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Commentary

NIH and USDA Funding of Dietary Supplement Research, 1999–2007[1]

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Abstract

Over one-half of U.S. adults use dietary supplements, so federally supported research into the safety and effectiveness of these compounds is important for the health of many Americans. Data collected in the Computer Access to Research on Dietary Supplements database, which compiles federally sponsored dietary supplement-related research, are useful to scientists in determining the type of dietary supplement research that federal agencies are currently funding and where research gaps exist. This article describes the dietary supplement-related research funded by the NIH and the USDA. Between fiscal years 1999 and 2007, the number of research projects and funding for dietary supplement research more than doubled. During that period, NIH funded 6748 dietary supplement-related projects at a cost of $1.9 billion and the USDA funded 2258 projects at a cost of $347 million. The top funded dietary supplement ingredient categories were vitamins and minerals, botanicals, phytochemicals, and fatty acids. Cancer was by far the most frequent health outcome in dietary supplement research funding, nearly double the next closest health outcome category. Other health outcomes with the greatest funding were cellular and molecular mechanisms, cardiovascular health, women's reproductive health, and immune function. The greatest number of dietary supplement research projects are funded by the NIH National Cancer Institute, the NIH National Center for Complementary and Alternative Medicine, the NIH Office of Dietary Supplements, and the USDA Agricultural Research Service. J. Nutr. 141: 1–3, 2011.

Over 53% of participants in the 2003–2006 NHANES reported using dietary supplements (1) and between 1999 and 2007, dietary supplement sales nearly doubled from $48 million to $94 million (2). The NIH Office of Dietary Supplements (ODS)[4] was created to support research on dietary supplements and disseminate research results. As part of its mission, the ODS developed the Computer Access to Research on Dietary Supplements (CARDS) database to collect information on federally funded research projects related to dietary supplements.

The CARDS data are useful to scientists in determining the type of dietary supplement-related research that agencies are currently funding and where research gaps exist. The information is timely for researchers preparing grant applications, because it appears ahead of scientific publications, providing details about research still in progress. As previously described (3), CARDS can be searched to identify research related to specific dietary supplement ingredients, health outcomes, and types of studies. CARDS currently contains projects funded by the USDA, the Department of Defense, and the institutes and centers of the NIH beginning with fiscal year (FY) 1999. In FY 2008, the NIH began using a new Research, Condition and Disease Categorization (RCDC) system to define the 215 categories, including nutrition, that the NIH reports annually to Congress and the public (4). The RCDC system substantially changes the way NIH research projects are identified and therefore makes it difficult to compare the number of nutrition projects and nutrition spending amounts in FY 2007 and earlier years with FY 2008 and beyond. This article summarizes the dietary supplement research portfolio at NIH and USDA prior to the implementation of the RCDC system. Projects funded by the Department of Defense comprise a very small percentage of the data in CARDS and will not be described.

The NIH and the USDA are the largest federal funders of dietary supplement research. The NIH spent $1.9 billion to fund 6748 projects and the USDA spent $347 million to fund 2258 projects pertaining to dietary supplements from 1999 to 2007. Overall, the NIH was responsible for 75% of the projects and 84% of the dietary supplement funding categorized in the CARDS database. The number of NIH projects related to dietary supplements that were funded each year more than doubled from 374 in 1999 to over 1039 in 2007. During the same period, NIH dietary supplement research funding increased nearly 2-fold from $98 million to $278 million. In contrast, the number of dietary supplement-related projects supported by the USDA remained essentially flat at ~250/y. USDA funding, on the other hand, rose for several years, then dropped below 1999 funding levels in 2005 and did not recover through 2007. Within the NIH, most institutes and centers had

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[4] Abbreviations used: CARDS, Computer Access to Research on Dietary Supplements; FY, fiscal year; ODS, Office of Dietary Supplements; RCDC, Research, Condition and Disease Categorization.

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TABLE 1 Total number of projects and funding for the NIH and USDA top 10 dietary supplement ingredients in the CARDS database, FY 1999–2007

	NIH		USDA	
Ingredient	Projects, *n*	Funding, *USD, millions*	Projects, *n*	Funding, *USD, millions*
Vitamins and minerals	3197	1093	1443	294
Botanicals	1583	439	592	87
Phytochemicals	1470	415	697	123
Fatty acids and lipids	1051	304	685	130
Unspecified[1]	1015	266	81	21
Proteins and amino acids	597	156	229	45
Antioxidants	528	142	290	82
Dietary Fiber and carbohydrates	196	79	165	24
Hormones/precursors	185	57	10	1
Other	196	63	64	9

[1] ''Unspecified'' is a category in which dietary supplements are considered generally with no focus on a particular supplement ingredient, i.e. a training grant or a diet assessment questionnaire.

some dietary supplement-related research in their portfolio. The National Cancer Institute supported the most in dietary supplement research ($447 million). The National Center for Complementary and Alternative Medicine was second in dietary supplement funding ($370 million) followed by the National Heart, Lung and Blood Institute, National Center for Research Resources, and the National Institute of Diabetes and Digestive and Kidney Diseases. Although the ODS does not have direct funding authority, it spent $65 million cofunding multiple research projects, conferences, and workshops between 1999 and 2007. The largest funder of dietary supplement research within the USDA ($296 million) was the Agricultural Research Service followed by the Cooperative State Research, Education and Extension Service ($51 million).

