Nutritional Supplements

1. For tonight
   1. History of supplements
   2. What is a supplement?
   3. How are supplements regulated?
   4. Are supplements necessary?
2. Supplements: A Billion-Dollar Industry
   1. There has been a dramatic increase in the sales of supplements in the United States since 1997. In 2003, 18.8 billion supplements were sold. Indeed, 46 percent of people polled from ages 14 to 19 indicated they used supplements.
3. What Is a Supplement?
   1. A product (other than tobacco) that is intended to supplement the diet that contains one or more of the following dietary ingredients: **a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance** used to supplement the diet by increasing the total daily intake, or a **concentrate, metabolite, constituent, extract, or combination** of these ingredients.
4. Regulation of Supplements
   1. *DSHEA - Dietary Supplement Health and Education Act of 1994*
      1. Ensured that the FDA would not have the same regulatory control over supplements that they do over prescription and over-the-counter medicines.
      2. Prior to that time, supplements were under similar regulations.
      3. Under the 1994 law, the supplement manufacturer must ensure that dietary supplements are safe before they are marketed.
      4. There are no provisions in the law for the FDA to approve dietary supplements for safety or effectiveness before they reach the consumer.
   2. FDA is not involved until after the product is on the market.
   3. Consumers should be educated?
      1. There are no strict regulations to protect consumers from potentially harmful supplements.
   4. “Natural” does not equal safe.
5. Label may not always equal the contents of the bottle
   1. Federal Trade Commission monitors the accuracy of advertising and labeling of supplements.
      1. They do not ensure the quality of supplements from manufacturer to manufacturer, or even between different batches of a product from the same manufacturer.
   2. For example, a study of ginseng products found that most contained less than half the amount of ginseng listed on their labels.
   3. Supplements may not contain the **correct ingredient** (plant species).
   4. Supplements might contain **higher or lower amounts** of the active ingredient.
   5. Supplements may be contaminated with unlabeled herbs, pesticides, heavy metals, or prescription drugs
6. Who takes supplements?
   1. According to the National Health and Nutrition Examination (NHANES) 2000, 52 percent of adults surveyed had taken a dietary supplement in the previous month.
   2. **Most commonly taken**:

• Multivitamins

• Vitamins E and C

• Calcium supplements

• B-complex vitamins

* 1. Statistically, supplement use is highest in the following groups: women, people age 60 and older, whites, people with an education beyond high school, and those who exercise. Also, the higher one’s BMI, the less likely one is to use a supplement.
  2. Use of supplements is common in athletes. This has led many athletic organizations, such as the IOC and NCAA, to ban some supplements to maintain fairness. Refer students to the text pages 312 and 313 listing permissible and banned substances or go to the organization’s web site for an updated list.

