

# BREAKFAST FOR THE BRAIN<sup>®</sup>

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**Breakfast for the Brain<sup>®</sup>** is a school-year e-mail service for science educators and others on topics in life science, biomedical research, and biotechnology, published by the Massachusetts Society for Medical Research, Inc.

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## MARCH 2002 – VOLUME 3 – THE USE OF ANIMALS IN SCIENCE

**ISSUE NO. 1:** Friday, March 1, 2002

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**Contribute!** Send comments, questions, guest articles, interesting Web sites, lesson plans, or articles that you would like to share with other educators on present or past topics to Leslie Nader, Ph.D., *Editor*, **Breakfast for the Brain<sup>®</sup>**, at [lnader@concentric.net](mailto:lnader@concentric.net). Subscriber feedback will be included through the **Open Forum** section of **Breakfast for the Brain<sup>®</sup>**.

#### Managing Your Subscription

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## OPENING MESSAGE & INTRODUCTION TO VOLUME 3

**Breakfast for the Brain<sup>®</sup>** is a school-year e-mail service (September through June) for science educators and others on topics in life science, biomedical research, and biotechnology. Topics change monthly and reflect current issues and areas of research in the life sciences. **Breakfast for the Brain<sup>®</sup>** features a topical article delivered on the first weekday morning of each month, followed by lesson plans, background facts and information, classroom activities, puzzles and games, announcements, and other items related to the topic delivered subsequently on varying mornings throughout the month. While topics focus on issues and events in biomedicine and biological science, **Breakfast for the Brain<sup>®</sup>** strives to be cross-curricular and to relate these issues and events to curricula and events in non-science, as well as science, disciplines.

To achieve these goals and make **Breakfast for the Brain**® a welcome addition to the classroom, subscribers are encouraged to actively participate in the content and format of this unique medium with insights, tried-and-true lesson plans, and other valuable input. Make suggestions for future topics and features you'd like to see covered in **Breakfast for the Brain**®. We will incorporate your feedback into the format through the **Open Forum** section of the newsletter.

*Introduction to Volume 3 – The Use of Animals in Science*

Animal research has been an absolutely essential tool of life scientists for more than a century. Yet the use of animals in science has been contentious from the beginning. Many subscribers will already be more or less familiar with some of the issues and arguments covering the spectrum of views in the animal research debate. However, the last word has not yet been uttered about animal research and there is plenty of room for new ideas and input.

This third volume of **Breakfast for the Brain**® seeks to examine aspects of the use of animals in science – some outlined before by the MSMR and others and reprised here, as well as some newer ideas and new formats for communicating them -- with the aim of deepening our understanding and continued exploration of the role that animal models play in the big picture of life science research. It is our goal in doing so to be honest in our approach and to examine the topic fairly but critically, including the arguments of those who oppose animal research.

We hope this topic will generate healthy participation amongst subscribers in whatever form they wish to use; however, we will insist that any participation be a civil and honest co-exploration, as that is always the spirit in which we offer our thoughts and ideas to you. Depending upon the extent of subscriber interest in exploring this topic with us, we may use the next two months for coverage of the use of animals in science exclusively.

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**ON THIS DAY IN HISTORY**

***Salem Witch Hunt begins***

In 1692, in Salem Village in the Massachusetts Bay Colony, Sarah Goode, Sarah Osborne, and Tituba, an Indian slave from Barbados, were charged with the illegal practice of witchcraft. Later that day, Tituba, possibly under coercion, confessed to the crime, encouraging the authorities to seek out more Salem witches.

Trouble in the small Puritan community began the month before, when nine-year-old Elizabeth Parris and 11-year-old Abigail Williams, the daughter and niece, respectively, of the Reverend Samuel Parris, began experiencing fits and other mysterious maladies. A doctor concluded that the children were suffering from the effects of witchcraft, and the young girls corroborated the doctor's diagnosis. With encouragement from a number of adults in the community, the girls, who were soon joined by other "afflicted" Salem residents, accused a widening circle of local residents of witchcraft, mostly middle-aged women but also several men and even one four-year-old child. During the next few months, the afflicted area residents incriminated more than 150 women and men from Salem Village and the surrounding areas of Satanic practices.

