ADA/APhA Special Report

From the Joint Working Group on Dietary Supplements

A Healthcare Professional's Guide to Evaluating Dietary Supplements

American Dietetic Association

Your link to nutrition and health℠

APhA

American Pharmaceutical Association

The National Professional Society of Pharmacists

Working Group

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Section A:

PURPOSE AND MISSION OF COLLABORATION BETWEEN ADA AND APhA

Recent trends toward "natural therapies" have increased the consumption of dietary supplements among Americans. Total sales of dietary supplements in 1998 were estimated to be $13.9 billion in the United States[1] and industry projections expect continued sales growth of 10% to 14% over the next 3 years.[2] Congressional legislation implementing the Dietary Supplements Health Education Act (DSHEA) has resulted in a significant increase in the number of supplement products in the marketplace. Nearly 16,000 dietary supplements will be available in the year 2000.[1] Yet the regulation of dietary supplements, including the development of good manufacturing practices (GMPs') and efficacy standards, lags behind that of traditional medications.

Data from the *Annual Eating Patterns in America* market research survey show that nearly two thirds of Americans now take dietary supplements either daily or a few times per week.[3] Among those polled in the American Dietetic Association's *Nutrition and You: Trends 2000* survey nearly half reported taking a daily vitamin or mineral supplement, although they still had considerable reservations about using herbal supplements. Only 12% of respondents indicated that they took herbal supplements daily, while 80% said that they never, or rarely, used herbal supplements.[4] Findings from the *Third National Health and Nutrition Examination Survey, 1988-1994*, (NHANES III), suggest that use of nonvitamin, nonmineral supplements increases with age, is consistent with more healthful lifestyles, and is more common among people of "other" races/ethnicity (not Hispanic, black nor white). The survey also reported a link between supplement use and higher alcohol consumption and obesity. In contrast to findings from other studies, NHANES III showed no correlation between supplement use and geographic region, urbanization, education, or income levels.[5]

Purpose

The American Dietetic Association (ADA) and the American Pharmaceutical Association (APhA), concerned about the growing use of dietary supplements by consumers who lack proper guidance and information about their safety and effectiveness, have joined forces to help educate healthcare professionals and consumers on use of dietary supplements. This partnership begins a dialogue that addresses the critical issues related to dietary supplements. ADA and APhA seek to equip dietitians and pharmacists with the tools they need to provide guidance to consumers. Dietitians and pharmacists have the expertise to evaluate scientific evidence about dietary supplements, as well as the skills to integrate appropriate therapies into patients' healthcare plans.

Mission

This guide is intended to assist healthcare professionals in:

- Evaluating the science behind supplements
- Determining how certain dietary supplements may fit into current wellness and treatment strategies
- Understanding potential adverse effects, drug–nutrient interactions, and indications for commonly used dietary supplements
- Communicating effectively with patients and clients regarding dietary supplements and answering questions about their use
- Understanding the ethical, legal, and regulatory challenges related to dietary supplements
- Accessing essential resources for reliable information regarding botanicals and nutrient products
- Educating other healthcare professionals, including physicians and nurses

A continuing challenge for healthcare professionals is the lack of information about dietary supplements including their efficacy, safety, standard dosage, side effects, interactions with medications and foods, and how they effect medical conditions. ADA professionals advise that the best nutritional strategy for promoting optimal health and reducing risk of chronic disease is to obtain adequate nutrients from a wide variety of foods. However, the organization also acknowledges that some dietary supplements may provide benefits to health and can be appropriate in many circumstances.[6]

Answers to the questions created by the widespread use of dietary supplements are not simple. By working together, pharmacists and dietetic professionals can help consumers navigate the often confusing maze of supplements and provide them with the information needed to make informed choices about ways to protect or improve their health.

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Section B:

REGULATORY, LEGAL, AND ETHICAL ISSUES

An understanding of the regulatory, legal, and ethical issues regarding the use of dietary supplements is crucial for dietetic professionals, pharmacists, and other healthcare professionals. Thousands of dietary supplements are available in the marketplace and consumers are increasingly relying upon healthcare professionals to help sort fact from fiction and to provide guidance. This section provides a brief summary of the current regulations concerning dietary supplements, including the review process and ethical issues that should be considered before recommending—or not recommending—a dietary supplement to clients or patients.[1,2]

Current Regulations and Review Process

A brief summary of the Dietary Supplements Health Education Act of 1994 (DSHEA) helps clarify the rationale behind the regulations in place today.[3] Prior to DSHEA legislation, the Food and Drug Administration (FDA) regulated dietary supplements as foods to ensure that they were safe and wholesome and that their labeling was truthful and not misleading. With the enactment of DSHEA, dietary supplements gained their own set of legal rules, separate and distinct from those governing food or drugs.

Under DSHEA, the FDA does not have the jurisdiction to authorize or require testing of supplements prior to marketing. FDA's responsibilities are limited to overseeing safety of supplements, establishing good manufacturing practices (GMPs), and ensuring that product information is truthful, including claims in a product's labeling, package inserts, and accompanying literature. The FDA can take action if it determines that a product is unsafe or mislabeled.

The Federal Trade Commission (FTC) regulates the advertising of dietary supplements, including claims in print and broadcast advertising, infomercials, catalogs, and similar direct marketing materials.[4] Advertisements for any products, including dietary supplements, must be truthful, nonmisleading, and substantiated. Both FDA and FTC require strong scientific support and careful presentation of claims on the package and in advertising. When evaluating potentially unqualified health claims, FDA and FTC tend to arrive at the same conclusion.[4]

Definition of Dietary Supplements

By definition, dietary supplements are products (other than tobacco) intended to *supplement* the diet and meet at least one of the following criteria[3]:

- Contain a vitamin, mineral, herb or other botanical, or amino acid; or contain a dietary substance to supplement the diet by increasing the total dietary intake; or contain a concentrate, metabolite, constituent, extract, or combination of any of the previously described ingredients
- Intended for digestion in a tablet, capsule, powder, softgel, gelcap, or liquid form
- Labeled as a dietary supplement
- Cannot be represented for use as a conventional food or as a sole item of a meal or diet

Safety and Efficacy

According to DSHEA, manufacturers of dietary supplements are responsible for ensuring that label information is truthful and not misleading, and that all ingredients in the supplement are safe. FDA is not required and does not evaluate the scientific data concerning the safety, purported benefits, or possible interactions of a dietary supplement product before it goes to market. FDA will evaluate a product only post-market and only when there is support or documentation that a product may be unsafe. It is FDA's responsibility to demonstrate that a supplement is unsafe or mislabeled before the product can be restricted or banned.

Manufacturers and distributors do not need to register with FDA or get FDA approval prior to producing or selling dietary supplements. However, if a new ingredient is introduced that was not marketed before October 1994, manufacturers must provide FDA with evidence at least 75 days prior to entering the marketplace that the ingredient is "reasonably expected to be safe" at the dosage level recommended on the package. Evidence is not required if the ingredient is on the Generally Recognized as Safe (GRAS) list.

Guidelines for Literature Where Supplements Are Sold

DSHEA permits the manufacturer (or anyone else) to supply an article, book, chapter, or abstract from a scientific journal to the consumer in support of a product. The information must not be false or misleading and cannot promote a particular manufacturer's brand of dietary supplement. It must be printed in its entirety without any added information, present a balanced view of the available scientific information, be displayed with other similar materials, be physically separated from dietary supplement products, and not have appended to it any other promotional information. Marketing on the Internet is also subject to regulation by FTC.[4] It is questionable whether all retailers follow these guidelines and FTC does not have the resources to fully monitor and enforce them.

Use of Claims and Nutrition Support Statements

Health claims for foods and dietary supplements are regulated under the Nutrition Labeling and Education Act of 1990 (NLEA), which requires premarket approval or authorization of all health claims by the FDA. Under amendments to the law, which were a result of the FDA Modernization Act of 1997 (FDAMA), distributors and manufacturers of food and dietary supplements can also use health claims that are based on current, published, authoritative statements from select federal scientific bodies, including the National Academy of Sciences (NAS).[5] These provisions are intended to expedite the process by which the scientific basis for such claims is established. Under criteria established by FDA, the authoritative statement that serves as the basis for the health claim must:

- Come from a federal scientific body with official responsibility for public health protection or research directly relating to human nutrition, such as the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), or NAS or any of its subdivisions
- Be published by the scientific body and currently be in effect
- State a relationship between a nutrient and a disease or health-related condition
- Not be a statement made individually by an employee of a federal scientific body but rather reflect a consensus within the scientific body
- Be based on the scientific body's deliberative review of the scientific evidence

For a complete listing of FDA-Approved Health Claims, see Appendix A.

Structure/Function Claims

In January 2000, FDA published a final rule enacting new labeling regulations for structure/function claims for dietary supplements.[6] A structure/function claim is a statement regarding the effect of a nutrient or botanical on a specific function in the human body and explains the conditions under which supplements can bear such statements. For example, a claim limited to the maintenance of healthy structure or function, such as "helps maintain cardiovascular health," or "builds strong bones" is not considered a disease claim since no reference is made to a disease or medical diagnosis. If a product makes a structure/function claim, it must bear the disclaimer, "This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease."

Additionally, a manufacturer must submit a 30-day notification of intent to market a product with a structure/function claim to the FDA. While the manufacturer must be able to substantiate its claims, it does not have to share the substantiation with FDA or make it publicly available.[7] Previously, some structure/function claims that did not require use of the disclaimer or notification to FDA were permissible. In order to comply with the final rule, any dietary supplement currently bearing a structure/function statement without a disclaimer must be relabeled within 12 months to include the disclaimer, and notification of the claim must be filed with the FDA. These guidelines are not applicable to pregnant or lactating women, which will be addressed by FDA in the near future.

