

Dietary Supplement Use in Women: Current Status and Future Directions

Dietary Supplement Use in Women: Current Status and Future Directions— Introduction and Conference Summary¹

Daniel J. Raiten,* Mary Frances Picciano^{†2} and Paul M. Coates[†]

*Office of Prevention Research and International Programs, National Institute of Child Health and Human Development, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD 20892 and †Office of Dietary Supplements, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD 20892

The use of dietary supplements has increased dramatically as our knowledge about the role of nutrients and other bioactive components of food in health has increased. Although much of the information about the diet and health connection that has driven this trend is related to the reduction of chronic disease risk in adults, belief in the prophylactic use of dietary intervention including the use of dietary supplements has been extended to consumers throughout the life cycle.

In response to a congressional mandate, the Office of Dietary Supplements (ODS) of the National Institutes of Health (NIH) organized a conference in January 2000 to explore the current state of our knowledge about the important issues related to bioavailability of dietary supplements. The conference, supported by a consortium that included organizations both within (NIH, U.S. Department of Agriculture, Food and Drug Administration and Centers for Disease Control and Prevention) and outside the federal research community, was intended to identify research needed to expand our knowledge about factors influencing the digestion, absorption and biological activity of nutrients and other bioactive components of dietary supplements.

One of the clearest findings emerging from this meeting was that the use of dietary supplements by children (infancy through adolescence), women and the elderly is increasing. However, little is known about either the evidence base to

support appropriate indications or the safety of these supplements for use by these groups.

To address this knowledge gap a second conference was organized by the Office of Prevention Research and International Programs of the National Institute of Child Health and Human Development (NICHD) and NIH ODS to focus on dietary supplement use by children. In determining the scope of issues to be covered at the conference, the organizers used the definition of dietary supplements as provided by the Dietary Supplement Health and Education Act of 1994 (1), which specifies the following:

The Dietary Supplement Health and Education Act defines dietary supplements as a: product (other than tobacco) intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, mineral, amino acid, herb or other botanical; or a dietary substance for use to supplement the diet by increasing the total dietary intake; or a concentrate, metabolite, constituent, extract, or combination of any ingredient described above; and intended for ingestion in the form of a capsule, powder, softgel, or gelcap, and not represented as a conventional food or as a sole item of a meal or the diet.

The results of the conference on children were recently published (2,3). Among the findings that emerged from the two initial conferences was that women of reproductive age are a major user group and one particularly targeted to increase use of dietary supplements.

Because of the important developmental milestones (both physiological and behavioral) that occur in women in the period encompassing adolescence through menopause, it is essential that the health care community have a clearer understanding of how diet and nutrition may interact and affect developmental processes. Little is known about the interaction between the use of the broad range of dietary supplements and health outcomes in women throughout these critical periods of development. Such knowledge is essential to the evaluation of both the justification and safety of dietary supplement by women.

In January 2002, a two-day conference was conducted to present current research about dietary supplement use by women in both U.S. and international populations. The goals of the conference were to develop a focused research program in this area. The issues explored included characteristics of

¹ From the National Institutes of Health (NIH) conference "Dietary Supplement Use in Women: Current Status and Future Directions" held on January 28–29, 2002, in Bethesda, MD. The conference was sponsored by the National Institute of Child Health and Human Development and the Office of Dietary Supplements, NIH, U.S. Department of Health and Human Services (DHHS) and was cosponsored by the Centers for Disease Control and Prevention, Food and Drug Administration Office of Women's Health, NIH Office of Research on Women's Health, National Institute of Diabetes and Digestive and Kidney Diseases Division of Nutrition Research Coordination, DHHS; National Center for Complementary Medicine, U.S. Department of Agriculture Agricultural Research Service; International Life Sciences Institute North America; March of Dimes; and Whitehall Robbins Healthcare. Conference proceedings were published in a supplement to *The Journal of Nutrition*. Guest editors for this workshop were Mary Frances Picciano, Office of Dietary Supplements, NIH, DHHS; Daniel J. Raiten, Office of Prevention Research and International Programs, National Institute of Child Health and Human Development, NIH, DHHS; and Paul M. Coates, Office of Dietary Supplements, NIH, DHHS.