In June 1692, the special Court of Oyer, "to hear," and Terminer, "to decide," convened in Salem under Chief Justice William Stoughton to judge the accused. The first to be tried was Bridget Bishop of Salem, who was found guilty and executed by hanging on June 10. Thirteen more women and four men from all stations of life followed her to the gallows, and one man, Giles Corey, was executed by crushing. Most of those tried were condemned on the basis of the witnesses' behavior during the actual proceedings, characterized by fits and hallucinations that were argued to be caused by the defendants on trial.

In October 1692, Governor William Phipps of Massachusetts ordered the Court of Oyer and Terminer dissolved and replaced with the Superior Court of Judicature, which forbade the type of sensational testimony allowed in the earlier trials. Executions ceased, and the Superior Court eventually released all those awaiting trial and pardoned those sentenced to death. The Salem witch trials, which resulted in the executions of 19 innocent women and men, had effectively ended.

The events surrounding the Salem Witch Trials have in recent years been attributed to a chemical – called ergot – produced by the fungus *Claviceps purpurea*. For more information, see the **Toxicology Trivia** section of **Breakfast for the Brain©** – Volume 1 – January 2002 – Issue No. 6.

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### CONSIDER THIS...

Evolution may have led to distinct appearances and biologies for yeast, fruit flies, worms, mice and humans, **BUT** it also has left many essential systems alone. Biologists speak of many genes being *conserved* – i.e., the genes for many basic cellular mechanisms have been preserved over millions of years and many of these genes today have similar or identical structures (and their protein products perform similar or identical functions) over a wide range of species. Fundamental cellular mechanisms, therefore, are remarkably similar from single-celled microbes to advanced mammals.

*And so it is that living organisms provide invaluable model systems in which to study biology and disease across species boundaries...*

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### UNFINISHED BUSINESS

**News & Items Related to Previous Issues of Breakfast for the Brain©**

[Breakfast for the Brain© - Volume 1 – January 2002 - Toxicology](#)

[Breakfast for the Brain© - Volume 2 – February 2002 – Drug Discovery & Development](#)

### TOXIC HEAVY METALS & UNDECLARED DRUGS IN ASIAN HERBAL MEDICINES

*Reprinted from:*

**HMS Beagle**, The BioMedNet magazine

“Toxic Heavy Metals & Undeclared Drugs in Asian Herbal Medicines,” by Edzard Ernst.

Issue 120, posted February 15, 2002

<http://news.bmn.com/hmsbeagle/120/notes/feature4>

#### Abstract

*Asian herbal medicines are currently used by large sections of the population. Because they are not regulated as medicines and are freely available to everyone, serious safety concerns might be associated with these herbal medicines. In this article, evidence suggesting that some Asian herbal medicines contain toxic heavy metals or undeclared prescription drugs is reviewed. In particular, Indian and Chinese preparations have been implicated. Although adulteration with drugs is by definition fraudulent, the inclusion of heavy metals could be either intentional for alleged medicinal purposes or accidental. Evidence from various countries implies that toxic heavy metals and undeclared prescription drugs in Asian herbal*

*medicines might constitute a serious health problem. However, the majority of the data is anecdotal and insufficient to define prevalence figures. Ways ought to be found to maximize consumer safety.*

In most developed countries, Asian herbal medicines (AHMs) are becoming more and more popular [1]. However, usually AHMs are not regulated as medicines. Problems might arise as a result of the lack of adequate regulations, the pharmacological complexity of herbal products, and the paucity of information on the pharmacology and toxicity of these compounds. AHMs can be purchased from outlets ranging from health-food stores to Internet sites, and thus a crucial evaluation of their safety is relevant and important. One obvious safety issue relates to the possibility that some AHMs contain heavy metals or undeclared drugs [2]. Based on a review of the recent medical literature (Medline, Embase 1990-2001), this article aims to summarize the recent evidence pertaining to this subject.

### **Indian Remedies**

Indian medical systems (e.g. Ayurveda and Unani) have a long and rich history of herbal medicine, and heavy metals have been a regular and deliberate constituent of traditional Indian remedies [3]. Thus, to use the term "contamination" with respect to the presence of heavy metals in such remedies might be misleading (see below). A London-based toxicology unit published a case series of adverse events associated with traditional medicines that were reported to them between 1991 and 1995 [4]. Of 12 cases of poisoning with lead, arsenic or mercury, nine cases were associated with herbal remedies from India and the remainder was due to traditional Indian cosmetics (e.g., "surma.") A recent exemplary case report from Italy [5] (Box 1) exhibits many hallmarks of such cases: desperate parents, non-medically qualified healers, lack of product standards, undeclared ingredients, nondisclosure of usage and long-term medication, in addition to delay of diagnosis of poisoning and hence delay of effective therapy.