Disease Claims

Separate regulations apply if a disease claim is made. In this case, the product will be regulated as a drug unless it has an authorized health claim for which the product qualifies. A statement is considered a disease claim (intended to "diagnose, mitigate, treat, cure or prevent disease") if it, either explicitly or implicitly, claims that the product[6]:

- Has an effect on a specific disease or class of diseases
- Has an effect on characteristic signs or symptoms of disease
- Has an effect on an abnormal condition associated with a natural state or process, if that condition is uncommon or can cause significant or permanent harm
- Has an effect on disease through one or more of the following:
  - ⇒ Implies an effect on disease in the name of the product
  - ⇒ Makes a statement about the formulation of the product, including a claim that the product contains an ingredient that has been regulated by FDA as a drug and is well known to consumers for its use or claimed use in preventing or treating a disease

⇒ Cites a publication or reference that refers to a disease if the context of the labeling as a whole implies treatment or prevention of a disease

⇒ Uses the term *disease* or *diseased* except in general statements about disease prevention that do not refer to a specific disease or class of diseases

⇒ Uses pictures, vignettes, symbols, or other means to refer to disease such as a heart symbol

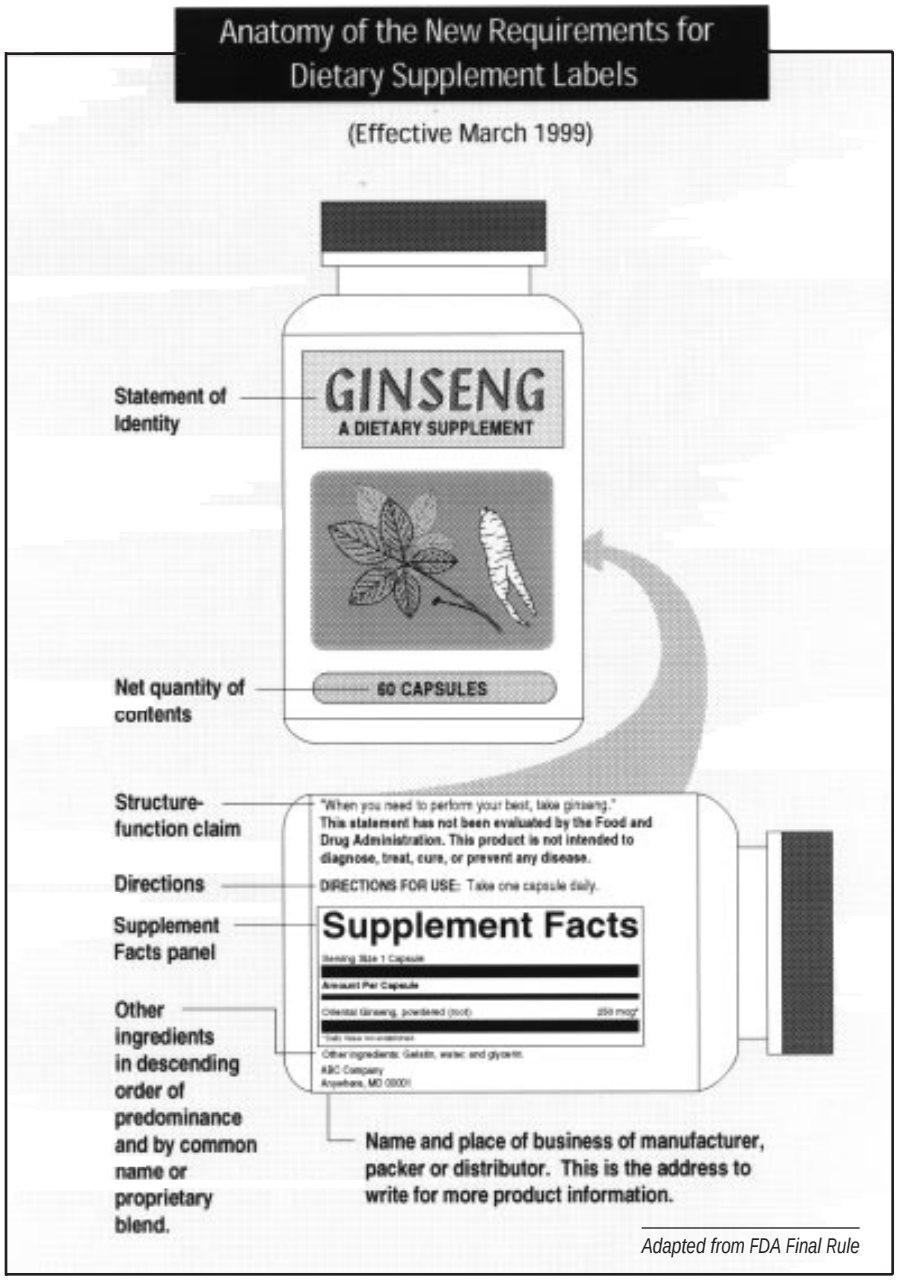
- Is a substitute for a product that is a therapy for a disease
- Treats, prevents, or mitigates adverse events associated with therapy for disease or otherwise suggests an effect on disease

Ingredient and Nutrition Labeling

Regardless of whether claims are made on a product, all supplement labels are required to carry the name of each ingredient, total quantity of all dietary ingredients (excluding inert ingredients), and the words *dietary supplement* as part of the product name (although the term *dietary* can be replaced by a descriptive phrase like *vitamin and mineral supplement*, if desired). In botanical products, the part of the plant from which the ingredient is derived must be identified. Supplements may carry a statement on the label that says the product contains a "standardized extract." If the quality, purity, strength, and identity are misrepresented or if any statements on the label are found to be false or misleading, a product is considered mislabeled.

Final rules went into effect in March 1999 requiring that all supplements carry a "supplement facts" panel that includes the following information [8]:

- Statement of identity
- Net quantity of ingredients, listed by common name in descending order by weight; active ingredients must be listed; other ingredients, like fillers, excipients, artificial colors or flavors, sweeteners, or binders must also be provided; if a product contains a proprietary blend, the total amount of the blend must be stated, although the individual amounts of each ingredient do not have to be labeled
- Appropriate serving size
- Directions for use
- Quantity and percent daily values (DV) for 14 nutrients and any other added vitamins or minerals when present at significant levels; for products with no established Reference Daily Intakes (RDI), the amount per serving must be stated (eg, 15 mg omega-3 fatty acids)



- Name and place of business of the manufacturer, packager, or distributor
- The term *high potency* can only be used on products containing 100% or more of the established RDI for that vitamin or mineral
- If a structure/function claim is made, the disclaimer statement ("This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.") must be included

Good Manufacturing Practice (GMP) Regulations

DSHEA explicitly granted FDA the authority to establish GMPs specifically for dietary supplements. GMPs govern the preparation, packing, and holding of dietary supplements under conditions that ensure their product integrity. FDA published proposed dietary supplement GMPs developed by the supplement industry in 1997.[9] However, at this time, there is not a final rule on GMPs specifically for dietary supplements. FDA expects to issue a formal proposed rule for further comment in 2000 followed by a final rule. When final supplement GMPs are adopted, they will offer greater assurance that all supplement manufacturers are using quality control procedures and providing reliable products.

Currently, supplement manufacturers must follow food GMPs that do not address the unique aspects of supplement manufacturing. Therefore, some supplement manufacturers are setting their own standards to ensure quality supplement products. Other manufacturers voluntarily follow GMPs devised by trade groups (such as the National Nutritional Foods Association).

Another method to ensure quality is participation in an independent auditing system. The United States Pharmacopeia (USP) is a nongovernment, nonprofit organization that sets standards assuring integrity and uniform quality of drugs and healthcare technologies.[10] USP publishes the *United States Pharmacopeia – National Formulary* manual (*USP 24–NF 19*, the most recent edition), which designates the standards for drugs, excipients, dietary supplements, vitamins, and minerals. The standards set by USP on product strength, quality, and purity are legally enforceable by FDA. A supplement may contain the USP or National Formulary (NF) symbol on its packaging, which indicates that the product has met USP standards for disintegration, dissolution, purity, strength, packaging, labeling, and weight variation. Also, any supplement with USP or NF designation is required to display a lot number and expiration date. Standards are voluntary, allowing supplement manufacturers the option of choosing whether to adopt and implement them. USP has developed standards for vitamins and minerals and is currently developing public standards for the 21 top-selling herbs, as well as botanical extracts and dosage forms.

There are also a number of independent, third-party companies that are testing dietary supplements. Many of these companies have Web sites listed in Section I of this guide.

Presidential Commission on Dietary Supplement Labels

Due to concern that consumers are sometimes misled by current dietary supplement advertising and distribution practices, as part of DSHEA, a seven-member Presidential Commission on Dietary Supplement Labels (CDSL) was appointed in 1995. Their mandate was to evaluate and make recommendations about how to provide consumers with information on supplements that is truthful, scientifically valid, and nonmisleading. In late 1997, the CDSL issued its final report[2] in which it:

- Called for improvements in surveillance of supplement safety and in reporting of adverse reactions to supplements
- Made recommendations on the scope and substantiation of nutrition support claims
- Agreed that health claims for dietary supplements should undergo the same authorization procedures as claims for foods
- Urged healthcare professionals to increase their knowledge of dietary supplements to aid consumers in making decisions
- Recommended that the FDA investigate the feasibility of approving botanical remedies for over-the-counter use when sufficient evidence is available
- Suggested that the supplement industry appoint an expert advisory committee to provide guidance on the safety and efficacy of supplements
- Recommended that Congress fully fund the Office of Dietary Supplements (ODS) as intended under DSHEA

FDA published a response to the CDSL report in 1998. Since then, FDA has begun reevaluating MedWatch (its reporting program for adverse events) to include dietary supplements by appointing a work group and increasing funds to improve the current system. Additionally, since publication of the CDSL report, funding for ODS has been increased.

