

Powerful Therapeutic Spices in Medicine

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Introduction

This course will discuss the properties of spices regarding nutrient density, their therapeutic uses in medicine, safety profile, and practical culinary applications. As oral health educators, we have the responsibility to understand the scientific evidence surrounding complementary and alternative medicine (CAM) and provide safe and accurate information to our patients.

Conflict of Interest Disclosure Statement

- The author reports no conflicts of interest associated with this course.

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Overview

Learn about the therapeutic effects of spices; the focus of this course will be on cayenne, cinnamon, clove, cumin, fennel, fenugreek, garlic, ginger, saffron, and turmeric. Spices have a long history of medicinal use across the globe in India, China, the Middle East, and Europe. This course will discuss the properties of spices regarding nutrient density, their therapeutic uses in medicine, safety profile, and practical culinary applications.

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Explain the components of complementary and alternative medicine (CAM).
- Define and list ten therapeutic spices and their history of medicinal use.
- Discuss clinical applications of spices for healthcare providers.
- List notable nutrients for therapeutic spices.
- Identify the safety profile of therapeutic spices.
- Describe current research and trends with use of therapeutic spices.
- Practical use of spices in culinary preparation.

Introduction

Long before modern medicine, spices were valued for their ability to help individuals fight



infection and aid in health promotion. Various civilizations relied on herbs and spices for both food and medicine.⁶ For example, in India, Ayurvedic medicine (some 3,000 years ago), utilized spices such as clove and cardamom. These spices were wrapped in betel nut leaves and chewed after a meal to increase salivary flow to aid in digestion. Spices also have a long history of use in Asia, Northeast Africa, and Europe as a form of currency during the spice trade. Spices such as cinnamon, cassia, cardamom, ginger, pepper, and turmeric were known and used for commerce in the Eastern World.¹

Today, people are increasingly interested in spice, not only to enhance the flavor of cuisine, but for the collective evidence in complementary and alternative medicine. Research is progressing and mounting evidence supports the therapeutic benefits of spices.

In preventive medicine, a diet rich in spices, fruits and vegetables is associated with a reduction of at least 20% of all cancers.⁶ According to the World Health Organization, "approximately 15% of oropharyngeal cancers can be attributed to dietary deficiencies."⁶ In fact, recent studies indicate a strong connection between a low-intake of antioxidant fibers and oral squamous cell carcinoma.⁶ Oral health is responsible for both the social and physical well-being of individuals.⁶ Vitamins, minerals, and antioxidants are natural occurring functional compounds found in spices that have amazing therapeutic properties.

"Let food be thy medicine and medicine be thy food." ~ Hippocrates⁶

Complementary and Alternative Medicine (CAM)

Complementary and Alternative Medicine (CAM) has a significant effect on healthcare. CAM encompasses several broad categories; the alternative medical system, mind-body interventions, manipulative based models and biological based therapies. Table 1 lists specific examples of each category. National healthcare and pharmaceutical options can be cost prohibited for many Americans, CAM offers an affordable option for many patients. While pharmaceutical ingredients have their value, we should not overlook the well-documented, non-toxic, healing properties of biologically based therapies. CAM may be used for various health conditions and disease processes including hypertension, hyperlipidemia, nausea, inflammation, insulin and immunity support, mood disorders, and even cancer, just to name a few. Therefore, healthcare providers should be cognizant of the use, efficiency, adverse reactions, and scientific evidence surrounding CAM. Our goal as healthcare providers is to offer safe, effective treatment and accurate information to our patients.⁵

Cayenne (*C. annuum*)

The cayenne pepper, also known as the Guinea spice, cow-horn pepper, red hot chili pepper, or in its powdered form, red pepper, is a cultivar

of *Capsicum annuum*, which is related to the bell pepper, jalapeno pepper, and paprika.¹

Cayenne peppers get their heat from compounds called capsaicinoids, the most researched being capsaicin, a powerful phytochemical responsible for many heart healthy and anti-cancer properties. Capsaicin has antioxidant and anti-inflammatory benefits, stimulates metabolism, and may enhance the absorption of nutrients by enlarging the villi-like hair-like structures in the small intestine that transport vitamins and minerals into the bloodstream.³ Scientists also believe capsaicin extract may inhibit harmful bacteria in the gut.³ Latest findings also demonstrate a significant reduction in the proliferation of cancer cells in the lungs, pancreas and prostate of mice.⁴

Adverse reactions to capsaicin may include anti-coagulate properties and worsening of gastrointestinal conditions such as heartburn, ulcers and GERD.⁴ It is advised that people on medications for hypertension (ACE inhibitors), stomach acid reducers, aspirin or blood-thinning medications and diabetes medications consult with their doctor before using capsaicin for medicinal purposes.