1. Why do People take supplements?
   1. To be healthier
      1. They want to obtain the nutrients they think they are missing in their diets, though most studies show that those who take supplements get the nutrients they need from their food.
   2. Quick fix
      1. Some take supplements because they hope for a quick fix or a magical cure. Many manufacturers, like the one whose ad is pictured here, pick up on the hopes of this last group and market their supplement to them.
      2. This business practice is especially disturbing when supplements are marketed to people who have HIV and cancer.
   3. Prevent disease
   4. Treat diseases
   5. Energy
2. Do you have to take supplements?
   1. **If you eat a varied and balanced diet, you should not need to take a supplement.**
   2. Limited evidence suggests that taking a multivitamin and mineral supplement at or below 100% of the DRI has harmful side effects.
   3. Exceptions may include iron and calcium.
   4. Over-consuming certain essential nutrients can be harmful.
3. Iron Supplements?
   1. Heme iron (more easily absorbed than non-heme) is not found in plant foods, so vegetarians may consider iron supplements
   2. Non-heme iron may be more efficiently absorbed in the presence of Vitamin C
4. Pregnancy?
5. Science or Marketing?
   1. Look at the rest and decide
6. DHEA (Dehydroepiandrosterone)
   1. “Fountain of Youth”
      1. Claims that it can slow aging, melt away fat, enhance memory, prevent osteoporosis, and increase libido
   2. DHEA is a hormone that is synthesized and secreted by the adrenal glands.
      1. Converted into estrogen and androgen
      2. Declines with age
   3. Research has suggested that DHEA is associated with decreased incidence of heart disease, various cancers, and several other age-related diseases.
   4. But whether or not a supplement can reverse the effects of aging is unclear.
   5. Potentially dangerous and undesirable side effects
7. Protein and Amino Acid Supplements
   1. **Whey** is a byproduct of cheese making. In its raw form it contains fat, lactose, and other substances. It is processed to produce **whey protein concentrates** (WPC) and **whey protein isolates** (WPI). WPC is rich in whey protein and contains some fat and lactose. WPIs are low in fat and lactose. Whey proteins may have antimicrobial functions, act as antioxidants, and aid the immune system. Whey proteins can be used as the sole protein in some infant formulas because they have been shown to result in fewer allergies in infants. Whey is not superior to soy, milk, or meat proteins in helping protein synthesis. People with milk allergies should avoid it.
   2. **Arginine** is conditionally essential. The typical American diet contains 3 to 6 g, mostly from plant proteins like soy. Normally, the body can make enough to meet its needs. However, people with certain genetic conditions and those who are recovering from burns or surgery cannot make enough arginine to meet their increased needs. Therefore, it is *conditionally essential*. Under normal circumstances, there is no benefit from supplementation.
   3. **Aspartic acid** is a non-essential amino acid used to make urea, proteins, glycogen, and energy. Its role in glycogen and energy production is the rationale behind the claim that supplemental aspartate has an “anti-fatigue” effect on skeletal muscle; this claim was never supported by research.
8. Timing of Amino Acid Ingestion
   1. The timing of amino acid–carbohydrate ingestion alters the anabolic response of muscle to resistance exercise (*Am. J. Physiol. Endocrinol. Metab.* *281*(2): E197-206).
   2. Optimum energy bar is equivalent to a food with 6 g of protein and 35 g of glucose.
   3. A glass of skim milk offers a similar amount.
9. Carotenoids
   1. Best to get from the diet: carrots, sweet potatoes—orange-pigmented vegetables
   2. Supplementation does not treat heart disease or cancer
10. Are the Natural Supplements More Effective?
    1. Herbs and botanicals are becoming increasingly popular. They are supplements that contain extracts or active ingredients from the roots, berries, seeds, stems, leaves, buds, or flowers of plants.
11. “Natural” Supplements?
    1. **Black cohosh** is a member of the buttercup family. It is also called black snakeroot, macrotys, bugbane, bugwort, rattleroot, and rattleweed. It has a history of use for rheumatism (arthritis and muscle pain), but more recently has been used to treat postmenopausal symptoms such as hot flashes, night sweats, and vaginal dryness. Additionally, it has been used to ease the effects of menstrual irregularities and premenstrual syndrome, and to induce labor. As with so many other supplements, there is no scientific evidence to support its effectiveness, or to indicate whether it is safe.
    2. Historically, **cranberry fruits and leaves** have been used for a variety of problems, such as treating wounds, urinary disorders, diarrhea, diabetes, stomach ailments, and liver problems. More recently, cranberry products have been used to prevent or treat urinary tract infections, *helicobacter pylori* infections that can lead to stomach ulcers, and dental plaque. Cranberries have also been reported to have antioxidant and anticancer properties. Although not conclusive, promising preliminary results do suggest that cranberry products could be used to prevent and treat urinary problems. Side effects from their consumption are minimal and include diarrhea and minor upset stomach.
12. “Natural” Supplements?
    1. **Ginkgo:** Used for treatment of various conditions, including memory and concentration problems, confusion, depression, anxiety, dizziness, ringing in the ears, and headache. Ginkgo is thought to increase blood flow by dilating blood vessels and decreasing blood thickness. It is also supposed to modify neurotransmitter systems and reduce oxygen-free radicals. Early studies strongly supported the use of ginkgo for mental functioning. More studies need to be conducted, but at this time there do not appear to be any severe side effects at doses of less than 200 mg per day.