The level of research funding for various ingredient categories reflects grant submissions as well as public interest in and use of various dietary supplement ingredients. Vitamins and botanicals were the top selling dietary supplements between 1999 and 2007 (*5*) and this level of public interest was reflected in federal funding; the most frequently funded dietary supplement ingredient categories at NIH throughout this period were vitamins and minerals, followed by botanicals, phytochemicals, fatty acids, and "unspecified" (i.e. topics with no focus on a particular supplement ingredient, e.g. a training grant or a diet assessment questionnaire) (**Table 1**). Substantial changes in funding may also have occurred in response to scientific findings with possible public health impact. For example, project funding in the "hormone" ingredient category more than tripled in 2003–2004 before returning to 1999 levels in 2005. This spike in alternative hormone replacement therapy research was likely in response to findings published in 2002 from the Women's Health Initiative that raised concerns about the safety of traditional hormone replacement therapy (*6*). The top 5 funded dietary supplement ingredient categories at the USDA were essentially the same as those at NIH but with "antioxidant" substituted for "unspecified" as the 5th most-funded category (Table 1).

Cancer, cellular and molecular mechanisms, cardiovascular disease, women's reproductive health, and immune function

TABLE 2 Total number of dietary supplement projects and funding by the NIH and USDA for the top health outcomes in the CARDS database, FY 1999–2007[1]

Outcome	NIH total funding, *USD, millions*	NIH DS[2] funding, *%*	USDA total funding, *USD, millions*	USDA DS funding, *%*
Cancer	615.0	33	100.5	29
Cardiovascular system	350.2	19	123.5	36
Cellular/molecular mechanisms	350.5	19	59.1	17
Women's reproductive health	260.1	14	32.2	9
Immune function	192.6	10	60.8	18
Musculoskeletal system	164.9	9	60.6	17
Aging	165.4	9	88.8	26
Nutrient requirements and metabolism	88.7	5	123.1	36
Unspecified[3]	147.0	8	11.4	3
Digestive and gastrointestinal system	105.8	6	24.2	7
Diabetes	81.6	5	40.3	12
Antioxidant function	57.1	3	61.6	18
Pediatrics	57.3	3	53.2	15
Obesity	54.0	3	56.1	16

[1] Percentages are calculated using the total number of projects per agency 1999–2007. Percentages total more than 100% because projects may be included in more than one category.
[2] DS, dietary supplement.
[3] Project abstract does not describe a specific health outcome being studied.

were the 5 health outcome categories receiving the most dietary supplement funding from the NIH (**Table 2**). NIH-funded dietary supplement research related to cancer outcomes ($615 million) was almost double the next closest health outcome category ($350 million). Dietary supplement funding related to cancer increased 300% from 1999 to 2007 and was substantially more than the overall dietary supplement funding increase of 184%. Funding for cellular and molecular mechanisms research, a form of basic research, fluctuated through the years, but also went up ~300% overall from 1999 to 2007. Funding for both women's reproductive health and immune function increased by over 400% and funding for aging-related projects increased 370%. Diabetes-related dietary supplement funding experienced a rapid rise, and by FY 2007 funding was over 700% higher than that in 1999. This is undoubtedly a reflection of diabetes as a growing public health concern.

The focus of USDA-funded dietary supplement research was similar to that at the NIH but with a somewhat different emphasis than projects funded by the NIH. The top USDA-funded health outcome categories were nutrient requirements and metabolism, cardiovascular system, cancer, aging, and antioxidant function and immune function (tied) (Table 2). USDA dietary supplement funding by health outcome was essentially the same ($124 million vs. $123 million) for the top 2 outcomes and funding for the next 3 outcomes was clustered closely ($60–100 million).

The type of dietary supplement studies most commonly funded by the NIH between 1999 and 2007 were human studies (3267) followed by animal (1796) and in vitro (1498) studies. Other funding categories were scientific conferences and chemical analysis. At the USDA, projects were more evenly split between animal (862) and human (809) studies. The difference in emphasis between the NIH and USDA reflects the different missions of the 2 agencies: biomedicine vs. food and health-related research.

Forty-five percent of the dietary supplement research supported by the NIH between 1999 and 2007 was funded via the Extramural Research Grant (R01) mechanism, with the remainder funded primarily via cooperative agreement (U01), General Clinical Research Centers (M01), Contracts (N01), and Exploratory Research grants (R21). In contrast, 62% of USDA dietary supplement research funding was via Intramural Research (Z01). Other mechanisms used frequently by the USDA were USDA Cooperative Agreement (U40), Research Grant (R01), and Formula Grant (B10).

CARDS has some limitations due to subjectivity on the part of agency staff interpreting the definition of dietary supplement and identifying appropriate projects for inclusion. In addition, projects in CARDS may be counted multiple times in different categories, e.g. a project looking at vitamin E and selenium in cancer and heart disease would be counted once in each supplement category and once in each health outcome category. Despite these limitations, CARDS provides important insight into federal funding of dietary supplement research, which is helpful for scientists to determine the type of dietary supplement-related research that agencies are funding and where research gaps exist.

CARDS will continue to capture dietary supplement-related research funded by the federal government and will expand to collect data from more federal agencies in the future. The implementation of RCDC will change the method by which dietary supplement research information is collected at the NIH and will have a bearing on the types and numbers of projects identified, but the full impact of the change in collection method is unknown at this time. A follow-up publication on the impact of RCDC on the collection of dietary supplement-related research at NIH is forthcoming. The CARDS database is publically available online (7).

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