Vibrant color is important in choosing the most flavorful and powerful qualities of dried

Table 1. CAM Categories.⁵

CAM by Category	Examples
Alternative Medical System	Homeopathic Medicine Naturopathic Medicine
Mind-body Interventions	Relaxation, Meditation, Hypnosis, Imagery
Biologically Based Therapies	Herbs, Spices, Food
Manipulative Based Models	Chiropractic, Massage

or fresh peppers. All varieties; ghost, chili, poblano, habanero, jalapeno, are easy to grow at home for greatest bioavailability. Peppers are classic additions to sautéed vegetables, omelets, lentils, and Mexican cuisine.



One tablespoon of cayenne pepper contains:¹
17 calories
1 gram of fat
2 milligrams sodium
3 grams carbohydrate
1 gram dietary fiber
1 gram sugar
1 gram protein
44 percent vitamin A

Clove (*Syzygium aromaticum*)

Cloves are the aromatic flower buds of a tree in the Myrtaceae family. They are native to the Maluku Islands in Indonesia and are commonly used as a spice, sold both whole or ground.¹ Clove seeds contain at least 15% volatile oil, eugenol, a phytochemical responsible for its effective antiseptic and anesthetic.⁹ Oil of clove has been used in dental plasters, fillings and cements for many years. Clove gel also provides an effective alternative to benzocaine for topical anesthesia.⁷

Clove is considered the number one spice when it comes to a true antioxidant superfood.⁸ A mere half-teaspoon contains as many antioxidants as a half-cup of blueberries.³ Studies show clove capable to reduce blood levels of inflammation in just seven days.⁸ Clove oil is also a powerful antimicrobial. Research confirms it is effective at inhibiting

the growth of foodborne pathogens, certain bacteria, and fungi.⁸

Clove has an excellent safety profile with few documented adverse reactions. Cloves tend to lose their potency quickly, so it is best to purchase whole cloves versus clove powder.⁸

In culinary dishes, clove may be used in both sweet and savory dishes; pumpkin pie, curries, chili, ham and beans.



One tablespoon of ground cloves contains:¹
18 calories
0.8 gram of fat
18 milligrams sodium
4.3 grams carbohydrate
2.2 gram dietary fiber
4% calcium
4% iron
4% magnesium

Cinnamon (*Cinnamomum aromaticum*)

Cinnamon is a spice obtained from the inner bark of several tree species and is used in both sweet and savory foods.¹ Most cinnamon sold in the United States is in the form of sticks or ground powder and is grown in China, Vietnam, and Indonesia.³

Cinnamon contains cinnamaldehyde, a phytochemical that may fight viruses, lower blood sugar and cholesterol as well as protect against neurodegenerative diseases.¹⁰ A study comparing the antioxidant level of spices ranked cinnamon as number two for its

potency, right behind cloves.⁸ Besides showing promise for promoting better glycemic control and reducing total cholesterol, it is also being studied as improving hormone imbalances in women of reproductive age.⁸

Coumarins are naturally occurring plant compounds found in cinnamon that have strong anticoagulant properties; therefore, it should not be used in patients taking a blood thinner. Excessive amounts of this compound may also have a toxic effect on the liver.¹¹ Up to one teaspoon of cinnamon a day is safe for daily consumption for most individuals. Supplement form should not be consumed during pregnancy or breastfeeding due to inconclusive data.⁸

Culinary uses include using it in baked goods, beef curries, smoothies, and hot and cold teas.



One tablespoon of ground cinnamon contains:¹
19 calories
0 grams of fat, sugar, or protein
4 gram of fiber
68% manganese
8% calcium
4% iron
3% Vitamin K

Cumin (*Cuminum cyminum*)

Cumin is a flowering plant in the Apiaceae family, native from the east Mediterranean to South Asia. Its seeds are used in the cuisines of many different cultures, in both whole and

ground form.¹ Cumin's nutrient profile includes amino acids, essential fatty acids, vitamins, minerals, and is an excellent source of iron.⁸ Cumin contains thymoquinone, unique only to this plant, which is a phytochemical with antioxidant and anti-inflammatory effects.¹¹ "That means it has the potential to help any chronic disease where there's an excess of inflammation," Dr. Lipi Roy, an internal medicine doctor at Harvard-affiliated Massachusetts General Hospital.¹⁰ In one study of patients with rheumatoid arthritis, when compared with a placebo group, patients found cumin oil was effectively in reducing pain, swelling and morning stiffness after daily use for one month.⁸

