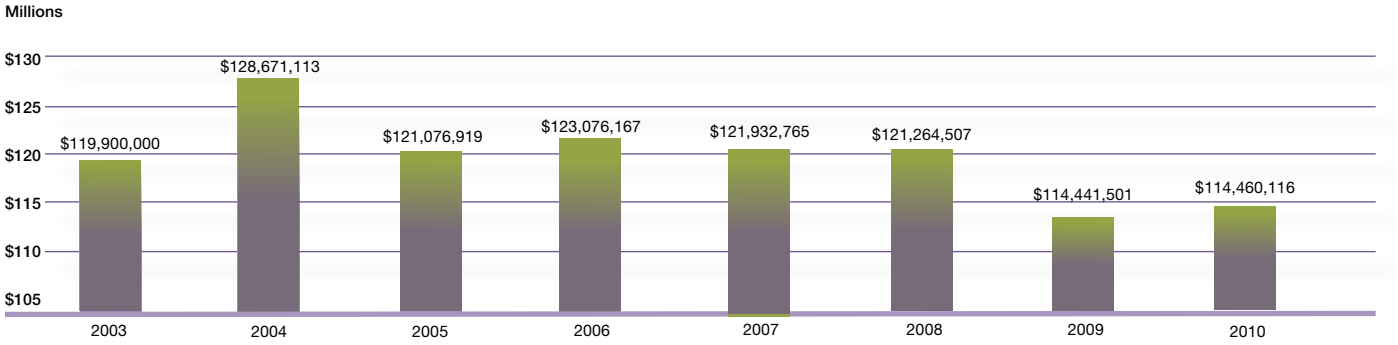
In addition, during FY 2010, NCI used $6,646,594 in funds from the American Recovery and Reinvestment Act (ARRA) to award 27 CAM research grants.

The above numbers do not include CAM training grants (T and F awards), K (research career) or R25 (cancer education) grants. These numbers are listed separately in Figure 4.

Grant Awards by Funding Opportunity Announcement

In FY 2010, there were 65 funding opportunity announcements (FOA) that yielded cancer CAM grants. The program announcement (PA) "Research Project Grants (Parent R01)" (PA-07-070) was the most productive mechanism for attracting new CAM grants to NCI. A total of 85 of the 238 CAM grants awarded through FOAs in FY 2010 came to NCI through this announcement (Figure 5).

Figure 3. NCI CAM Expenditures: FY 2003-2010*



* Includes grants, cooperative agreements, intramural projects, and contracts. Grants and cooperative agreements are only included when NCI is the primary funding agency. Excludes training grants (Ts, Fs, Ks, and R25s) and ARRA funds. Total projects include all active projects in FY 2010.

Figure 4. NCI CAM Training Projects 2010

Training Grant Mechanisms	Number of Grants	Total Funding
F (31, 32)	3	$ 48,892
K (01, 05, 07, 22, 23, 24)	19	$1,427,308
R25	4	$ 782,445
T32	1	$ 46,140
TOTAL	**27**	**$2,304,785**

Note: does not include ARRA funded projects.

Breakdown by Research Type

The accompanying pie-chart (Figure 6) shows the distribution of the projects by prevention, treatment, symptom/side effects management, epidemiology, and conferences. In FY 2010, 61.5% of cancer CAM-related research project funds went to various cancer prevention efforts, while treatment, symptom/side effects management, epidemiology, and conferences received 19.7%, 11.2%, 7.5%, and 0.004% respectively.

Breakdown by Major CAM Therapy Category

In FY 2010, NCI performed or supported research addressing a variety of CAM approaches (Figure 7). These CAM therapies fall into nine groups: alternative medicine systems, energy therapies, exercise therapies, manipulative and body-based methods, mind-body interventions, nutritional therapeutics, pharmacological and biologic treatments, spiritual therapies, and miscellaneous. (See page 4 for definitions of CAM categories.)

Figure 5. Number of Grant Awards by Funding Opportunity Announcement

AT03-002	2	PA04-046	1	PA06-351	4	PA07-100	2	PA07-362	8	PA08-220	2	PAR08-020	1
AT08-003	1	PA04-099	2	PA06-400	3	PA07-174	1	PA08-032	1	PA09-010	3	PAR08-055	14
CA04-004	1	PA05-027	1	PA06-412	3	PA07-175	4	PA08-051	1	PA09-149	1	PAR08-135	4
CA05-001	1	PA05-040	1	PA06-413	4	PA07-176	1	PA08-074	1	PA09-167	3	PAR08-237	3
CA05-013	2	PA05-125	2	PA06-414	1	PA07-177	1	PA08-121	1	PA10-067	1	PAR09-025	1
CA05-014	1	PA06-042	1	PA06-440	1	PA07-257	2	PA08-149	1	PAR05-156	4	Total Solicited	238
CA07-025	6	PA06-283	1	PA06-510	8	PA07-258	1	PA08-185	4	PAR06-294	2	Total Unsolicited	137
CA08-004	1	PA06-303	1	PA07-007	3	PA07-280	1	PA08-208	2	PAR06-313	13		
CA09-022	2	PA06-314	2	PA07-046	1	PA07-320	1	PA08-209	1	PAR06-458	1	**TOTAL GRANTS AWARDED**	**375**
HL08-013	1	PA06-315	5	PA07-070	85	PA07-356	1	PA08-210	1	PAR06-505	1		