² To whom correspondence should be addressed.
E-mail: PiccianM@OD.NIH.GOV.

women at different developmental and physiological stages who consume dietary supplements; exposure estimates regarding dietary supplement use: who and what; current knowledge of dietary status of women across this development period; identification of developmental differences over this period in the life span that affect physiological functions and bioavailability of nutrients and other bioactive substances, combined with environmental factors that influence behavior (development of attitudes and beliefs); issues and data gaps related to supplement use in women, such as safety and various types of interactions (i.e., drug–nutrient, nutrient–nutrient, supplement–drug interactions, etc.); and evaluation of current justifications for use, including effects of dietary supplement use in women on risk factors of adult diseases, relative role of diet and dietary supplements to meet national health goals for women, and the need for supplements in the context of reproductive health, healthy pregnancy, birth outcomes and lactation. A case study approach was used to explore these issues and the nature of the interaction among science, policy and implementation (both in terms of promulgation of national policy and effect on consumer practices).

Coverage and organization

The opening session of the conference included overview presentations about the universe of dietary supplements currently marketed to women, possible justification for use based on national survey data and history of use both in the United States and internationally. Consistent with themes developed during previous NIH workshops on dietary supplement use, the agenda of this conference included discussions of four key topical areas from a developmental and methodological perspective: monitoring and data needs, developmental physiology, case studies useful experiences gained from four substances (calcium and other bone health related supplements, iron, folic acid and phytochemicals) with well-characterized public health implications, and factors influencing the decision to use dietary supplements. In addition to the plenary papers, each session included a panel of experts charged with addressing a predetermined set of core questions regarding research needs.

The panel discussions were intended to be interactive opportunities for cross-fertilization of ideas between a panel of experts on the subjects covered in the plenary session and the audience. Panels consisted of four to five members with representation from each of the four life stages (i.e., adolescence, pregnancy and lactation, adult women of reproductive age and postmenopausal women) plus the session chair and were charged with answering preassigned questions.

The text of representative presentations from the plenary sessions will follow this introduction and conference summary. The following is a brief account of the panel discussions and a list of recommendations and suggestions for future activities.

Panel discussions

Opening session: overview of dietary supplements. Although this session was not followed by a formal panel discussion, the audience had an opportunity to respond to the opening presentations. Among the most prominent comments during this discussion was concern raised about the limitations of data with specific reference to the use of botanical supplements by women, particularly during pregnancy. Another point of discussion concerned how best to design and use the national nutrition monitoring system, in particular the expanded National Health and Nutrition Examination Survey

(NHANES) to collect valid, accurate data on dietary supplement use in women. This issue became a recurrent theme throughout the meeting.

Panel session 1: monitoring data needs. The questions assigned to the panel were the following:

1. What are the critical gaps in our knowledge about patterns of use of dietary supplements by women across developmental states/stages?

Responses: Strong sentiment existed both within the panel and among the audience for the need to use multiple surveys (i.e., not limited to reliance on only NHANES) to garner data on the full range of issues relevant to dietary supplement use in women and across the developmental and ethnic spectrum in the United States. The Food and Drug Administration was noted to use all available data sources in making its assessment of dietary supplement use and related factors. Another gap concerned how best to quantify and monitor new bioactive substances identified as having significant public health interest during processes such as the revision of dietary guidance (e.g., the new Dietary Reference Intakes). Choline was given as an example of a substance that has assumed increased public health significance as the result of the latest guidance iteration. The question then becomes, “How can we best monitor the intake and public health outcomes related to choline intake?” It was noted that the rate-limiting step in adding new items to the national monitoring system is the availability of accurate data in nutrient and food databases. The panel and audience agreed that a significant gap in the ability to determine usage and health outcomes of dietary supplement use is the absence of sensitive and specific biomarkers.

2. What are the strengths and weaknesses of current surveillance systems in terms of monitoring use patterns across the diverse range of ethnic, demographic, developmental and physiological/age groups?