Cumin safety profile is good. Adverse reactions were reported in two studies when people experienced skin irritation for using cumin oil topically. Cumin seed is safe during pregnancy, but the supplement form should be avoided due to its ability to produce uterine contractions.⁸

In culinary use, cumin has a mild nutty, toasty taste which can be added to vegetables, beans, sauces, and soups.⁸



One tablespoon of cumin seed contains:¹
22 calories
1.3 grams of fat
2.7 grams sugar
1.1 grams protein
0.6 grams of fiber
5% magnesium
5% calcium
22% iron

Garlic (*Allium sativum*)

Garlic root bulb has been utilized thousands of years for medicinal purposes. For example, the Egyptian civilization used garlic to treat infections and intestinal parasites.⁵ Today garlic is the most widely studied herbal supplement in the United States. Garlic is a member of the lily family and is recognized for over 100 distinct phytochemicals. The most significant active compound that gives garlic its pungent smell and health benefit is allicin. Allicin is an active component containing a high concentration of sulfur-containing amino acids.⁶ Studies have been extensive on garlic's ability to reduce blood pressure, improve lipid profile, boost immune function, along with anticarcinogenic properties.⁷ In addition, various studies have shown that consumption of garlic decreases the risks of oral, colon, stomach, and skin cancer by inhibiting the proliferation of cancer cells.⁶ Other therapeutic properties found garlic paste effective in treating oral ulcers due to its strong antimicrobial activity against gram positive and gram negative bacteria and viruses.⁶

Clinical trials have consistently demonstrated "garlic breath" and body odor are the most common patient complaints.⁸ Garlic may enhance the pharmacological effect of anticoagulation and reduce the efficacy of HIV medications.⁸ Healthcare providers should be consulted when their patients are using a garlic supplement on a regular basis and should be aware of the potential side effects when combined with prescription medication.⁵

Garlic pairs well with olive oil in appetizers such as humus as well as homemade salad dressing, Italian dishes, and stir fries. To maximize the therapeutic properties, crush, mince, or mash garlic cloves and wait 10 minutes to allow the active ingredient, allicin, to reach bioavailability.⁸



One tablespoon of garlic contains:¹
4 calories
0 grams of fat, sugar, sodium
0.2 grams protein
0.1 grams of fiber
1% vitamin C

Ginger (*Zingiber officinale*)

Ginger is a tropical plant that belongs to the Zingiberaceae family.¹¹ It has been used for centuries as a spice and food supplement as well as in CAM herbal therapy, particularly with patients experiencing nausea from pregnancy, motion sickness, or chemotherapy.¹¹ Ginger works by blocking the effects of serotonin, a chemical produced by the brain and stomach when a patient is nauseated.¹² In a recent study, ginger was equally as effective in relieving motion sickness as Dramamine.¹² In a double blind study of women being treated for breast cancer, 500 mg of powdered ginger was administered twice a day for three days. This benefited those patients experiencing nausea and vomiting associated with chemotherapy.¹¹ During pregnancy, approximately 70-80% of

women experience nausea and vomiting.¹³ Many new studies have taken a therapeutic approach to treat pregnancy induced sickness. Ginger has a long history of pharmaceutical application, especially in China, Japan, and India.¹³ According to the results, ginger is a simple, accessible and convenient approach to gestational nausea.¹³

Orally, studies have demonstrated that gingerol, a compound in ginger, poses both antiviral and antifungal agents that promote salivary flow and reduce oral candidiasis.⁶

Ginger has an excellent safety profile. The most common side effect was gastrointestinal irritation.⁸ Due to the pungent nature of ginger, high doses may cause heartburn. Patients on blood thinners, such as warfarin, should avoid ginger due to its anti-coagulate properties.⁸

In culinary use, ginger may be used fresh in hot teas, winter soups, or grated and pressed to enhance the flavor of fish and stir-fries.



Five slices of ginger contains:¹
9 calories
0.1 grams of fat, sugar, sodium
0.2 grams protein
0.2 grams of fiber
1% vitamin C and magnesium

Fennel (*Foeniculum vulgare*)

Fennel is a flowering, aromatic perennial herb related to the carrot, dill, and parsley family in which all parts are edible.¹ It has been used in Ayurveda medicine and in Greek mythology for centuries.¹⁴ Fennel is known for its phytochemical, anethole, to

reduce inflammation and improve digestion. The seeds, with their high fiber content and volatile oils stimulate bile production to allow food to move faster through the body.¹⁴ The digestive benefit is well known in India, where individuals commonly chew fennel seeds after a meal.

