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The effect of complimentary and alternative medicine products on laboratory testing

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A multi-billion dollar industry has evolved over the last decade based on herbal product sales with an underlying belief that herbals are natural and therefore safe. The herbal product industry is essentially unregulated and producers are not required to follow good manufacturing practices (GMP). Batch to batch product variation, heavy metal and pesticide contamination, and even therapeutic drug contamination are problematic. Compounding these manufacturing issues are drug to drug and drug to herbal interactions that can cause cytochrome induction or inhibition. It is important for physicians to query their patients on herbal use and educate them on the potential adverse reactions. Herbals have been used for thousands of years and undoubtedly have demonstrated health benefits. However, more research is needed to gain an understanding of the complexity issues from mechanism of action to interference with clinical laboratory testing.

The earliest recorded history of herbal medicine use dates back to the Han Chinese Dynasty, 2700 B.C., where 365 medicinal plants were catalogued according to disease treatment. Indian Ayurveda medicine has documented the use of plants and oils dating back to 1900 B.C., whereas the Egyptians, along with Native Americans, recorded herbal therapy use around 1000 B.C. Anthropologists have data suggesting that herbal medicine was practiced as far back as 15,000 B.C. and that every continent and virtually every culture used this medicine for healing. Herbal treatments are certainly not new, and many modern-day medicines have been derived from plant origin (eg, opium, aspirin, digitalis, quinine). Modern society has accepted the use of herbals based primarily on the premise that they are natural remedies; however, natural does not necessarily equal safe.

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Table 1[1] has a listing of commonly used herbal remedies and their purported usages. The table encompasses only a small portion of available herbals on the market and the health benefit claims vary from decreasing severity of a cold to reducing cancer risk.

Under the 1958 Food Additive Amendments to the Federal Food, Drug, and Cosmetic (FD&C) Act, the U.S. Food and Drug Administration (FDA) had premarket approval of dietary supplements, treating them as a food product. The FD&C Act grants the FDA ability to ensure the safety of dietary supplements and herbals and that there is truth in product labeling. The authority of the FDA changed dramatically when the Dietary Supplement Health and Education Act of 1994 (DSHEA)[2] was passed into law. Dietary supplements were no longer subject to premarket safety evaluations required of other food products or even for new uses of food products. The law was enacted by Congress because of consumer pressure. Legislators were led to believe that there were health benefits to dietary and herbal supplements and that industry deregulation would reduce overall health cost and disease incidence. The provisions of

Table 1 Common herbal supplements, reasons for usage, and potential problems

Herb	Purported usage	Potential problem
Echinacea	Limit severity of rhino-viral colds	Hepatoxicity
Feverfew	Migraine headaches	Altered bleeding time
Ginseng	Dyspepsia, vomiting, nervousness	Headache, manic episodes
Garlic	Lowering cholesterol	Altered bleeding time
Gingko	Improving memory	Altered bleeding time
Ginger	Rheumatoid arthritis, migraines, sore throat, atherosclerosis	Altered bleeding time
St. John's wort	Depression	Interacts with drugs, may limit iron absorption
Valerian	Sedative effect	Additive sedative efects
Licorice	Peptic ulcers, sore throat, coughs, skin inflammation, boils	Hypertension
Plantain	Diuretic, fevers	Interference with drug pharmcogenomics
Shankapulshpi (Ayurvedic preparation)	Memory enhancer	Interference with drug pharmcogenomics
Kava-kava	Sedative effects	Additive sedative effects, coma
Kelp	Weight loss, reduce cancer risk, hypothyroidism, Lyme disease, tuberculosis, reduce cholesterol	Potential interference with thyroid drug replacement

DSHEA established a new safety framework and expanded the meaning of a "dietary supplement" beyond a vitamin, mineral, or essential protein. The FDA retains the authority to prevent product distribution if, in its assessment, the product poses a danger to the public.

According to the DSHEA, a supplement manufacturer must follow good manufacturing practice (GMP) and the manufacturer may not make health claims on the product label unless the claim has been approved under the FD&C Act. Accordingly, health claims may not be made about the use of a dietary supplement to diagnose, prevent, mitigate, or cure a specific disease. Claims such as "cures cancer" or "treats arthritis" may not be used. Health claims that have been authorized by the FDA may be used on a product. Examples include the link between folic acid and reduction of neural tube defects or the reduction of the risk of osteoporosis by calcium. Although manufacturers must follow the product labeling requirements, what has occurred in the marketplace is an explosion of unsubstantiated consumer information on the Internet. These Internet product and supplement claims are being made by unknown sources and have gone as far as making claims for cures and accusing the health care industry of hiding these cures for their own profit motives. This type of marketing has created an unprecedented demand for supplements, herbal products, and, of course, profit takers.

An entire industry has been spawned in essentially an unregulated environment. During the 7-year period between 1990 and 1997, a national survey estimated that the sale of dietary supplements ranged from $10 billion to approximately $30 billion.[3] The National Institutes of Health conducted a survey in 1997 for the same period and reported even higher dietary supplementation sales, estimating them to be between $36 billion and $47 billion.[4] In addition, the herbal supplementation market represented an additional $5 billion in sales. As the dollar volume would indicate, the use of complementary and alternative medicine (CAM) products is widespread and growing. The following examples indicate just how extensively CAMs have penetrated daily life.

An Australian study of symptomatic women transitioning through menopause[5] found that slightly more than half were using CAM products, with red clover (*Trifolium pretense*), black cohosh (*Cinicifuga racemosa*), and soy being the most popular. In this group, almost 60% were also using a prescription or over-the-counter pharmaceutical. The decision to use the CAM product was generally made without consultation of a health care provider (62.5%), and although 70.4% of the women told their doctor about the CAM use, only 26.4% of the physicians inquired about CAM usage. (Incidentally, 59.5% of the women felt that the CAM product provided relief of the symptoms that drove their use.) Similar results have been reported in other studies.[6,7]

A study of American surgical patients found that 67% of participants used some type of CAM product within 2 weeks of their surgical procedure, with 27% consuming herbs, 39% using dietary supplements, and 54% using vitamins. One-third (34%) of the patients were judged to be using CAMs that potentially could interact with anesthetics or inhibit coagulation.[8]

A survey of families presenting to a pediatric emergency department in Toronto, Canada indicated that 20% of the children were using CAM products, with 15% using more than one. Review of the CAM products and the pharmaceuticals being used suggested that as many as 16% of the children using CAM products had combinations that presented the potential for CAM–CAM or CAM–drug interactions.[9-11]

There are many factors contributing to the growth of the dietary supplementation market, and they are beyond the scope of this review. However, the growth raises serious questions about product safety, efficacy, and the impact on individual personalized health. Other questions to consider include: What overall impact do CAM products have on the