#### **Box 1. Case report of arsenic poisoning through a traditional Indian remedy**

Patient	Five-year-old Italian boy with congenital bilateral retinoblastoma
Remedy	Indian healer prescribed ethnic remedies (undescribed pills and powders) in August 1995 because parents wanted to avoid proposed enucleation of the boy's second eye
Symptoms or signs of toxicity	Nausea, fatigue, parasthesiae, progressive weakness of lower limbs, normochromic anaemia and leukopenia (all August 1996)
Diagnosis	Arsenic concentration in remedy ( $184 \text{ mg g}^{-1}$ ) and patient's hair ( $6.6 \text{ mg kg}^{-1}$ )
Therapy	Discontinuation of traditional Indian remedies
Outcome	Full recovery from arsenic poisoning

Indian authors recently analyzed 31 Ayurvedic formulations obtained in India for their mercury content [6]. With the exception of one remedy, all exceeded the legal limits of 1 ppm mercury and 16 preparations exceeded the limits by more than two orders of magnitude. These authors also noted that huge variability of mercury content existed within one allegedly identical remedy manufactured by different companies. No recent systematic investigations are available about the prevalence of heavy metal content of traditional Indian remedies on sale in developed countries. Thus, a considerable degree of uncertainty continues to surround this area.

### **Chinese Remedies**

Numerous case reports and case series of heavy metal poisoning associated with the use of traditional Chinese medicines (TCMs) have been published [7]; lead has relatively often been implicated as the cause of such poisoning but mercury, cadmium, arsenic, copper, and thallium have also been found in TCMs [7].

Californian officials have screened for undeclared pharmaceuticals and heavy metals in imported Chinese remedies on sale in Californian herbal retail stores [8]. Seven percent of the 251 products tested contained

undeclared pharmaceuticals (e.g., ephedrine, chlorpheniramine, methyltestosterone, and phenacetin). Twenty-four products contained at least 10 ppm lead, 36 contained an average of 14.6 ppm arsenic, 35 contained an average of 1,046 ppm mercury, and 23 had more than one contaminant and/or adulterant. Koh and Woo [9] reported the detection of toxic heavy metals that exceeded Singapore's legal limits in 42 Chinese proprietary medicines. They collected 2,080 samples of such medicines in Singapore and tested them for heavy metal content. Forty-two different medicines were found to contain metals in amounts exceeding the legal limits. Mercury was found in 28 products, lead in eight, arsenic in six, and copper in one. One product contained both mercury and lead and another product contained both mercury and arsenic. Melchart et al. [10] analyzed all 317 batches of dried Chinese herbs delivered to a German hospital of Chinese medicine. Heavy metal content beyond the legal limits was detected in 3.5% of these samples.

Obviously, heavy metals are not the only possible toxic ingredients in herbal remedies; contamination with herbicides, pesticides, microorganisms; or mycotoxins, insects, or undeclared herbal constituents are other relevant possibilities [2, 11-13]. Moreover, contamination with toxic herbal constituents (e.g., through misidentification of the herbal ingredients) can be a serious problem. In Belgium, the use of a TCM contaminated with plants from the *Aristolochia* species resulted in an epidemic of subacute intestinal nephropathy. Many of the affected patients required kidney transplantation. When 19 kidneys and urethras removed from ten such patients were examined histologically, there were conclusive signs of neoplasms in 40% of cases [14].

Numerous case reports originating from countries such as Australia, Belgium, China, the Netherlands, New Zealand, United Kingdom, and United States demonstrate the adulteration of TCMs with synthetic drugs and associate the use of adulterated remedies with health problems of the user [15]. The adulterants include a wide range of pharmaceuticals (Box 2). The resulting clinical consequences are often serious and sometimes life threatening: agranulocytosis, Cushing's syndrome, coma, the excessive increase of the international normalized ratio (INR) have all been reported. In other cases, the adulterants caused no symptoms at all and the problem was discovered only through routine check-ups or through the remarkably good clinical response, which turned out to be due not to the TCM but to the undeclared prescription drug.