Fennel has no known adverse reactions. It's best to purchase whole seeds verses powder, since fennel has a relatively short shelf life.⁸

To prepare fresh fennel, thinly slice the bulb to accompany salads and sandwiches, or sauté to add flavor to meats and fish. The stalks and leaves can add subtle flavor in soups, stews and stocks.¹⁴



One cup of sliced fennel contains:¹
27 calories
0.2 grams of fat
6 grams sugar
1.1 grams protein
2.7 grams of fiber
3% magnesium
2% vitamin A
4% calcium
17% vitamin C

Fenugreek (*Trigonella foenum-graecum*)

Fenugreek is a white-flowered herbaceous plant of the legume family, it is one of the oldest medicinal plants in Ayurveda medicine.¹⁵ The edible seeds, whole or powdered, have

a strong, spicy aroma and bittersweet tastes found in Middle Eastern cuisine.¹⁵ Fenugreek has been studied for its therapeutic phytochemical known as saponins.⁸ In clinical studies, this unique amino acid; 4-hydroxyisoleucine, may promote insulin sensitivity and better glycemic control in patients with diabetes mellitus.¹⁵

Fenugreek should be avoided by patients with legume and peanut allergies.¹⁵ Pregnant and breastfeeding women should also avoid fenugreek due to possible early labor and or miscarriage risks as well as its hypoglycemic effects.⁸

Fenugreek leaves makes a flavorful addition to salads and sandwiches. The seeds may add a slight sweet and spicy flavor to curries and stews.



One tablespoon of fenugreek contains:¹
36 calories
0.7 grams of fat
6 grams sugar
2.6 grams protein
2.7 grams of fiber
3% magnesium
5% B-6 and magnesium
20% iron
17% vitamin C

Saffron (*crocus sativus*)

Saffron is an orange spice that is made from the dried crocus and is used to color or flavor foods in the Middle East, Asia, and India.⁸ The main compound, safranal, has found to be a potent antidepressant and contain neuroprotective properties.⁸ Clinical studies indicate safranal has a positive impact on serotonin, one of the brain's neurotransmitter. In another randomized double-blind clinical trial, safranal appears to protect the brain against oxidative damage while acting as a radical scavenger improving memory as well as promote the diffusivity of oxygen in tissues.¹⁶

Saffron has an excellent safety profile.⁸ Take advantage of Saffron's therapeutic effects by soaking the yellow-orange strands in warm water for five minutes to release the volatile oils.⁸

In cooking, saffron can be used in rice pilaf, roasted salmon, or sautéed with shrimp, chicken and pork.



One tablespoon of saffron contains:¹
6 calories
0.1 grams of fat
1.4 grams sugar
0.2 grams protein
0.1 grams of fiber
2% magnesium
29% manganese

Turmeric (*Curcuma longa*)

Turmeric is an ancient spice dating back to 600 BC, used as medicine, a condiment, and in flavoring foods.¹⁷ It is a member of the ginger family of herbs, cultivated in south-east Asia.¹⁷ The most active component of turmeric is curcumin, which gives the spice its vibrant orange-yellow color.⁸ Today, turmeric is known for a variety of health promoting properties as well as treatment of inflammatory conditions.¹⁷ Curcumin also has a chemopreventive effect on oral precancerous lesions like oral leukoplakia, oral lichen planus and oral fibrosis.⁶ It is currently being studied in human clinical trials for colon and pancreatic cancers, Alzheimer's disease, rheumatoid arthritis, and psoriasis.¹⁰

Turmeric has blood thinning properties; therefore, patients who take warfarin or Coumadin should not supplement with turmeric.⁸ Patients with active liver disease or gallstones should also use caution because of turmeric's potential to stimulate contractions and bile secretions.⁸ Pregnant and breast-feeding women should not take turmeric due to the lack of safety data available.⁸

In India, turmeric is one of the most extensively used spices. In the United States, it is used as a coloring agent in cheese, mustard, cereal, soups, ice cream and yogurt. Turmeric has a wide variety of culinary uses. It makes a great addition to legumes of any type while improving their digestibility.⁸ Mix it into salad dressing, marinade, soups, and smoothies to enhance nutrient density.¹⁷



One tablespoon of turmeric contains:¹
24 calories
0.7 grams of fat
4.4 grams sugar
0.5 grams protein
1.4 grams of fiber
3% magnesium and vitamin C
5% B-6
15% iron