Figure 6. NCI CAM Research Projects by Research Type*

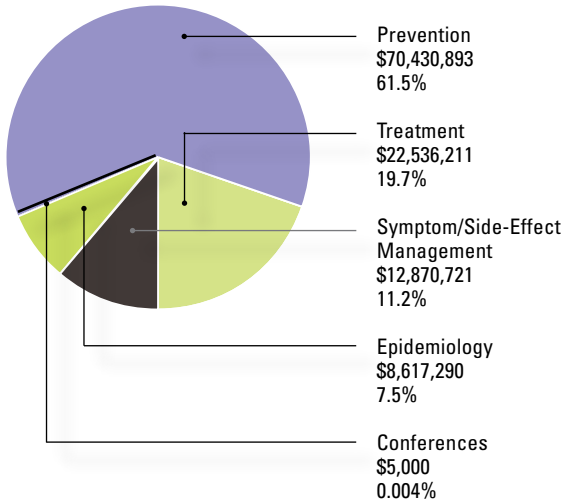


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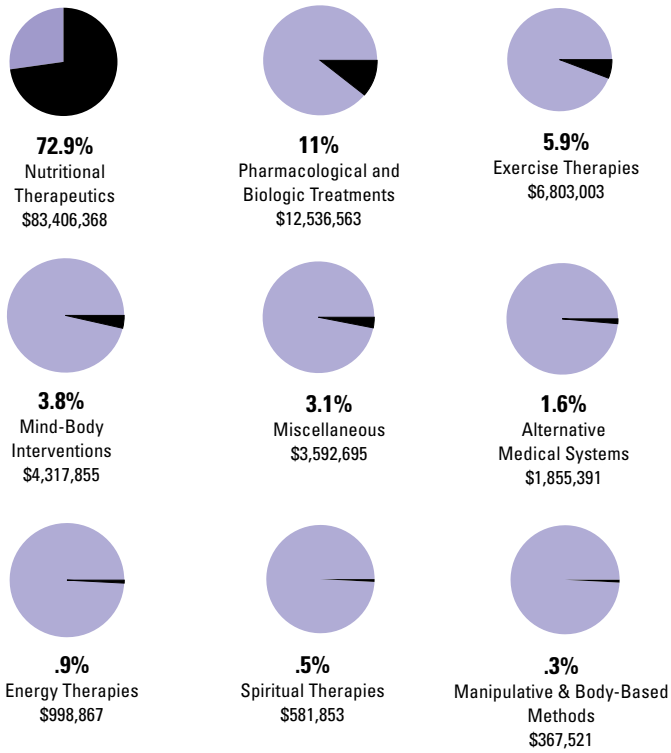
Figure 7. NCI CAM Research Projects by CAM Category*



The largest percentage (72.9%) of CAM research funding went to projects that investigated nutritional therapeutics, which can be further broken out into subcategories of research on: foods (e.g., broccoli and berries); minerals (e.g., calcium and selenium); vitamins (e.g., vitamins C and D); bioactive food components (e.g., isoflavones and carotenoids); dietary regimens (e.g., caloric restriction and high fruits and vegetables); fats (e.g., linoleic acid and omega-3); and amino acids and proteins (e.g., N-acetyl cysteine and glycine).

Figure 8 shows the distribution of projects by the subcategories of nutritional therapeutics.

Breakdown by Cancer Type

The research projects that make up NCI's FY 2010 CAM research portfolio address 17 categories of cancer types. Among the various categories, prostate, breast, colorectal, and lung cancers received the largest amounts of cancer CAM research funding. Nearly 28% of NCI's cancer CAM research funding supported projects addressing "multiple types" of cancer.

For a complete listing of the cancer type categories and estimated funding amounts, please see Figure 9 below.

Figure 8. NCI CAM Nutritional Therapeutics Projects by Category*

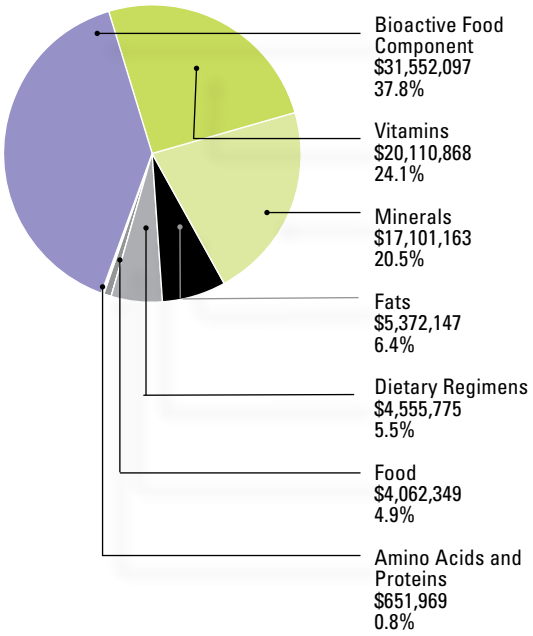


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Figure 9. NCI CAM Research Projects by Cancer Type*