**Box 2. Undeclared pharmaceuticals that have been found in traditional Chinese remedies**

- Acetaminophen (paracetamol)
- Aminopyrine
- Caffeine
- Carbamazepine
- Chlorzoxazone
- Clobetasol propionate
- Dexamethasone
- Diazepam
- Diclofenac
- Ethoxybenzamide
- Fluocinolone acetonide
- Glibenclamide
- Hydrochlorothiazide
- Hydrocortisone
- Indomethacin
- Mefenamic acid
- Methylsalicylate
- Phenacetin
- Phenylbutazone
- Phenytoin
- Valproate

Analyses are available of Chinese herbal medicines collected in Australia [16], Taiwan [17] and UK [18]. The largest of these studies is that of Huang and colleagues from Taiwan [17], who showed that 24% of all 2,609 samples collected contained at least one adulterant. This high prevalence was due to the fact that the

samples were associated with reports of adverse effects and poisoning, and possibly included low-grade folk remedies. Examples of recent case reports [19,20] are illustrated in Boxes 3 and 4.

**Box 3. Case report of mercury poisoning by a traditional Chinese remedy**

Patient	Five-year-old boy from Hong Kong with mouth ulcers
Remedy	Chinese patent medicine (ingredients not known)
Symptoms or signs of toxicity	Irritability, skin rash, motor and vocal tics
Diagnosis	Mercury concentration in remedy was 878 ppm whereas the level of blood mercury was 17 µg dl <sup>-1</sup>
Therapy	Discontinuation of remedy
Outcome	Full recovery within 2 weeks

**Box 4. Case report of adulteration of a traditional Chinese remedy with prescription drugs**

Patient	56-year-old Indonesian man with type II diabetes
Adulterated remedy	"Zhen Qi" bought for diabetes in Malaysia (herbal ingredients not known)
Symptoms or signs of toxicity	Pre-comatose state, persistent hypoglycaemia
Diagnosis	Analysis of the remedy revealed the presence of undeclared glibenclamide
Therapy	Dextrose infusions, discontinuation of Chinese remedy
Outcome	Full recovery

**Concerns About the Safety of Asian Herbal Medicines**

These data raise concerns about the safety of consumers using AHMs. Both toxic heavy metal content and adulteration with prescription drugs have been reported. To date, few data are available to calculate the prevalence of these problems reliably in developed countries. A recent press release [21] of the British "Medicines Control Agency" stated that this regulatory body "continues to find potentially dangerous and illegal ingredients in TCMs. Recently TCMs have been found to include . . . mercury and arsenic . . . [and] prescription only steroids." It is notable that the majority of clinical problems occur with self-prescription of AHMs. One could therefore argue that consulting an experienced herbal practitioner might avert adverse events; however, evidence is required to support this claim.

Several possibilities exist to explain the presence of heavy metals in AHMs. First, heavy metals could be included intentionally for alleged medicinal properties. Some Indian schools of medicine emphasize the importance of metals such as lead, copper, gold, iron, mercury, silver, tin and zinc for the proper function of the human body [22]. Ayurvedic textbooks, for example, take note of the toxicity of heavy metals and recommend special physicochemical processes that, according to ancient Indian belief, "detoxify" such toxic heavy metals (e.g. by heating them until they glow [23]). In traditional Chinese medicine, mercury is part of some preparations under the terminology of "cinnabaris" (mercury sulfide), "calomel" (mercury chloride) or "hydrargyri oxydum rubrum" (mercury oxide). Such products are used for a variety of indications including, for example, as a tranquilliser, an anti-epileptic, for ulcers or to treat insomnia [9]. Lead is used as "Mi Tuo Seng" (Lithargyrum) [24] and arsenic as "Xiong Huang" (Realgar) [25] in the manufacture of several TCMs. Strictly speaking, these constituents are thus not contaminants but ingredients deliberately included for a specific curative purpose.

Second, the presence of heavy metals might be the result of contamination during manufacture, for example, from grinding weights or lead-increasing containers or other manufacturing utensils [9]. Third, AHMs might contain heavy metals when grown on seriously polluted soil [26]. In this context it is relevant to

note that TCMs might also contain animal and mineral products and that these too might be contaminated with heavy metals [27].

Although contamination can be accidental, adulteration is, by definition, fraudulent. The reasons why some AHMs contain prescription drugs are speculative. I suspect that some manufacturers include such ingredients to render their products more clinically effective. If this is the case, it seems obvious that the inclusion of prescription drugs is fraudulent and illegal.