Office of Dietary Supplements (ODS)

ODS began operations in November 1995. Its mission is to strengthen knowledge and understanding of dietary supplements by evaluating scientific information, stimulating and supporting research, disseminating research results, and educating the public to foster an enhanced quality of life and health for the US population.[11]

ODS is responsible for coordinating research on dietary supplements at NIH; organizing symposia; serving as principal advisor to NIH, CDC, FDA, and others regarding dietary supplements; and compiling research on supplements into its two databases. The International Bibliographic Information on Dietary Supplements (IBIDS) is a database of published, international, scientific literature about dietary supplements, including vitamins, minerals, and botanicals. IBIDS currently contains more than 328,000 scientific abstracts and citations. CARDS (computer access to research on dietary supplements) is a database that lists existing and ongoing dietary supplement research currently supported by federal agencies. Both Web sites are available through the ODS Web site http://dietary-supplements.info.nih.gov/.

By the end of fiscal year 1998, ODS coordinated 13 studies through the Research Enhancement Awards Program and in 1999 awarded major grants of $1.5 million per year for 5 years to the University of California, Los Angeles, and the University of Illinois, Chicago, to establish the first Dietary Supplements Research Centers with an emphasis on botanicals. Additionally, ODS is in the process of developing information fact sheets on supplements for the public.

FDA's 10 Year Plan

In January 2000, FDA presented an outline of an overall dietary supplement strategy in a 10-year plan to achieve effective regulation of dietary supplements.[12] The goal of the program is to have a science-based regulatory program that fully implements DSHEA, thereby providing consumers with a high level of confidence in the safety, composition, and labeling of dietary supplement products. The plan encompasses such issues as safety, labeling, boundaries (dietary supplement versus drug and dietary supplement versus conventional food), enforcement activities, enhanced research and science capabilities, and outreach efforts to assure effective communication. A detailed outline of the *Dietary Supplement Strategy: Ten Year Plan* is available at http://www.vm.cfsan.fda.gov/~dms/ds-strat.html.

Legal Considerations for Dietetic Professionals and Pharmacists

As dietary supplements become more mainstream among consumers, dietetic professionals and pharmacists may sometimes find conflicting state laws that beg questions regarding their respective scopes of practice. There are often inconsistencies between medical licensing laws— which define the practice of medicine in terms of diagnosis, prevention, cure, and treatment of human injury or disease—and scope of practice laws for ancillary healthcare professionals.[13] It is imperative to research the dietetic or pharmaceutical licensure laws in each state as well as each state's medical licensure laws for any potential incongruities. Each state's department of professional regulation can be of assistance.

Dietetic professionals and pharmacists must have a strong knowledge of dietary supplements in order to provide appropriate recommendations to consumers. It is important that recommendations of dietary supplements are worded carefully, in order to avoid the appearance of diagnosing and treating disease. A disclaimer which explains the scope of the practice of dietetics professionals and pharmacists, may be appropriate. Patients should be reminded to consult a physician for all medical conditions, inform physicians of any dietary supplements that they are taking, and to continue to see a physician for follow-up. Despite these precautions, however, the risks of prosecution, litigation, and discipline are very remote, but real.

Considerations for the Future

Revisions to the current regulatory environment are needed to provide assurance to the healthcare professional, as well as the consumer, that the dietary supplement products they recommend or purchase are efficacious and safe. Both the American Dietetic Association (ADA) and the American Pharmaceutical Association (APhA) have provided their input to FDA on ways to improve regulation of dietary supplements. Comments can be found on their respective Web sites, http://www.eatright.org and http://www.aphanet.org. APhA also addresses their recommendations in the 1999-2000 APhA Policy Committee Report on the Regulation of Dietary Supplements.[14]

Ethical Issues

There are many ethical issues to consider when recommending dietary supplements to clients and patients.[15] ADA and APhA each has a Code of Ethics that provides a framework of the roles and responsibilities of dietetic professionals and pharmacists.[16,17] These codes are based on moral obligations and virtues and are established to guide dietitians and pharmacists in relationships with patients, other healthcare professionals, and the public.

Position papers published by ADA and APhA provide guidance regarding ethical issues related to dietary supplements. ADA, for example, has a position on *Vitamin and Mineral Supplementation*[18] and its position on dietary supplements is addressed in its paper on *Functional Foods*,[19] both of which can be accessed at the ADA Web site (http://www.eatright.org/positions.html). Likewise, the APhA has an official policy concerning *Vitamins, Minerals, and Other Nutritional Supplement Usage*[20] and a policy on *Complementary and Alternative Medicine*,[21] which addresses dietary supplements.

ADA's *Standards of Professional Practice for Dietetic Professionals*[22] and APhA's *Principles of Practice for Pharmaceutical Care*[23] are

additional sources for application of ethics to practice. The standards are not requirements, but rather describe the expectations and responsibilities of dietetic professionals and pharmacists, respectively, in providing services to the public. There are several ethical questions the practitioner should consider before counseling a patient and recommending dietary supplements, including[15]:

- Have I sufficiently researched this subject area to comment on it or do I need to refer the patient to someone who knows more?
- Am I familiar with dosages and potential interactions between this supplement and foods/other medications?
- Am I reasonably convinced of the safety of this supplement for this particular patient?
- Am I reasonably convinced of the efficacy for the intended purpose of this supplement for this particular patient?
- Is there sufficient scientific evidence of greater benefit than risk to support use of this supplement?
- If I sell this product, do I know enough about it to feel comfortable selling it or having it available for patient self-selection? Can I recommend its use in an unbiased manner?

The area of dietary supplements can be a challenging one when applying practice standards. For some supplements, there is limited conventional scientific research available; for others, the evidence is considered substantive enough to warrant recommendations for usage. Current practice guidelines tend to rely on conventional medical research, which uses well-designed, properly controlled clinical trials as its standard. Research studies of this caliber with dietary supplements are currently limited but certainly growing. There is a commitment by FDA and ODS to make clinical trials more standard practice for the evaluation of product efficacy within the supplement industry. However, clinical trials are costly in terms of time and resources. There is a need to build a stronger scientific basis for dietary supplements to prove their efficacy in promoting health and treating disease. Additionally, scientifically proven benefits need to be clearly stated so consumers can understand the intended use of dietary supplements. But until that time, as with any health product, practitioners must weigh the risks versus benefits for any given supplement intended for an individual patient.

Practitioners who have questions regarding ethics in the area of dietary supplements should contact their professional association (ADA or APhA), state regulators, or another appropriate agency for specific help. Since the safety and efficacy of many dietary supplements is unknown, this presents a particular challenge to the dietetic professional and pharmacist in advising patients who wish to use these products. Healthcare professionals must decide how to responsibly advise patients about the use of dietary supplements in the current environment of inconclusive evidence.

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Section C:

EXAMINING THE SCIENCE BEHIND DIETARY SUPPLEMENTS

With the increasing popularity of dietary supplements, clinical research in this evolving area of science has expanded significantly. Research regarding a number of the most widely used supplements (including vitamins E and C, St. John's wort, saw palmetto, and others) is now fairly comprehensive. This information has percolated through peer-reviewed medical literature by way of individual studies, systematic reviews, and meta-analyses. This allows tertiary literature sources (see Section I) to provide evidence-based information that is useful to healthcare professionals and patients when making informed decisions about supplement use. Of course, the quality of the tertiary literature source must be considered.

The process of completing an evaluation of the scientific evidence concerning a dietary supplement is lengthy and tedious. Fortunately, several excellent resources exist to provide the healthcare professional with a summary of the available evidence on the majority of dietary supplements:

- The University of Illinois, Chicago (UIC) posts a detailed handout evaluating eight botanical supplements at http://www.uic.edu/pharmacy/research/diet/ce.html.
- The United States Pharmacopia (USP) already has standards for vitamins and minerals, and is developing a series of monographs on botanicals. For example, saw palmetto is complete and can be found at http://www.usp.org.
- The European Scientific Cooperative on Phytotherapy (ESCOP) has a series of monographs on plant drugs, with 50 completed so far.
- The World Health Organization (WHO) has published monographs on 28 medicinal plants, the first volume in a comprehensive series on dietary supplements. For information on purchasing *WHO Monographs on Selected Medicinal Plants*, volume 1, contact:

  WHO Publications Center, USA
  49 Sheridan Avenue
  Albany, New York 12210
  Telephone: (518) 436-7433

For supplements that are *not* among the most popular, a method to examine the limited body of evidence is needed. This section presents one systematic method for healthcare professionals to use in gathering and evaluating information for a particular dietary supplement.

Well-controlled, randomized trials with adequate sample size are considered the "gold standard" when it comes to evaluating drug claims and health claims for food products. While some may argue that the same stringent criteria should be applied to dietary supplements, currently there is little research of this quality available by which to evaluate select dietary supplements. Product claims that lack support of the product's efficacy by properly controlled clinical trials should be questioned. Given the paucity of clear-cut scientific evidence related to effects and benefits of some dietary supplements, the question of whether or not to recommend a particular supplement to a patient can present a problem.

Rosenbloom and Storlie[1] suggest a unique way of evaluating a dietary supplement for an individual patient using the familiar SOAP (Subjective, Objective, Assessment, Plan) format. The SOAP approach allows for an in-depth review of the information on a particular supplement while at the same time recognizes that the scientific evidence available for these supplements may be less than ideal. A *SOAP Checklist* for evaluating a dietary supplement is shown in Appendix B.

Subjective ("unscientific" information)

To conduct a subjective analysis, collect as much information as possible about the product, including promotional literature, advertisements, Web sites, articles from consumer magazines, and anecdotal reports from patients. Call the manufacturer and ask to speak with someone who can address your questions (see Section D of this guide for detailed information on requesting information and sample questions to ask manufacturers) or check the manufacturer's Web site for information. Be aware, however, that many supplement companies often supply "proof" of their claims by citing anecdotal reports from satisfied customers or "internal" research that includes charts, tables, and graphs. This information is often presented in a format designed to look like a published research study when, in fact, it is not.