Responses: A general concern was raised about whether it is possible to design surveys that can meet the needs of all parties. For example, the Food and Drug Administration requires data that will support its mission of determining safety of dietary supplements whereas the U.S. Department of Agriculture needs data to determine dietary adequacy. Concern was also raised about the level of precision that can be expected from national surveillance data. The general consensus was that the current source data for dietary supplements is quantitatively insufficient both in terms of amounts of active ingredients and compositional identity. The panel and audience strongly endorsed the need for a concerted interdepartmental and community effort to generate accurate, reliable data on dietary supplement composition. The relevant agencies were also encouraged to develop procedures to more accurately determine the exact nature (brands with accurate label information regarding identity and composition) of the dietary supplements used by Americans. Particular concern was raised about the quality of label and ingredient data for botanical supplements.

3. What are the key methodological issues to be addressed with respect to surveillance of dietary essentials, botanicals and other bioactive ingredients as dietary supplements?

Responses: Questionnaire development for the determination of dietary supplement identity and quantity was a key methodological issue. The panel agreed with many comments from the audience about the need for methodological research focused on the design of questionnaires to determine the value of various approaches in collecting dietary supplement use data. An example would be a pilot study to determine the relative value of using identifiers of specific dietary supplements rather than asking survey participants to provide actual

composition data about their supplements. It was recognized that should the focus be on such identifiers, the extant database on dietary supplements on the market would have to be improved considerably and with the advice and full participation of the dietary supplement industry.

4. What are the essential research questions that need to be addressed in terms of monitoring dietary supplement use?

Responses: The panel and audience endorsed the following key research priorities: development of biomarkers to assess both intake and health outcomes of dietary supplement use; methods to determine high risk ethnic or racial groups, including the development of assessment tools that are ethnically and culturally appropriate; research to determine the extent of systematic bias in data collection procedures, including identification of factors contributing to over- and under-reporting of dietary supplement use; and methods to determine the effect of contextual factors influencing dietary supplement use, including cost and behavioral correlates.

Panel session II: developmental physiology. The questions assigned to the panel were the following:

1. Are there differences in scientific issues dependent on geographical, ethnic or demographic settings?

Responses: The panel and audience agreed that differences do exist based on geography (albeit to a much lesser extent in the United States than in international settings, particularly in resource-limited settings where food distribution systems differ and seasonal and geographical differences will have a greater effect on nutritional status). Ethnic and demographic considerations will be important from a population perspective as well as within developmental stages (e.g., adolescent girls from different ethnic groups will be influenced by different factors affecting their nutritional status and use of dietary supplements and alternative therapies). The panel also acknowledged the potential of genetic differences in response to nutrient status and intervention. The example was given of an increased incidence in twinning in some populations due to nutritional interventions (e.g., folate and vitamin A supplementation). Acculturation within ethnic subgroups will also be a consideration in response to public health messages. An example was given of differences within the Hispanic community [e.g., Puerto Ricans and Cubans have been shown to be more acculturated (higher facility with English) than Mexican Americans].

2. What issues might exist with respect to different classes of dietary supplements and physiological state?

Responses: The panel members concurred that adherence to interventions can be influenced by physiological state. The example cited in this context was pregnancy and the use of prenatal vitamins. The panel and audience again raised concerns about the paucity of knowledge concerning the use and safety of botanical supplements by women of reproductive age and during pregnancy.

3. What are the core research questions for each stage of physiological development discussed during the plenary session?

Responses: The panel and audience endorsed the following key research priorities: identification of metabolic disorder and rare diseases that may require nutritional interventions (e.g., inborn errors of metabolism, where benefit of dietary supplement use outweighs any risks); identification of the role, benefits and potential risks of traditional medicine in ethnic populations in the United States and internationally (the panel endorsed the need to explore more fully the potential differences in dietary practices across ethnic and cultural subgroups that may affect health outcomes related to public policy); further exploration of the use of genetic tools such as

the microarray technologies to help identify individuals most likely to respond to a dietary intervention; inclusion of ethnic and cultural influences particularly in studies involving children and adolescents; identification of areas of convergence and divergence between U.S. ethnic populations and ethnically identical populations living in the countries of origin; and reinforcement and upgrading of the surveillance with specific reference to pregnancy and lactation.