Many consumers are motivated to try AHMs through a misconception that these remedies are inherently safe [28], and there is evidence that the (UK) daily press have their share in perpetuating this myth [29]. Approximately half of the individuals using herbal medicines do not tell their physician [30]. This level of non-communication further increases the risk to the consumer because doctors might fail to diagnose adverse effects caused by treatments of which they are not aware. The majority of people taking herbal remedies combine them with conventional drugs [30]. This opens the possibility of herb-drug interactions [31,32], which, in turn, further raises concern about consumer safety. Recent evidence suggests that consumers are beginning to become concerned about the risks of under-regulation of dietary supplements, and the majority of US consumers now seem to support [33]: (1) the requirement that the Food and Drug Administration (FDA) review the safety of new dietary supplements before their sale; (2) increased authority to remove from sale those products shown to be unsafe; and (3) increased government regulation to ensure that advertising claims about the health benefits of dietary supplements are true.

How can the risk to patients be minimized? An appropriate strategy [34,35] (Box 5) should follow several avenues. The consumer should be informed that "natural" does not necessarily mean 'free from risk' and that adverse effects as a result of AHMs are an undeniable reality. Patients and physicians should be encouraged to talk about the use of AHMs and other complementary/alternative treatments [34] and the possibility of interactions of herbal medicines with prescribed drugs [31,32]. Regulators should consider measures to control this sector of healthcare more effectively.

**Box 5. Advice for patients regarding use of herbal medicine [a]**

- Herbal remedies must be considered medicines
- Follow recommended dosages
- Avoid long-term therapy
- Consult and discuss issues with a doctor
- Be aware of the possibility of herb-drug interactions
- Be aware of the possibility that some (Asian) herbal medicines might contain toxic heavy metals or undeclared drugs
- Buy only from reputable sources
- When experiencing adverse effects, stop herbal medicine and consult your doctor
- Vulnerable individuals (e.g. young children) and women who are pregnant or breastfeeding should not use herbal medicines

<sup>a</sup> Ko, R. 1999. Adverse reactions to watch for in patients using herbal remedies. *West. J. Med.*, 171, 181-186.

It is concluded that toxic herbal metals and undeclared drugs in AHM represent a potentially serious problem that puts consumers at risk. Means of minimizing this risk must be found and implemented.

*Wang, Ang, b. 1615; Hu, Tsung-wen Shen-nung pen ts'ao pei yao i fang ho pien (Herbal and Prescriptions) China, 1740. 6 vols. from The National Library of Medicine.*

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## **Lesson:**

### **Herbs: Healthy Alternatives or Bad Medicine? Comparing Herbal and Pharmaceutical Remedies for Common Ailments**

#### **Grade Level**

Middle and High School

#### **Teaching Objectives**

In this lesson, students compare herbal and pharmaceutical remedies for common ailments. Students will:

1. Share their beliefs about the use of herbal medicine.

2. Evaluate recent trends in using herbal supplements and recent research findings by reading and discussing the article entitled "Scientists Say Herbs Need More Regulation" (see Materials Needed below).
3. Investigate the reported effects and warnings about specific herbal and pharmaceutical remedies used to treat common ailments.
4. Develop comparison/contrast charts exploring the researched herbal and pharmaceutical remedies.

#### Materials Needed

- Student journals
- Paper
- Pens/pencils
- Classroom blackboard
- Copies of the article "Scientists Say Herbs Need More Regulation" (**NY Times**, March 7,2000). See: [http://www.nytimes.com/learning/teachers/featured\\_articles/20000307tuesday.html](http://www.nytimes.com/learning/teachers/featured_articles/20000307tuesday.html)
- Resource materials on the uses and criticisms of specific herbal and pharmaceutical medicines (e.g., health texts and reference books, encyclopedias, Internet)
- Large piece of poster board (per pair of students)

#### Lesson Activities

1. Warm-Up: Prior to class, write the following statements on the board:

- Herbal medicine is an ancient, worthless practice and has no basis in science.
- Herbal medicine may work for some, but I prefer taking more conventional medicine.
- Herbal medicine may be a viable medical practice, but I need more information.
- Herbal medicine is as reliable a medical practice as more conventional medicines.
- Herbal medicine is a better way to treat illness than conventional medicine.