In gathering subjective information, investigate the following:

- What claims are being made for the product?
- Who is making these claims?
- Why are these claims made and what is the motivation behind them?
- Is the product marketed in a pharmacy, health food store, or sold by an individual or a healthcare professional?
- Why is your patient interested in taking the supplement? What was he or she told about it? Where did the information originate?

While there is a significant amount of information available on the more commonly used dietary supplements, some of this information

may have little scientific support. Therefore, when scientific research is not available despite an abundance of subjective data, the pharmacist or dietetic professional should be responsibly cautious in recommending its use.

Objective (scientific and patient-related information)

The objective review of a dietary supplement includes detailed, factual information about the product, including a review of the literature. While it may not be possible to answer all of these questions, here is a list of some to consider:

- Is the supplement generally safe? Can it cause harm at any dosage?
- Is the product made by a company that is known to use safe and good manufacturing practices? If not, is the company a large and respected one that is highly likely to use safe and appropriate manufacturing conditions? Are you confident that the product or ingredient(s) is not contaminated or adulterated?
- What is known about efficacy in the condition for which the patient wishes to use the product? Are there data to support efficacy?
- Does the preparation method affect the potency or safety of the active ingredient?
- What is the mode of action or underlying mechanism of the primary active component(s)?
- In what plant and plant part(s) is the active ingredient(s) found?
- What does the active ingredient(s) do?
- How much of each ingredient is in the product?
- What is the recommended dosage of the product?

It is also important to consider the individual patient's needs, such as:

- What is the nature, severity, or duration of the disease or condition for which the product is to be used?
- Is the diagnosis firm? Was the patient diagnosed by a healthcare professional?
- What are the patient's concomitant disease states?
- What are the patient's concomitant prescription or over-the-counter medications?
- What are the likelihood and severity of harm if the supplement treatment does not aid the condition, masks another condition, or prevents the patient from seeing a healthcare professional?

Combination products, where two or more active ingredients are combined into one supplement, pose a unique situation. Only rarely are clinical data available that examine the efficacy of the particular combination product, so each ingredient must be evaluated individually. In combination products, some of the ingredients may have evidence of safety and efficacy, while others may not. A common problem with combination products is that even if an individual ingredient has been shown to be of value, the amount of the ingredient in the combination product is typically much less than that used in clinical trials. In this case, there is no evidence to ensure that the product would provide the same beneficial effect.

New labeling laws for dietary supplements took effect in 1999 that require each supplement to carry a "supplement facts" label and an ingredient list (see Section B). Still, this information does not always disclose how much of each ingredient is contained in each dosage unit. The manufacturer, not the FDA, determines the dose of dietary supplements. Ideally, the dose of the herbal product should be based on clinical data and for some supplements, this is the case. However, the dispensing dose may not be equivalent to that reported in scientific studies for all supplements, since the manufacturer determines dosage units.

As mentioned above, a review of available literature is a key step in determining accuracy or validity of information found elsewhere. How do busy healthcare professionals, perhaps with limited access to some research resources, do this efficiently?

- Summaries of reviews and published studies available through Web sites mentioned at the beginning of this section.
- Summaries, sometimes with analytical commentary, published in various periodicals:
  - ⇒ *Alternative Therapies in Health and Medicine*—InnoVision Communications. Information at http://www.alternative-therapies.com.
  - ⇒ *Focus on Alternative and Complementary Therapies*—Pharmaceutical Press. Covers a wide range of therapies, not just supplements. Information at http://www.pharmpress.com.
  - ⇒ *Herbalgram*—American Botanical Council. Information at http://www.herbalgram.org.

There may be occasions when review articles or summaries of studies are not available and it is still important to get a clear picture of evidence for efficacy and safety of a supplement. Guidance in examining the quality of studies is available from these sources:

- "Evaluating the medical literature" by PG Cuddy et al. Three articles published in *Annals of Emergency Medicine* provide a detailed review of methods for evaluating trials.[2-4]
- "Literature evaluation" by KW Mosdell in *Drug Information*.[5] A local drug information center, at a hospital or university, will also have other books and materials available.
- Clinical Literature Assessment Program, Monograph 2: *How to Evaluate Clinical Studies* is available from Pfizer Pharmaceuticals US.
- *How to Understand and Interpret Food and Health-Related Scientific Studies*, available from the International Food Information Council through their Web site http://www.ific.org/publications/reviews.vtml.

- "Understanding and Evaluating original research articles" by BR Motheral and TR Jackson in *Journal of the American Pharmaceutical Association*.[6]
- "Criteria for levels of evidence" developed by the USP. A four-level scheme using evidence-based safety and efficacy criteria to evaluate botanicals considered for admission to the USP. Full article is provided in Appendix C, or http://www.usp.org.
- "Critical appraisal of published research: Introductory guidelines" by FG Fowkes and PM Fulton in *British Medical Journal*.[7].

After available trials have been examined, they should be systematically classified according to their importance in order to make a decision.[8]

Assessment

Once the subjective and objective data have been gathered and reviewed, the next step is to assess the product for use in a particular patient. Based on the data gathered, consider:

- Validity of the product's efficacy claims
- Risk/benefit to using this product in a particular patient (due to contraindications, interactions with other medications, etc.)
- Evidence to support recommendation of a particular product formulation or brand for the patient (This is especially important with botanicals.)

Plan

Once the evaluation is completed, the dietetics professional or pharmacist needs to work with the patient to determine a plan of action. For example, if the patient elects to take the supplement, then monitoring strategies will be needed to evaluate the supplement's effectiveness and any side effects. Possible side effects should be discussed, as well as what action to take if they occur. The length of time that the supplement will be used should be determined based on findings in the literature. Finally, recommendations (both pro and con) should be documented in a written record.

If the product is ineffective but safe, and the patient still wants to use it, the healthcare professional should work with, not against, the patient, to include it in safe amounts. Section G of this guide provides more details on effective patient communication.

It is important to remember that, in the case of dietary supplements, unlike other medical therapies, the patient—not the healthcare professional—is the gatekeeper.[8] Therefore, it is crucial that healthcare professionals are knowledgeable and open-minded about dietary supplements; they must be able to provide information and possibly make recommendations. Otherwise, patients may gather information from less reliable sources, such as the Internet or retail sales staff.

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Section D:

REQUESTING INFORMATION FROM MANUFACTURERS OF DIETARY SUPPLEMENTS

Healthcare professionals may find it helpful to contact manufacturers of dietary supplements to help "fill in the gaps" of missing information about their products. For example, it may be useful to obtain and evaluate information about products and formulations in order to understand why the consumer believes a product may help him or her. Under the Dietary Supplement Health and Education Act (DSHEA), supplements are legally required to be safe and unadulterated. However, the burden of proof is on the Food and Drug Administration (FDA)—not the manufacturers—to demonstrate that a product is unsafe or mislabled. The lack of requirements for quality control, safety, and efficacy make it difficult to determine: whether a supplement's active compounds are actually in the product; if the compound(s) is bioavailable; if the dosage is appropriate; whether all bottles purchased will have the same compound (or even if all of the dosage units within the same bottle will); and, what other chemicals are in the product besides the claimed ingredients.[1,2] Some herbal supplements have been estimated to vary in potency 10,000-fold among various products from the same type of plant.[1]

Not all supplement manufacturers abide by DSHEA rules (even though it is law) and their products may improperly label identity and potency. These manufacturers also may not test their ingredients for purity. Product labels may be incorrect or incomplete, herbs may be misidentified, harvested at the wrong time, or the wrong part of the plant might be used in the supplement.[2] The same common name may be applied to different plants recommended for different illnesses.[3] Adulterants like heavy metals may be found in herbal preparations from other countries, usually added to increase the weight of herbs that are sold by weight. Some of these metals are thought to help cure without being absorbed.[2] However, there are numerous reports in the literature of poisoning with lead, arsenic, copper, and mercury from herbal preparations obtained in other countries.[4-10]

Some manufacturers, although relatively few, conduct their own research. Unfortunately, there is little motivation for most manufacturers to conduct good research including randomized, placebo-controlled, double-blinded trials that prove efficacy of botanical products. Manufacturers are not required to do so by law.[11] While companies cannot patent basic herbs or other supplement ingredients, they can patent a process (such as PharmaPrint) or a combination or specific form of herbs. There is much research underway in this area by some of the larger companies, and others are likely to follow suit in developing proprietary blends and processes. Additionally, there are some well-designed scientific studies on supplement usage, especially in other countries where regulatory authorities require some basic assessment of safety and efficacy.[2] The National Center for Complementary and Alternative Medicine (NCCAM), the Office of Dietary Supplements (ODS), and other National Institutes of Health (NIH) units are increasing funding of studies on dietary supplement ingredients, although there is a need for even higher levels of funding.

In order to gain additional information about specific supplements that is not available through a literature search, it is necessary to contact the manufacturer and ask questions specific to their product. If a company says that it doesn't have information available on its products, it would be wise to be skeptical of those products. Companies that are willing to share scientific information about their products with healthcare professionals and consumers are more likely to be reliable resources. Of course, it is still important to consider the scientific merit of the information provided by the company, since pseudoscience may be presented convincingly by some manufacturers.

The National Council for Reliable Health Information identified several deceptive marketing tactics used by some manufacturers to promote their product.[12] These methods include:

- **Borrowed Science:** Claims based on data that is borrowed from different sources. Most manufacturers rarely conduct original research studies using their own brand of supplements.
- **Misrepresenting Data:** Some manufacturers use information that is not entirely accurate and "bend the truth" to meet their needs. For example, a manufacturer may refer you to a research study on a certain herb in an effort to lend scientific support to its product. However, the manufacturer's product may not contain the exact formulation or dosage as that used in the study.
- **Saying That Research Is Underway:** Many companies will say that they are in the process of conducting research but they are unable to provide any further specifics. They should be asked to share where the research is being conducted, if it uses animals or humans as subjects, and the variables that are being studied.
- **Using Testimonials:** Using testimonials from celebrities and "satisfied customers" is a popular marketing technique.
- **Providing Shaky Research:** Research studies may be poorly designed or reported only in abstract form and never published in peer-reviewed publications.