Conclusion

Approximately 500 years ago, Christopher Columbus and his crew were interested and placed value on spice. In fact, wars were fought and empires were built to ensure access to spices.⁸ Today spices are used around the globe in complementary and alternative medicine (CAM). It is important for healthcare providers to understand why patients may be consuming spices and herbal supplements, either for preventive or therapeutic purposes. Research is progressing and more evidence is supporting the therapeutic benefits of spices.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/professional-education/ce-courses/ce549/start-test

1. **Examples of CAM include the following _____.**
 - a. Homeopathic therapy
 - b. Medicinal spices
 - c. Chiropractic and massage
 - d. Meditation and hypnosis
 - e. All of the above.

2. **Cayenne (C. annuum) is an excellent source of this vitamin.**
 - a. Vitamin A
 - b. Vitamin C
 - c. Vitamin E
 - d. Vitamin D

3. **This phytochemical may enhance the absorption of nutrients by enlarging the villi-tiny hair-like structures in the small intestine that transport vitamins and minerals into the bloodstream.**
 - a. Curcumin
 - b. Capsaicinoids
 - c. Saponins
 - d. Anethole

4. **Which of the following spices are known to have strong anticoagulant properties?**
 - a. Garlic, cinnamon, and turmeric
 - b. Fennel, clove, and garlic
 - c. Saffron, ginger, and fenugreek
 - d. Cumin, clove, turmeric

5. **Which spice contain at least 15% volatile oil, eugenol, a phytochemical responsible for its effective antiseptic and anesthetic properties?**
 - a. Fennel
 - b. Saffron
 - c. Clove
 - d. Turmeric

6. **This spice contains a unique amino acid 4-hydroxyisoleucine which may promote insulin sensitivity and better glycemic control in patients with diabetes mellitus.**
 - a. Ginger
 - b. Cayenne
 - c. Saffron
 - d. Fenugreek

7. **Which of the following spices have a digestive benefit where individuals in India commonly chew the seeds after a meal?**
 - a. Cinnamon
 - b. Fennel
 - c. Garlic
 - d. Cumin

8. **Which spice works by blocking the effects of serotonin, a chemical produced by the brain and stomach when a patient is nauseated?**
 - a. Garlic
 - b. Saffron
 - c. Ginger
 - d. Fenugreek

9. **This highly concentrated sulfur-containing amino acid in garlic gives it medicinal properties and is responsible for its pungent odor.**
 - a. Allicin
 - b. Curcumin
 - c. Thymoquinone
 - d. Anethole

10. **This phytochemical in saffron appears to protect the brain against oxidative damage while acting as a radical scavenger improving memory as well as promote the diffusivity of oxygen in tissues.**
 - a. Safranal
 - b. Anethole
 - c. Saponins
 - d. Capsaicinoids

11. **This spice contains thymoquinone, unique to this plant, is a phytochemical with antioxidant and anti-inflammatory properties.**
 - a. Fennel
 - b. Saffron
 - c. Cumin
 - d. Ginger

12. **One half teaspoon of this spice contains as many antioxidants as a half-cup of blueberries.**
 - a. Cayenne
 - b. Garlic
 - c. Turmeric
 - d. Clove

13. **What phytochemical has a chemopreventive effect on oral precancerous lesions like oral leukoplakia, oral lichen planus and oral fibrosis?**
 - a. Curcumin
 - b. Gingerol
 - c. Capsaicinoids
 - d. Allicin

14. **Which compound poses both antiviral and antifungal agents that promotes salivary flow and reduces oral candidiasis?**
 - a. Anethole
 - b. Safranal
 - c. Gingerol
 - d. Allin

- 15. Which spice, when creating a paste, is effective in treating oral ulcers due to its strong antimicrobial activity against gram positive and gram negative bacteria and viruses?**
- a. Clove
 - b. Garlic
 - c. Ginger
 - d. Turmeric

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Diane Verneti-Callahan, RDH, BS is a 1986 graduate of Marquette University, School of Dental Hygiene. She is a former clinical professor at the University of Minnesota and is currently a dental hygiene instructor at Madison College, Madison, WI, where she has been on the faculty since 2000. Diane has a combined 25 years' experience in both education and private practice. Academic interest includes health and wellness, nutrition and oral health, public health, Dental Initiative of Dane County, and clinical instruction. In the public health sector, Diane has worked as Program Coordinator at the Madison Department of Public Health for the National Program, "Give Kids a Smile."

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