Bladder	$1,257,201
Brain	$308,138
Breast	$16,092,015
Cervical	$1,124,471
Childhood Cancer	$544,632
Colorectal	$14,868,217
Esophageal	$1,535,074
Gastric	$1,714,307
Head and Neck	$2,989,885
Hematologic	$2,128,574
Liver	$1,114,248
Lung	$10,001,521
Multiple Types	$31,728,976
Pancreatic	$3,140,236
Prostate	$20,832,378
Skin: Melanoma and Non-Melanoma	$5,030,124
Small Intestine	$50,119
TOTAL:	**$114,460,116**

* Includes grants, cooperative agreements, intramural projects, and contracts. Grants and cooperative agreements are only included when NCI is the primary funding agency. Excludes training grants (Ts, Fs, Ks, and R25s) and ARRA funds. Total projects include all active projects in FY 2010.

NCI Collaborative Partnerships Supporting Complementary and Alternative Medicine

Botanicals Research

The Botanical Research Center (BRC) Program was established in 1999 by the Office of Dietary Supplements (ODS) to provide funding for United States research centers to investigate the safety, effectiveness, and biology of botanical products. The awards, worth approximately $1.5 million each year for 5 years, are jointly funded by ODS and the National Center for Complementary and Alternative Medicine (NCCAM). In FY10, the NCI co-supported two of the five centers selected. The NCI-supported centers are located at the University of Illinois at Urbana-Champaign and the University of Missouri.

As women approach menopause, estrogen levels in their bodies decrease. Many women look to botanical estrogens (such as wild yam, soy, and dong quai) as safe and natural replacements for the estrogen they are losing. However, estrogens have a variety of effects on cells and not much is known about the exact actions of botanical estrogens. At the Botanical Estrogens: Mechanisms, Dose, and Target Tissues Center (University of Illinois at Urbana-Champaign) researchers are investigating how

plant-derived estrogens affect molecular and cellular activity and see how similar (or how different) they are to estrogens naturally found in the body. In addition this BRC, which is headed by William Helferich, Ph.D., will determine how botanical estrogens affect breast cancer metastasis.

The Center for Botanical Interaction Studies at the University of Missouri also received support from the BRC program in FY10. The principal investigator of this center is Dennis Lubahn, Ph.D. One of the research projects at this center focuses on actions by commonly-used botanical dietary supplements on five signaling pathways, which may have chemopreventive effects. The botanicals that will be studied at this BRC include garlic, soy, sutherlandia (a medicinal plant from Africa), picrorhiza (a plant found in the Himalayan mountains), and elderberry. The researchers hope to gain a better understanding of exactly how these botanicals may act to help prevent prostate cancer.

Intramural Research Collaboration with Chinese Academy of Sciences

In March 2010, NCI signed a Memorandum of Understanding (MOU) with the Key Laboratory of Chemistry for Natural Products of Guizhou Province and Chinese Academy of Sciences, China. The MOU states that the Key Laboratory will provide compounds and extracts isolated from Traditional Chinese Medicine, folk/tribal medicine, and other Guizhou-area specific botanicals to NCI for anti-cancer activity screening and other cellular pathway functional assays.

Currently, a group of 243 chemical compounds with determined structures isolated at the Guizhou Key Laboratory are being studied via the NCI 60 human cancer cell line screen for growth inhibitory activity, as well as in cellular pathway analysis studies targeting specific cellular signaling, and metabolic pathways involved in growth of cancers. Research for this partnership is ongoing.

Office of Cancer Complementary and Alternative Medicine (OCCAM)

NCI's Office of Cancer Complementary and Alternative Medicine (OCCAM) is a coordinating office responsible for: identifying gaps in the science and creating corresponding funding opportunities for cancer CAM research; partnering with NCI program staff and other governmental and nongovernmental organizations to increase the testing of CAM approaches for cancer prevention, diagnosis, treatment, symptom management, and rehabilitation; developing communication products for various audiences concerning the investigation and use of these approaches; and helping to build bridges between CAM practitioners and the cancer research community.

OCCAM is part of the NCI Division of Cancer Treatment and Diagnosis (DCTD); (http://dctd.cancer.gov). The division's mission is to improve the lives of the American public by discovering and conducting better ways to diagnose, assess, treat, and cure cancer through stimulating, coordinating, and funding a national program of cancer research. OCCAM's programs and activities complement DCTD's mission and are enhanced by the other major programs and branches within DCTD.

OCCAM's research priorities include:

- Identifying novel therapeutics in the pharmacopeia of traditional medical systems as defined by the World Health Organization
- Research of complementary approaches to improve the therapeutic ratio of standard and investigational anti-cancer therapies
- Research on lifestyle modifications (e.g., diet, exercise, mind-body approaches) for their impact on cancer outcomes (e.g., response to conventional cancer therapy, survival)