- **Promoting Their Patent:** A patent simply means that a product is unique. It has nothing to do with whether it is safe or effective.
- **Saying That Research Is Unavailable:** When companies say that their research is proprietary and they are not able to share the data, it is likely that no research actually exists.

To help gather reliable information about a specific dietary supplement not obtainable through a literature review, follow these suggestions[13]:

- **Review the product label.** If statements are unclear or if the label makes seemingly unrealistic claims, the manufacturer may not be following DSHEA rules. The United States Pharmacopeia (USP) symbol on supplements ensures that the product has met standards for disintegration, dissolution, purity, strength, packaging, labeling, and weight variation. Other supplements may carry the National Formulary (NF) symbol on the label (alone or in addition to the USP symbol), which indicates that the product complies with the standards in the NF. The difference between the "USP" and "NF" designations on the label of a product reflects the differing admission criteria for the two official compendia in which the product may appear.[14] It is important to note that *neither* the USP nor the NF evaluates efficacy of the product. For more detailed information on the USP and NF, refer to section B of this guide.

  Some brands of supplements provide standardization information about their products and/or advertise it on their packaging, independent of the USP or NF. Standardization ensures that supplements contain the same amount of the herb's active ingredient or marker from bottle to bottle and pill to pill. Typically, step one of the standardization process is to test the herbs or ingredient for pesticides and other unwanted chemicals. Step two requires a microbiological analysis to search for impurities such as fungi. In step three, a phytograph, which identifies several unique or important compounds, is performed to ensure an herb's identity and quality. In step four, dosage units are prepared to specified percentage standards for the ingredient or marker. Finally, in step five, a representative sample of final product is quality tested to ensure that consumers get a consistent product. However, labeling a product as "standardized" does not currently guarantee that the product has undergone these five steps.

- **Check the manufacturer name.** Nationally known food and supplement companies are more likely to have strict quality control procedures and good manufacturing practices (GMPs) in place, and to provide reliable products. Also, some companies import products which have been clinically tested in Europe. A list of these is included in *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines* available from the American Botanical Council (http://www.herbalgram.com).

- **Contact the manufacturer.** Ask to speak to a technical expert about how products are made, what quality control procedures are in place, and their GMPs. Companies should be willing to provide answers to the following questions:
  - ⇒ Has this specific product been used in any clinical studies published in peer-reviewed journals?
  - ⇒ Can the company share the scientific studies upon which the structure/function statements or health claims are based? What safety studies have been completed on this product? Ask the representative to send information, whether published research or not.
  - ⇒ Can the company explain the pharmacological or biochemical mechanisms of action? Is there research to support this?
  - ⇒ Does the company complete an analysis on the raw ingredients, including inert ingredients? How does the company do this?
  - ⇒ Does the company also complete an analysis on the final product to guarantee that the contents in the bottle match those stated on the label?
    - —What range of variability is used for dosages?
    - —Is the product tested for content uniformity?
  - ⇒ Does the product meet any existing standards for disintegration and dissolution or other tests of bioavailability?
  - ⇒ Are there any contraindications for using this supplement—such as over-the-counter medications, specific disease states or health problems, prescription medications, foods, or other herbal supplements?
    - —Is this product contraindicated for certain individuals (ie, pregnant women, children)?
  - ⇒ Are there any stability/storage issues?

Manufacturers may not be able, or always willing, to share research information about their products. However, this step is an important one in evaluating the efficacy and safety of a given product. Gathering as much information as possible about products, including from manufacturers, helps provide the healthcare professional with a greater knowledge from which to make recommendations to consumers.

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Section E:

REPORTING ADVERSE EFFECTS

Unlike pharmaceutical manufacturers, supplement companies are not required by law to report dietary supplement product problems to the government. Accounts of adverse events caused by dietary supplements that government agencies do receive frequently come from inexpert sources. Since there is no central source of information about adverse reactions to dietary supplements, it is difficult to assess how frequently reactions occur.

According to the American Association of Poison Control Centers, in 1998, 704 adverse reactions to dietary supplements involved children ages 6 to 18 years. Since 1994, the Food and Drug Administration (FDA) has investigated over 800 cases linking the supplement ephedra to serious illnesses including insomnia, nervousness, seizure, hypertension, stroke, and death.[1]

How to Report Possible Adverse Effects

Dietetic professionals and pharmacists can play an important role in the reporting of adverse events associated with dietary supplement use. In the event that a consumer reports an adverse reaction after taking a supplement, there are specific steps to follow. As mentioned briefly in Section B of this guide, MedWatch is the FDA's medical products reporting program (http://www.fda.gov/medwatch). It is designed to educate all healthcare professionals about the critical importance of being aware, monitoring, and reporting adverse health events and problems to FDA and/or the manufacturer.[1] The purpose of MedWatch is to enhance the effectiveness of postmarketing surveillance of medical products—including dietary supplements—as they are used and to rapidly identify significant health hazards associated with these products. MedWatch also helps ensure that new safety information is rapidly communicated to the medical community. The program can help to quickly correct product problems and/or help to remove defective or dangerous products from distribution.

The identity of consumers involved in MedWatch reports is confidential and legally protected. The identity of the reporter may be shared with the manufacturer unless the reporter requests anonymity. The FDA's MedWatch central unit initially receives all of the reports. Within 24 hours, the report is sent to the appropriate program responsible for the particular type of product.

Once an adverse event or product problem is identified, FDA can take any of the following actions:

- ***Labeling Changes*** may be mandated. Adverse events often prompt FDA to require the manufacturer to add new information to the product's package insert.
- ***Boxed Warnings*** are reserved for serious adverse events. FDA can require that warnings be placed in a prominent position on the product's packaging to ensure its continued safe use.
- ***Product Recalls and Withdrawals*** are among the most serious actions FDA can advise a company to take. Recalls involve the firm's removal of a product from the market and may require taking the product off the market permanently.
- ***Medical and Safety Alerts*** are used to provide important safety information about a product to healthcare professionals, trade organizations, and the media.

Serious adverse events and product problems should be reported directly to the FDA and to the manufacturer of the product, as appropriate. Healthcare professionals may report them to FDA by four different means: mail (using the postage-paid MedWatch form, available in PDF format at http://www.fda.gov/medwatch/report/hcp.htm, phone (800) FDA-1088, fax (800) FDA-0178 or Internet (http://www.fda.gov/medwatch/report/hcp.htm). A copy of the *MedWatch Reporting Form* is included in Appendix D of this guide.

Healthcare professionals should report their suspicion that a drug or dietary supplement may be related to a serious adverse effect. The healthcare professional is not expected to establish the connection or even wait until evidence seems compelling. Following are some guidelines for healthcare professionals to use when deciding whether or not to report an adverse reaction related to a dietary supplement.

Product Problems

Product problems concerning the quality, performance, or safety of any dietary supplement should be reported. Problems with product quality may occur during manufacturing, shipping, or storage and include:

- Product contamination
- Defective components
- Poor packaging or product mix-up
- Questionable stability
- Labeling concerns

Adverse Events

An adverse event is defined as any undesirable occurrence in a patient associated with the use of a medical product or dietary supplement.

The event is considered to be serious and should be reported immediately when the patient outcome is:

Death

Report if the patient's death is suspected to be a direct outcome of the adverse event.

Life-threatening

Report if the patient was at substantial risk of dying at the time of the adverse event or it is suspected that the use or continued use of the product could have resulted in the patient's death.

Hospitalization

Report if admission to the hospital or prolongation of a hospital stay resulted due to the adverse event.

Disability

Report if the adverse event resulted in a significant, persistent, or permanent change, impairment, damage, or disruption in the patient's body function/structure, physical activities, or quality of life.

Congenital Anomaly

Report if there are suspicions that exposure to a medical product/dietary supplement prior to conception or during pregnancy resulted in an adverse outcome in the child.

Requires Intervention to Prevent Permanent Impairment or Damage

Report if it is suspected that the use of a medical product/dietary supplement resulted in a condition that required medical or surgical intervention to preclude permanent impairment or damage to a patient.

A significant problem of the MedWatch program is that it currently does not require manufacturers to report consumer calls related to any adverse effects associated with use of their product. Therefore, the true frequency of reactions, mild or more serious, that may be associated with use of a product is unknown. Until the FDA is granted authority to require regular reports from manufacturers citing adverse reactions, the safety of products available in the market cannot be ensured.

Case Study: St. John's Wort

St. John's wort is one of the most popular herbal dietary supplements used. Dangerous interactions between St. John's wort and other medications reported in February 2000[2] have led many healthcare professionals to question potential interactions that may occur between other dietary supplements and over-the-counter or prescription medications. A summary of St. John's wort, including its role in treating depression and a summary of the clinical studies demonstrating its efficacy, is described below.

Why So Popular?

St. John's wort (*Hypericum perforatum*) is a long-living, wild-growing herb with yellow flowers that has been used for centuries to treat wounds, mental disorders, and nerve pain. In ancient times, doctors and herbalists wrote about its use as a sedative and antimalarial agent as well as a balm for wounds, burns, and insect bites. Today, the herb is a popular treatment for mild to moderate depression; it also is used to treat anxiety, seasonal affective disorder, and sleep disorders.[3]

St. John's wort is widely used in Germany, where doctors prescribed almost 66 million daily doses in 1994 for psychological complaints.[4] In fact, German doctors prescribe St. John's wort approximately 20 times more often than Prozac (fluoxetine), one of the most widely prescribed antidepressants in the United States.[5]

Treating Depression

Depression can be mild, moderate, or severe. Specific psychotherapies (such as interpersonal and cognitive–behavioral therapy) and antidepressant medications have been found to be effective for patients with major depression. Several effective antidepressant drugs have become more widely used in the past several years. However, patients sometimes report unpleasant side effects such as a dry mouth, nausea, headache, diarrhea, or impaired sexual function or sleep.[6]

In part because of these types of drug side effects, many patients with depression are turning to herbal treatments such as St. John's wort. Researchers are interested in it for its potential to cause fewer and less severe side effects. St. John's wort costs far less than most antidepressant medications and does not require a prescription.[7]

St. John's wort is not completely free of side effects. Some users have complained of a dry mouth, dizziness, gastrointestinal symptoms, increased sensitivity to sunlight, and fatigue.[8] Herbal treatments often are not as effective or as quick to act as conventional treatments, and may not produce the desired results. Still, some people turn to herbs because they prefer to use "natural" products, rather than prescription drugs.