(**Note:** For younger students, you may also provide definitions of herbal medicine and conventional medicine on the board.)

Provide the following for students to answer in their journals (also written on the board): "Think about these five statements about herbal medicine. Select the one statement with which you most agree, and write a journal entry about why you have chosen this statement. Include any facts or examples that you know of to support your ideas." Students then share their responses. Make a record of how many students agreed with each statement.

2. Read and discuss "Scientists Say Herbs Need More Regulation," focusing on the following questions:
  - a. Read the first three paragraphs of the article. Why might someone with a terminal illness like cancer turn to herbal remedies?
  - b. What was the purpose of the conference "The Efficacy and Safety of Medicinal Herbs"?
  - c. Why are herbal remedies not regulated in the same way that pharmaceutical drugs are regulated?
  - d. Why are people comfortable with turning "to magazines for information" about health and herbal remedies?
  - e. Why might herbal remedies be more accepted in some countries than in others?
  - f. The article examines eight common herbal remedies: St. John's Wort, saw palmetto, ginseng, comfrey, garlic, feverfew, ginkgo biloba and echinacea. What have doctors found about the uses and misuses of these remedies?
  - g. Why is it difficult for Americans to "obtain reliable products with known doses of (herbal) substances that have medicinal effects"?
  - h. What suggestions does Dr. Varro E. Tyler offer? How does he fault "manufacturers (and) the FDA" for the misuse of herbal remedies?

- i. What is Dr. Tyler's position on the testing of herbs for medicinal use, and what would this testing require?
3. As a class, develop a list of common ailments on the board (such as headache, stomachache, runny nose, sore throat, allergies, depression, obesity, and sleeplessness). Divide students into pairs, and assign each pair an ailment from the list for research of one herbal remedy and one pharmaceutical remedy. For each remedy, students should investigate the answers to the following questions (written on the board for easier student access):
    - What are the reported effects of this remedy?
    - How does this remedy work?
    - What is the history behind the use of this remedy? (When, where, and why was it first used?)
    - In what products would one find this ingredient?
    - What warnings exist regarding this remedy?
    - What are the conflicting claims about the benefits of this remedy?
  4. Wrap-Up: After concluding their research, each pair creates a comparative chart documenting their findings about both the herbal remedy and the pharmaceutical remedy. Students should make their posters visually interesting by including pictures, illustrations, related headlines and other interesting items. In a future class session, students should share their research by either presenting their findings orally or by displaying posters in the classroom.

#### Further Questions for Discussion

- How do you feel about the current trend in using herbal remedies, and why?
- In what types of non-medicinal products might one find herbs used for medicinal purposes?
- How have herbs and other botanicals been used in various civilizations over time?
- Do you feel that herbal remedies have as much true medicinal value as more traditional medicines, and why?
- What does the increase in the trend of using herbal supplements rather than more conventional medicines tell one about the views of our society as a whole?
- Why might one choose to use an herbal supplement over a conventional medicine?
- Why are herbal products not as closely regulated as drugs, and how might this endanger consumers?
- How do proponents of herbal medicine support the use of herbs for medicinal purposes?
- If herbal products are not closely regulated, why are consumers buying them at such a high rate?
- How are the natural supplies of some herbs becoming endangered due to the popularity of herbal supplements, and what might this mean for the future of the industry and of the earth?
- What informational goods and services about herbs and their uses are now in existence, and what may they do to forward the trend in herbal supplements?
- Why do conflicting claims about the benefits of various herbs exist? --Do you feel that herbal supplements should have to adhere to the same strict standards as drugs, and why?
- Do you feel that herbs used as medicine should be considered drugs, and why?

#### Vocabulary

tinge, herbalist, supplements, nutrient, epidemiology, efficacy, medicinal, mainstream, rigorous, scrutiny, vast, harvesting, reliable, chronic, placebo, antioxidant, toxicity, inflammation, dementia, extracts, emeritus, pharmacognosy, bewildered, patentable

#### Extension Activities

1. Investigate the importance of testing any scientific experiment or question over time. How does long-term testing affect the reliability and validity of results? What is the purpose of a control group? How do these ideas relate to the featured article?