Panel session III: case studies and factors influencing the decision to use dietary supplements. The questions assigned to the panel were the following:

1. Based on the case studies presented, what are the strengths and weaknesses of our current system for translation of science into practice?

Responses: A key element identified by the panel in this regard was the necessity for targeting specific recommendations to women. Using folic acid supplementation to support the case, the panel agreed that the focus should move from fortification to supplementation of women because of the potential overflow effect of fortification on other segments of the population such as infants and children. The panel endorsed the need for further efforts to identify the potential safety concerns for the full developmental spectrum of public health interventions.

2. What are the obstacles to implementation of evidence-based practice domestically?

Response: There was general agreement that more premarket data are needed in anticipation of public health initiatives such as fortification and better monitoring of postmarket effect of such interventions to determine the effect of such policies on health outcomes across the entire developmental spectrum. The current national nutrition monitoring needs to be more proactive and responsive in developing the necessary databases to ensure accurate projections of exposure and effect (actual consumption and relevant health outcome data).

3. Regarding social, cultural and behavioral factors associated with patterns of use in women: How can we get input from and information to consumers about dietary supplement use? What factors need to be evaluated to determine how attitudes and behaviors are formed relative to the use of dietary supplements?

Responses: The consensus was that a need exists for expanded research efforts to elucidate the factors and processes that influence the decision to use dietary supplements. Such research needs to distinguish factors that may be similar or may differ for the use of different classes of dietary supplements.

Summary and conclusions

In many respects, the presentations and deliberations of the panels echoed the conclusions reached at the previously held conference on dietary supplement use in children—that is, substantial gaps exist in our knowledge about who is using dietary supplements, what particular dietary supplements are being used and why they are being used.

In terms of surveillance, as with children, those responsible for the design and conduct of the national surveillance system to determine what the American population consumes continue to struggle with a myriad of issues related to the ability to determine both the quality and quantity of supplements consumed by women in the United States. Accurate data on quantity and quality of supplement ingredients, identity of active ingredients in herbal and botanical supplements and the evidence base to document efficacy and subsequent label claims continue to be inadequate. As recently documented in the papers summarizing the conference, “What We Eat in

America Survey: Future Directions" (4–7), there is an increasing recognition by all of the agencies within the federal nutrition science policy community of a need to focus our efforts on better methods for determining the extent and effect of dietary supplement use across all segments of the U.S. population.

From a research perspective, a need exists for greater understanding about the social, cultural and behavioral factors that predict a woman's decision to use dietary supplements. Research efforts in this area must distinguish among factors influencing uses of different classes of dietary supplements (e.g., vitamin and mineral supplements and herbal supplements) to determine whether there is a common mindset regardless of the supplement used or whether differences exist in the orientation, knowledge base or sources of information for these groups.

Questions exist about the safety, efficacy and indications for use of the full array of dietary supplements currently on the market. Specific research questions include the effect of supplement use on fetal health, birth outcomes and reproductive endocrinology and the potential for drug–supplement or supplement–drug interactions. Gaps also were identified in the potential interactions between supplements, whether nutrient and botanically derived. The effect of physiological state on the bioavailability of dietary supplements was also identified as a research priority.

Although much has been learned from our experiences with such well-characterized public policies as food fortification and recommendations to increase the intake of specific nutrients, the effect of such policies has been difficult to track. As with the general issue of monitoring supplement use, the ability to track changes in nutrient intakes and the potential public health effect subsequent to the initiation of such policies as fortification of foods with folic acid or health claims based on specific diet–disease relationships (e.g., calcium and osteoporosis) has been slow to develop. Moreover, our understanding of the public's responsiveness to these policies has also been difficult to characterize. A more effective interface between the public agencies charged with the responsibility of monitoring these changes and the private sector responsible for providing these products was identified as a high priority area for enhancement.

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