Clinical depression is a serious medical disorder that, in many cases, can be treated. However, St. John's wort is not a proven therapy for clinical depression. Therefore, there is some risk in recommending it to treat clinical depression.[9]

How St. John's Wort Works

The components in extracts of St. John's wort include flavonoids, kaempferol, luteolin, biapigenin, hyperforin, polycyclic phenols, hypericin, and pseudohypericin.[9] New research suggests that hyperforin also plays a larger role in the herb's antidepressant effects. Some German manufacturers of St. John's wort have begun standardizing, not only to hypericin as most US manufacturers do, but to hyperforin as well.[10]

Several mechanisms of action of St. John's wort have been proposed, including the following:

- Inhibition of monoamine (serotonin, dopamine, and norepinephrine), GABA, and L-glutamate re-uptake: St. John's wort appears to reduce the rate at which brain cells reabsorb serotonin. Low levels of serotonin in the body are associated with depression. Hyperforin elevates intracellular sodium in the presynaptic cleft. This changes the intra/extracellular sodium gradient, which affects the neurotransmitter uptake.[11-13]

- Modulation of interleukin-6 (IL-6) activity: Raised levels of IL-6, a protein involved in the communication between cells in the body's immune system, may lead to increases in adrenal regulatory hormones, a hallmark of depression. St. John's wort may reduce levels of IL-6, and thus help treat depression.[14]

More research is needed to determine all the active ingredients in St. John's wort and to identify precise modes of action.

Drug Interactions

In February 2000, results from a study conducted by the National Institutes of Health (NIH) alerted the public to concerns about interactions between St. John's wort and Crixivan (indinavir), a protease inhibitor used in the treatment of human immunodeficiency virus (HIV) infection.[2] In the study, concomitant administration of St. John's wort and indinavir substantially decreased indinavir plasma concentrations, possibly due to induction of the cytochrome P-450 metabolic pathway. Although data are only available for indinavir, based on these results, it is expected that St. John's wort may significantly decrease blood concentrations of all currently marketed protease inhibitors (PIs) and possibly other drugs (to varying degrees) that are similarly metabolized, including the nonnucleoside reverse transcriptase inhibitors (NNRTIs). Consequently, concomitant use of St. John's wort with PIs or NNRTIs is not recommended because this may result in suboptimal antiretroviral drug concentrations, leading to loss of virologic response and development of resistance or class cross-resistance.

In addition to the interaction with indinavir, interaction between St. John's wort and cyclosporine, a drug used to reduce the risk of organ transplant rejection, was also reported.[15] Treatment with St. John's wort was associated with a drop in cyclosporine values below the therapeutic range and resulted in acute heart transplant rejection in two patients. St. John's wort extracts, which contain at least ten different constituents or groups of components that may contribute to its pharmacological effects, were blamed. In particular, the naphtodiantrons induce the CYP3A isoenzyme of the microsomal cytochrome P-450 complex that metabolizes cyclosporine. In addition, St. John's wort extracts have been suggested to induce intestinal P-glycoprotein drug transporter, which could potentially contribute to a decreased oral bioavailability of cyclosporine. St. John's wort also may interact with other immunosuppressant drugs.

In Sweden, the Medical Products Agency has received seven case reports since 1998 of a reduced anticoagulant effect of warfarin—a decreased International Normalized Ratio (INR) associated with concomitant use of St. John's wort. Although none of the patients developed thromboembolic complications, the decrease in INR was thought to be clinically significant. The INR returned to target values after either the warfarin dose was increased or St. John's wort was withdrawn. The reduced effect of warfarin suggests an induction of cytochrome P-450 2C9, according to researchers.[16]

Based on these studies and reports, St. John's wort appears to be an inducer of an important metabolic pathway, cytochrome P-450. Since many prescription drugs used to treat conditions— such as heart disease, depression, seizures and certain cancers—or used to prevent conditions— such as transplant rejection or pregnancy (with oral contraceptives)—are metabolized via this pathway, healthcare providers should alert patients about these potential drug interactions. Failure to do so could result in loss of therapeutic effect of any drug metabolized by the cytochrome P-450 pathway.[17] Drugs with which St. John's wort may cause a reduced effect of the medication include:

Heart Drugs: digoxin (*Lanoxin*), diltiazem (*Cardizem, Cartia*), nifedipine (*Procardia*), and beta-blockers (*Inderol, Lopressor, Levatol)*

Antidepressants: imipramine (*Tofranil*), amoxapine (*Asendin*), amitriptyline (*Elavil*)

Anti-seizure Drugs: carbamazepine (*Tegretol*), phenytoin (*Dilantin*), phenobarbital (*Luminal*)

Anti-cancer Drugs: cyclophosphamide (*Cytoxan*), tamoxifen (*Nolvadex*), paclitaxel (*Taxol*), etoposide (*Toposar, Etopophos, VePesid*)

Anti-transplant Rejection Drugs: cyclosporine (*Neoral, Sandimmune, SangCya*), sirolimus (*Rapamune*), tacrolimus (*Prograf*)

Birth Control Drugs: all products containing ethinyl estradiol

These reports have prompted several major retail drug chains to begin offering information on drug and supplement interactions to patients.

In addition to the potential for drug interactions, the American Society of Anesthesiologists (ASA) cautions people who use herbal medications to stop taking them at least 2 to 3 weeks prior to surgery.[18] Although the ASA has not conducted formal research, a number of anesthesiologists have reported significant changes in heart rate or blood pressure in some patients who have been taking herbal medications.[18] A study published in the *American Association of Nurse Anesthetists Journal* found that in a survey of 500 outpatients following elective surgery, 27% were taking supplements in the 2 weeks prior to surgery that can increase bleeding and prolong the time it takes for clotting. Additionally, 12% of the subjects took herbs that could adversely affect blood pressure.[19]

The potential for drug interactions with herbal supplements is a real threat to health. Patients need to be informed of these possibilities and monitored on an on-going basis. Healthcare professionals, including dietetic professionals and pharmacists, must make it a priority to ask patients about supplement use, because many consumers do not understand the powerful effect some supplements may have. Documenting use of supplements in a medical or patient record and noting tolerance as well as adverse effects is also crucial for monitoring purposes. A sample *Dietary Supplement Intake* form is included as Appendix E of this guide.

Sources

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Section F:

ROLE OF DIETARY SUPPLEMENTS IN CURRENT WELLNESS AND TREATMENT STRATEGIES

Vitamin, mineral, and other nutrients delivered as dietary supplements can play an important role in preventing disease and promoting good health. While not a substitute for a well-balanced diet, supplements can help "fill in the gaps" when nutrients are not obtained by food sources, the amount needed cannot be easily consumed from foods, or the compound is not available in foods— as is the case with herbal supplements.

Nutrients

Vitamin, mineral, and other nutrient-based supplements are not meant to be substitutes for making improvements in the diet. Changes in dietary intake to enhance the nutrient quality for optimal health are best made through diet first and then adding supplements as an individual's need arises. The *Food Frequency Record*, found in Appendix F, is a useful tool for assessing an individual's food and nutrient intake.

The following is a list of vitamins and minerals that are most commonly deficient in the diet along with key food sources of the nutrient.

Food Sources of Commonly Deficient Nutrients

Nutrient	Examples of Food Sources
VITAMINS	
Vitamin A and its precursor, beta-carotene	Liver, eggs, milk, sweet potatoes, carrots, dark leafy greens, mango, papaya, cantaloupe, peppers, apricots, broccoli
Vitamin C	Cabbage, grapefruit, guava, kiwi, oranges, papaya, red or green peppers, potatoes, strawberries, tangerines, tomatoes, mangoes
Vitamin D	Eggs, fish with edible bones, fortified cereals, fortified milk
Vitamin E	Vegetable oils, margarine, salad dressings, nuts, seeds, wheat germ
Vitamin B_{12}	Animal products such as beef, milk, cheese, yogurt, fish, liver, veal, chicken
Folate	Dry beans and peas, avocado, strawberries, oranges, peanuts, spinach, wheat germ, fortified bread, pasta, rice, cereal
MINERALS	
Calcium	Milk, yogurt, cheese, tofu (processed with calcium), fish with edible bones, leafy greens, broccoli, calcium-fortified products such as fruit juices and cereals
Iron	Meat, poultry, fish, fortified cereals, dry beans and peas, enriched bread, rice, pasta and other grain products, spinach
Magnesium	Dry beans and peas, nuts, peanut butter, whole grains
Potassium	Banana, oranges, potato, tomatoes, bell pepper, milk, poultry, fish
Selenium	Seafood, liver, kidney, grain products, seeds (content depends on amount in soil)
Zinc	Meat, seafood, liver, milk, eggs, whole grain products, wheat germ

Source: Duyff RL. *The American Dietetic Association's Complete Food and Nutrition Guide.* Chicago, IL: The American Dietetic Association;1996.

Throughout the life cycle, there are times when nutritional needs exceed those typically consumed through the diet. For example, women who are pregnant or breast-feeding need more of some nutrients, like iron, folate, and calcium. While women can obtain these nutrients in increased amounts through food, most do not. Therefore, a dietary vitamin and mineral supplement may be necessary. Postmenopausal women generally benefit from calcium supplements. People on *very* low calorie diets do not consume enough food to meet their vitamin and mineral needs, and vegetarians may need extra calcium, iron, zinc, and vitamins B_{12} and D.