2. Interview a medical doctor and an "alternative" practitioner about the issues discussed in the article, and compare their responses. What similarities and differences of opinion exist, and why?
3. Visit a health food store and a pharmacy, and research herbs and other supplements added to foods and over-the-counter drugs. Why are these things added, and what are their effects? Would the presence of these supplements encourage or discourage you from purchasing the products, and why?
4. Investigate the medical training necessary to become the types of doctors mentioned in the featured article. What kinds of treatments are they experts in, and why are some methods not studied in traditional medical schools in the United States? Try to interview different types of doctors, as well as conduct traditional research, to find these answers.
5. Learn about how different health insurance companies view herbal remedies and other non-traditional forms of medicine as reflected in what their policies will financially cover.
6. Research digitalis (made from the leaves of the purple foxglove plant and used as a cardiac stimulant) and other all-natural medicines that are part of conventional medicine rather than being considered as "herbal supplements." What do you think differentiates these medicines from being considered herbal medicines?
7. Debate or write a persuasive essay analyzing why people may turn to herbal supplements and other alternative medical practices (such as acupuncture, chiropractic and aromatherapy), or the role that medicine plays in our society.
8. Interview members of your family about healing practices in which they have participated during the course of their lives. Older family members may offer insight into what medicine was like when they were younger.
9. Evaluate various sayings about health, such as "an apple a day keeps the doctor away." How do these sayings reflect the beliefs and practices of the culture in which they are used?

### Interdisciplinary Connections

*American History/Civics* - Create a timeline reflecting the history of drug regulation in the United States, including major legislation and the establishment of important organizations and government divisions such as the Food and Drug Administration.

*Geography* - Learn about ethnobotany, the study of natural remedies used by different peoples in relation to the natural resources available.

*Global Studies* - Explore the roots of herbal medicine and other forms of alternative medical beliefs and practices.

*Mathematics* - Compare statistics on the use of herbal remedies to those of more conventional types of medicine over a period of time. Create a graph reflecting your findings.

*Media Studies* - Analyze advertisements and packaging of natural, organic, and herbal products. What tactics do these ads and product packages use to inform and persuade customers to use these products?

*Media Studies/Technology* - Explore how different Web sites promote or challenge the use of herbal remedies. How can someone figure out, based on the vast amount of information on the Web, what information is accurate?

### Some Internet Resources

- The United States Food and Drug Administration Web site (<http://www.fda.gov>) provides press releases, weekly enforcement reports, consumer magazines, research, and regulation information.
- Herbal Market (<http://www.herbalmarket.com>) is an online consulting and information service to help consumers decipher the thousands of herbal products on the market.
- The Herb Research Foundation (<http://www.herbs.org/index.html>) is dedicated to responsible informed self-care with medicinal plants.
- The National Institute of Health (<http://www.nal.usda.gov/fnic/IBIDS/>) is a database of dietary supplements, including herbal products.

- The American Botanical Council (<http://www.herbalgram.org>) aims to educate the public on the use of herbs and phytomedicinals.

**Source:** Alison Zimbalist and Tanya Yasmin Chin, NY Times Learning Network, March 7, 2000, [http://www.nytimes.com/learning/teachers/lessons/20000307tuesday.html?searchpv=learning\\_lessons](http://www.nytimes.com/learning/teachers/lessons/20000307tuesday.html?searchpv=learning_lessons).

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The mission of the Massachusetts Society for Medical Research, Inc. (MSMR) is to promote and enhance biomedical and biological research, including the proper care and use of animals, for the improved health and well-being of people, animals, and the environment. In furtherance of this mission, the goal of the MSMR is to improve basic literacy in and enthusiasm for life science among the public, the media, and especially future generations of citizens and scientists.

The MSMR offers a full-range of programs and materials to classroom educators on topics in biomedical science, biotechnology, and the use of animals in research and testing. Most of the MSMR's outreach programs and materials are available free of charge to K-12 educators throughout the Northeast (New England and New York). To request a copy of the MSMR's catalogue of programs and materials, send an e-mail request to Leslie Nader, Ph.D., *Vice President for Education*, at [lnader@concentric.net](mailto:lnader@concentric.net).

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## OPEN FORUM

**Contribute!** Send comments, questions, guest articles, interesting Web sites, lesson plans, or articles that you would like to share with other educators on present or past topics to Leslie Nader, Ph.D., *Editor, Breakfast for the Brain*<sup>®</sup>, at [lnader@concentric.net](mailto:lnader@concentric.net). Subscriber feedback will be included through the **Open Forum** section of **Breakfast for the Brain**<sup>®</sup>.

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