Some vitamins and minerals may be beneficial at levels far above the recommended daily allowances (RDA), since the RDA reflects intake levels necessary to prevent classic deficiency syndromes in a population. Antioxidant vitamins, such as vitamins E and C, have been shown in studies to provide protective health effects at dosage levels above the RDA recommendations. For example, the RDA for vitamin E is 30 international units (IU) per day. However, the dosage recommended for vitamin E to potentially protect against heart disease and other medical conditions is 100-800 IU per day.[1] In recognition of research recommending intakes above the RDAs, the National Academy of Sciences, Food and Nutrition Board, released new Dietary Reference Intakes (DRIs) for antioxidant vitamins in Spring 2000. The new DRIs for vitamins C and E, selenium, and carotenoids include Tolerable Upper Intake Levels (ULs), which describe the highest level of daily nutrient intake that is likely to pose no risks or adverse health effects to almost all individuals in the general population. Following is a summary of the current recommendations for dietary antioxidants:

Recommendations for Antioxidants

Antioxidant	DRI for Women	DRI for Men	Upper Intake Level	Additional Notes
Vitamin C	75 mg	90 mg	2,000 mg	Smokers need additional 35 mg/day
Vitamin E	15 mg from food (equivalent to 22 IU natural source vitamin E or 33 IU synthetic form)	15 mg from food (equivalent to 22 IU natural source vitamin E or 33 IU synthetic form)	1,000 mg alpha-tocopherol (equivalent to 1500 IU natural source vitamin E or 1100 IU synthetic form)	
Selenium	55 mcg	55 mcg	400 mcg	
Beta-carotene and other carotenoids	Due to conflicting evidence, DRI not recommended	Due to conflicting evidence, DRI not recommended	Due to conflicting evidence, UL not recommended	

Source: National Academy of Sciences. *Dietary Reference Intakes.* Washington, DC: National Academy Press; 2000.

Appendix G provides detailed charts of DRIs, RDAs, and ULs for other nutrients. These charts can be used with the *Dietary Supplement Intake Form* (Appendix E) and *Food Frequency Record* (Appendix F) to assess the appropriateness of patient nutrient intake amounts.

Herbal and Botanical Supplements

The use of herbs and botanical supplements to prevent or treat disease is not as well documented as use of vitamins and minerals. This is not to say that herbal supplements may not have a preventive or a therapeutic role against certain illnesses. There is no question that herbs and botanicals can have strong physiological effects; in fact, 30% of all modern drugs are derived from plants.[2] Depending on the particular supplement, there may be adequate research for its use in treating or preventing disease. For example, the use of ginkgo biloba for the symptomatic treatment of age-associated memory impairment and dementia (including Alzheimer's disease) and for the symptomatic treatment of intermittent claudication is documented.[3] The use of standardized saw palmetto extracts for the treatment of lower urinary tract symptoms, secondary to benign prostatic hyperplasia also has support.[3] Scientific research is currently underway on many herbal and botanical supplements and substantiation for their preventive effects against, or treatment for, disease is growing. For up-to-date, detailed information on the scientific efficacy of various supplements for the treatment or prevention of disease, refer to the following Web sites:

University of Illinois, Chicago—
http://www.uic.edu/pharmacy/research/diet/ce.html
United States Pharmacopeia—http://www.usp.org
Office of Dietary Supplements—
http://dietary-supplements.info.nih.gov/

Advances in nutrition research have discovered new components that, when delivered in the right amount, have measurable health benefits. As research programs and new supplements enter the market, healthcare professionals will need to assess the potential safety and efficacy benefits some of these products will offer. The role of dietary supplements —vitamins, minerals, amino acids, proteins, newly discovered nutrients (such as isoflavones, phytosterols), and botanicals—in the optimization of health, prevention, and treatment of disease is growing rapidly as researchers uncover new evidence to support their usage. While the use of vitamins and minerals is generally well documented to treat and prevent disease states, some studies on herbal and botanical supplements also look promising for treatment and wellness strategies.

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3. Mahady G. Herbal Medicines: What Works, What Doesn't. Presented at American College of Physicians, April 15, 2000; Philadelphia, PA. Presentation and accompanying handout available at http://www.uic.edu/pharmacy/research/diet/ce.html.

Section G:

EFFECTIVE COMMUNICATION WITH PATIENTS

Discussing the potential benefits and risks of taking various dietary and herbal supplements with patients does not require new skills for healthcare professionals, since most are already well versed in approaching controversial subjects with their patients or clients. Asking about a patient's use of herbal remedies, vitamins, minerals, and other supplements should be part of a routine medical history that includes other lifestyle questions typically asked, such as those related to eating, smoking, exercise, recreational or illicit drug use, and alcohol habits.[1] Questions should be framed in an objective, open-ended, and nonjudgmental manner.

It is important to understand and respect the perspective of the patient and the reason he or she may feel that supplements are beneficial to health. Patients may take dietary supplements to prevent disease, to treat disease, or to improve functions such as stamina, memory, or energy level. Sometimes patients turn to supplements because they are dissatisfied with the treatment or disease prevention options offered by conventional medicine, and supplements help them feel more in control of their own health.[1] For some patients, dietary supplements are part of their culture and are used to treat or prevent a condition. Additionally, feelings of control from taking action are frequently cited as a reason for taking supplements. This, in part, explains why so many people who take supplements have chronic or incurable diseases such as acquired immunodeficiency syndrome (AIDS), arthritis, diabetes, or cancer.[2]

Many people wholeheartedly believe in the structure/function claims stated on the supplement label or in accompanying literature. For example, manufacturers may give a product a name that alludes to its effect, such as "Sleep" for insomnia, so there is no doubt about the product's intended use.

Advertisements, magazine articles, the Internet, personal experience, and anecdotal reports from friends and relatives all serve as sources of information on dietary supplements for consumers. Advice also comes from health food store employees, although most have no formal training in nutrition or herbal medicine. Some employees with no medical training even freely dispense medical advice by recommending specific products to help people treat a disease based on information provided by the consumer.[2]

Some evidence exist that select herbal and dietary supplements can promote health, such as that for St. John's wort, garlic, saw palmetto, and ginkgo biloba. However, as discussed in previous sections, the scientific evidence for many products is still incomplete relative to safety and efficacy. Obtaining the scientific evidence to support many of the advertising and label claims may be a long and difficult process.[1] Until that evidence emerges, pharmacists and dietetic professionals need to understand the current literature in relation to the risks and benefits of specific supplements. Pharmacists and dietetic professionals need to look for supplements with proven efficacy and safety, and guide patients to select those with proof over other supplements. In addition, they must access credible sources of information, and provide this information to patients so that they will make appropriate decisions. Healthcare professionals must develop and institute an appropriate monitoring plan for each patient taking a particular supplement.

Communication with patients regarding dietary supplement use requires healthcare professionals to be open to unconventional remedies and willing to investigate the potential merits and limitations of all unfamiliar supplements. Withholding judgment on the value of a supplement is advised until the healthcare professional can weigh the evidence, taking into consideration that patient's particular medical history, current use of medications, and dietary habits. Simply telling a patient to stop using a product if there is no clear risk to health can be harmful to the relationship between the healthcare professional and the patient.[1]

People are taking an increasingly active role in their health—asking questions, raising concerns, and sharing observations about what they've learned, read, and heard. At the same time, many people are not as open revealing their use of dietary supplements as they should be. Research shows that many people do not inform their physicians about their use of alternative therapies, including dietary supplements,[3,4] although they appear to be more open in speaking about supplements with pharmacists and dietetic professionals.[5,6] Patients may feel that healthcare providers would not approve of them taking specific supplements, might think of them as silly for taking supplements, and/or would tell them to stop. Therefore, patients do not always talk with their healthcare professionals about supplements. It is important for the healthcare professional to initiate a discussion regarding supplements and be prepared to answer questions and address any patient concerns.

Healthcare professionals should consider the following suggestions[7]:

- **Initiate conversation.** Ask patients about supplement use as part of the standard medical history. Do not wait for him or her to bring it up. Use the *Dietary Supplements Intake Form* (Appendix E) and *Food Frequency Record* (Appendix F) to gather information about supplement usage, and dietary and lifestyle habits.

This algorithm outlines a procedure for gathering information from patients about their usage of dietary supplements.

Algorithm of Dietary Supplement Use: Patient History

- Source of Supplements
  - ⇒ Over-the-counter
  - ⇒ Prescribed
- Type of Supplement
  - ⇒ Vitamin
  - ⇒ Mineral
  - ⇒ Herbal/botanical
  - ⇒ Amino acid/protein
  - ⇒ Fiber
- Dose and Frequency
  - ⇒ Amount
  - ⇒ How often
  - ⇒ With meals or other supplements
  - ⇒ What other supplement(s)
  - ⇒ Form of supplement—liquid, pill, unit dose, food
  - ⇒ Route—oral, injection
- Reason Patient Taking Supplement?
  - ⇒ Perceived benefits
  - ⇒ Preventive or treatment effects
  - ⇒ Label claims
  - ⇒ Recommendations from family members, friends or other persons
  - ⇒ Recommendation from another healthcare professional
- Patient Education
  - ⇒ Proven benefits/effectiveness
  - ⇒ Interactions with medications, foods/nutrients
  - ⇒ Appropriate dosage
  - ⇒ Duration of use
  - ⇒ Other cautions (eg, side effects, contraindications for use such as disease/health problems)
  - ⇒ Appropriate monitoring needed for specific supplement
- Documentation (in patient chart)
  - ⇒ Specific dietary supplements
  - ⇒ Patient perceptions
  - ⇒ Health outcome/symptom relief
  - ⇒ Adverse effects
  - ⇒ Drug interactions

Developed by Cynthia A. Thomson, PhD, RD and Anita B. Lasswell, PhD, RD; 2000.

- **Avoid judgments.** People take supplements because they believe them to be helpful. Be open-minded and fair when discussing supplement use with patients. Gain an understanding of your patients' motives, beliefs, and sources of influence (family, friends, magazines, other healthcare professionals). Provide information about the risks of taking dietary supplements particularly if certain supplements pose safety risks. Make sure patients understand that while they ultimately will make their own decisions about supplement use, healthcare professionals want to help them use such products safely.

- **Assess patient knowledge.** Find out what the patient knows about taking a particular supplement such as the benefits and risks; contraindications with medications, foods, or other supplements; etc. Initiating a dialogue about supplement use allows you to show your sincere interest in helping your patients improve their health. Providing current information to patients on the effectiveness of the supplement, pro and con, will help patients make informed decisions regarding supplement use. Then, patients will value the healthcare professional's opinion on controversial and/or potentially harmful supplements.

- **Become knowledgeable.** Know the safety, efficacy, potential interactions with other medications/foods, and recommended dosage levels of commonly used supplements (see Section I for a summary of recommended resources). Staying up-to-date on the literature in this quickly expanding area gives patients confidence that healthcare professionals understand the potential value of dietary supplements and don't automatically regard them as useless. Patients are more likely to rely on the advice of healthcare professionals who are open to the possibilities of supplements in promoting good health. Remind patients and clients that a supplement, by definition, is a substance to augment a healthful diet and lifestyle.

- **Provide easy-to-understand information.** While not a substitute for one-on-one communications, a handout of frequently asked questions and their accompanying answers may be a useful tool for practitioners to use with patients. The Appendix H handout, *Questions Consumers Frequently Ask About Dietary Supplements*, provides an overview of dietary supplements and answers general consumer questions about supplements. However, healthcare professionals will need to provide specific information to consumers on an individual basis. Fact sheets on various botanical supplements are available from the National Institutes of Health, Office of Dietary Supplements (http://www.odp.od.nih.gov/ods/) and the University of Illinois, Chicago/NIH Center for Botanical Dietary Supplement Research (http://www.uic.edu/pharmacy/research/diet/ce.html) Web sites. The *Food and Supplement Recommendation* handout found in Appendix

I of this guide provides patients with an easy-to-understand summary of recommendations regarding supplement and dietary recommendations.

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Section H:

WHERE DO WE GO FROM HERE?

There is a great deal of research and education to be done in the area of dietary supplements, and pharmacists and dietetic professionals can play an integral role in this process. Educating consumers and other healthcare professionals about the potential benefits and risks of taking dietary supplements is a primary need. Pharmacists and dietetic professionals can participate in research programs to gather more data on effectiveness or assist in legislative efforts to help strengthen regulations for dietary supplements. A summary of the goals for dietetic professionals and pharmacists in this rapidly growing area include:

- Routinely ask patients about their use of dietary supplements.
- Evaluate the evidence for safety and *efficacy* on a continuous basis.
- Continue to voice the need for rigorous, peer-reviewed research to assess efficacy conducted prior to product marketing. Ask manufacturers for safety and efficacy data.
- Be open-minded about supplements and their potential to optimize health or treat and prevent disease. Understand and respect the perspective of the patients and why they feel taking supplements is beneficial for their health.
- Educate consumers about the potential benefits, as well as the potential risks, of taking dietary supplements. Help consumers recognize supplements are not magic bullets and many products lack proof of efficacy. In addition, it will help consumers understand that dietary supplements are held to a lower safety standard than that applied to other over-the-counter medications. Healthcare professionals need to deliver the facts; the decision on whether or not to take a supplement is up to the consumer.
- Routinely report any adverse reactions to MedWatch. Manufacturers also need to be included in the adverse effects reporting system. Encourage regulation that requires manufacturers to submit to FDA any data they have solicited or any consumer reports they have received relevant to safety issues.
- Educate other healthcare professionals on the topic of dietary supplements.
- Become better recognized, credible sources of information on dietary supplements for consumers, the media, and other healthcare professionals.
- Continue to encourage changes in the regulatory environment regarding supplements. Lawmakers must be encouraged to establish effective enforcement policies that permit prompt removal of unsafe products from the marketplace; to establish a final rule on good manufacturing procedures specific to dietary supplements; and to revise label standards to ensure more useful information, clear guidelines, and to protect consumers from false and misleading claims. Encourage development of a system that assesses efficacy of dietary supplements.

Section I:

ADDITIONAL RESOURCES

Publications for Consumers

Lininger SW, ed. *A-Z Guide to Drug-Herb and Vitamin Interactions*. Rocklin, CA: Prima Publications; 1999.

Pierce A. *American Pharmaceutical Association Practical Guide to Natural Medicines and Regulatory Perspectives*. New York, NY: Stonesong Press; 1999.

Duke JA. *Green Pharmacy: New Discoveries in Herbal Remedies for Common Diseases and Conditions from the World's Foremost Authority on Healing Herbs*. Emmaus, PA: Rodale Press; 1999.

Gruenwald J, Brendler T, Jaenicke C, eds. *PDR for Herbal Medicines*, 2nd ed. Montvale, NJ: Medical Economics Company, Inc; 2000.

Newsletters

Environmental Nutrition. Subscription information at PO Box 420451, Palm Coast, FL 32142 or (800) 829-5384.

Nutrition Action Health Letter. Published by Center for Science in the Public Interest. Subscription information at http://www.cspinet.org.

Publications for Healthcare Professionals

Useful in the clinical setting

Blumenthal M, Goldberg A, Brinkmann J, eds. *Herbal Medicine – Expanded Commission E Monographs*. Austin, TX: American Botanical Council; 1999.

Brinker FJ. *Herb Contraindications and Drug Interactions*, 2nd ed. Sandy, OR: Eclectic Medical Publications; 1998.

Cohen MH. *Complementary and Alternative Medicine: Legal Boundaries*. Baltimore, MD: Johns Hopkins Press; 1998.

Fetrow CW, Avila JR, eds. *Professional's Handbook of Complementary & Alternative Medicines*. Springhouse, PA: Springhouse Publishing; 1999.

Natural Medicines Comprehensive Database. The Pharmacist's Letter/The Prescriber's Letter; 1999, Updated yearly.

Pelton R, LaVelle JB, Hawkins EB, Krinsky DL eds. *Drug-Induced Nutrient Depletion Handbook*. Hudson, OH: Lexi-Comp, Inc; 1999.

Useful in research or for in-depth background information

Blumenthal M, Goldberg A, Gruenwald J, Hall T, Riggins CW, Rister RS, eds. *Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*. Austin, TX: American Botanical Council; 1998.

Leung AY, Foster S. *Encyclopedia of Common Natural Ingredients Used in Foods, Drugs, and Cosmetics*, 2nd ed. New York, NY: Wiley; 1996.

Schultz V, Hansel R, Tyler VE. *Rational Phytotherapy: A Physician's Guide to Herbal Medicine*. New York, NY: Springer; 1998.

DerMardersoian A, ed. *Guide to Popular Natural Products (Abridged)*. St. Louis, MO: Facts and Comparisons; 1999.

Sarubin A. *The Health Professional's Guide to Popular Dietary Supplements*. Chicago, IL: American Dietetic Association; 2000.

Robbers JE, Tyler V. *Herbs of Choice*. Binghamton, NY: Haworth Herbal Press; 1999.

Internet Sites for Consumers

American Botanical Council
http://www.herbalgram.org

American Dietetic Association
http//www.eatright.org

American Pharmaceutical Association
http://www.pharmacyandyou.org *or* http://www.aphanet.org

Consumer Healthcare Products Association
http://www.ndmainfo.org

ConsumerLab.com
http://www.consumerlab.com

Herb Research Foundation
http://www.herbs.org

National Center for Complementary and Alternative Medicine
http://nccam.nih.gov/nccam/

National Council for Reliable Health Information
http://www.ncahf.org

The Natural Pharmacist
http://www.tnp.com

Office of Dietary Supplements (ODS)
http://dietary-supplements.info.nih.gov

SupplementWatch
http://www.SupplementWatch.com

RxList—The Internet Drug Index (alternative medicine page)
http://www.rxlist.com/alternative.htm

Internet Sites for Healthcare Professionals

Alternative Medicine Review
http://www.thorne.com/altm

American Botanical Council
http://www.herbalgram.org

American Dietetic Association
http://www.eatright.org

American Pharmaceutical Association
http://www.aphanet.org

Consumer Healthcare Products Association
http://www.ndmainfo.org

Council for Responsible Nutrition
http://www.crnusa.org
(202) 872-1488

The Dietary Supplement Quality Initiative
http://www.dsqi.org

European Herbal Practitioners Association
http://www.users.globalnet.co.uk/~epha/

Food and Drug Administration
http:/www.fda.gov

Herb Research Foundation
http://www.herbs.org

International Bibliographic Information on Dietary Supplements (IBIDS)
http://odp.od.nih.gov/ods/databases/ibids.html

NAPRALERT—Natural Products Alert Database (subscription required)
http://www.pcog8.pmmp.uic.edu/mcp/nap1.html

National Center for Complementary and Alternative Medicine
http://www.nlm.nih.gov/nccam/camonpubmed.html/

National Council for Reliable Health Information
http://www.ncahf.org

Natural Medicines Comprehensive Database (subscription required)
http://www.naturaldatabase.com

The Natural Pharmacist
http://www.tnp.com

Office of Dietary Supplements (ODS)
http://dietary-supplements.info.nih.gov

SupplementWatch
http://www.SupplementWatch.com

Phytonet
www.exeter.ac.uk/phytonet/

USDA Nutrient Data Laboratory
http://www.nal.usda.gov/fnic/foodcomp

CD-ROM Databases

Complementary & Alternative Medicine Series. Micromedia, Inc.

Clinical Essentials. Portland, OR: HealthNotes, Inc.

USP24–NF19. United States Pharmacopeia–National Formulary CD-ROM. Rockville, MD: Updated January 2000.

Web addresses are subject to change.