    2. **Ginseng:** A lot of claims have been made about ginseng, but it is most commonly sold to improve overall health and boost the immune system. Research conducted to date is still inconclusive. NCCAM is studying ginseng’s interaction with other herbs and drugs and its potential to treat chronic lung infection, impaired glucose tolerance, and Alzheimer's disease. Other studies are exploring whether ginseng may lower blood sugar levels; if so, it may benefit diabetics. However, people with diabetes should use extra caution when taking ginseng, especially if they are using medicines or taking other herbs to lower blood sugar. Side effects are rare but have been reported. They include headache, gastrointestinal upset, breast tenderness, menstrual irregularities, and high blood pressure. The difficulty in identifying side effects is that ginseng is often added to other products, such as teas and energy drinks, making it difficult to determine whether the side effect is from the ginseng or from other ingredients in the product.
    3. **Yohimbine:** Best known as an aphrodisiac. This conclusion is based primarily on testimonials, as its true effect on the sex drive of humans has not been properly demonstrated. However, for more than seventy years, yohimbine has been used to treat male sexual difficulties. The use of yohimbine is based on evidence from studies using the prescription drug yohimbine hydrochloride, which does appear to effectively treat male impotence. The supplemental form is made from the bark and, although yohimbine is present in yohimbe bark extract, levels are variable and often very low. Safety has not been evaluated scientifically, but many adverse side effects have been reported, such as excessive sweating, facial flushing, increased heart rate and blood pressure, restlessness, irritability, shakes, and increased anxiety.
13. “Natural” Supplements?
    1. **Echinacea**: Believed to prevent colds, as well as reduce their symptoms and duration. It is difficult to determine whether echinacea really works as suggested because preparations available on the market vary significantly. Studies investigating whether taking echinacea preparations for eight to twelve weeks prevents colds have been conducted, but the results show no clear effect. Other research has focused on whether taking echinacea preparations after the onset of cold symptoms shortens the cold’s duration or decreases its severity. It seems that some preparations, based on the herb echinacea purpurea*,* might be effective for this purpose in adults, while the evidence remains unclear regarding the effectiveness of other preparations, or whether children may benefit. Echinacea seems to be nontoxic, but it is suggested that it not be used for longer periods than eight weeks due to a loss of effectiveness. Although it currently seems safe when taken as a supplement, caution should be taken: Allergic reactions can occur, especially in people who are allergic to related plants in the daisy family, such as ragweed, chrysanthemums, and marigolds.
    2. **Garlic**: It has grown in popularity due to associated decreases in cholesterol and its ability to help control blood pressure. Garlic has also been shown to have potential anticancer effects. It belongs to the *allium* vegetable family, along with onions, ginger, scallion, leeks, and chives. As a result, these food items have many of the same beneficial compounds as garlic. It is unclear whether odorless supplements have the same benefits as natural garlic. The most dangerous side effect associated with garlic supplementation is the risk of bleeding. Therefore, supplementation should be discontinued prior to any surgical procedure, and is not advisable for people who take anticoagulants or blood thinners.
14. “Natural” Supplements?
    1. **Ginger:** Used in the relief of nausea, vomiting, and motion sickness. It has also been reported to have anti-inflammatory properties and, although the evidence is still inconclusive, it may be effective in relieving morning sickness during pregnancy.
    2. **St. John's Wort:** Has been used for centuries to treat mental disorders as well as nerve pain. Today, St. John's Wort is used to treat mild-to-moderate depression, anxiety, and sleep disorders. The major benefits of St. John’s Wort are that it costs less than prescription medications for depression and typically does not produce the undesirable side effects shown by conventional antidepressive drugs. Results from several studies have supported the effectiveness of certain St. John's Wort extracts for depression. It is best used to treat mild depression.
    3. **Valerian:** Used as a mild sedative and sleeping agent. Studies conducted on the effectiveness of valerian for insomnia have been poorly controlled and, therefore, are inconclusive. To date, no adverse side effects have been reported in humans.
15. “Natural” Supplements?
    1. **Glucosamine** and **chondroitin** have been widely promoted as useful for treating arthritis. Glucosamine is thought to stimulate the production and repair of cartilage. Chondroitin is a cartilage component thought to promote water retention and elasticity. Both compounds are produced in the body. Some research suggests that glucosamine may stimulate the production of cartilage-building proteins. Other studies suggest that chondroitin may inhibit production of cartilage-destroying enzymes and fight inflammation. While there have been some positive results, well-controlled long-term studies have not yet been conducted. No study so far has found any serious side effects from either glucosamine or chondroitin. You should take glucosamine sulfate rather than glucosamine hydrochloride, and do so for three months. If positive results are not experienced after this length of time, then the supplement probably is not going to work.

**Coenzyme Q10**, also called **ubiquinone,** is a fat-soluble, vitamin-like substance made in the body. It is an antioxidant and serves as a coenzyme for several key enzymatic steps toward the production of energy within the cell. It is present in small amounts in a variety of foods, particularly beef, soy oil, sardines, mackerel, liver, and peanuts. In healthy individuals, normal levels are maintained by intake bodily production. Extravagant claims have been made for coenzyme Q10, many of which have not been supported by well-controlled studies. It is currently being tested for its ability to slow the progress of Parkinson's disease, boost stamina in AIDS patients, stabilize blood sugar levels in diabetics, enhance athletic performance, decrease allergies, and prevent retina deterioration that occurs with macular degeneration. Taking coenzyme Q10 in pill form may not provide any potential benefits, as it can lose its structure during digestion.

* 1. There is evidence to indicate that coenzyme Q10 does work to support the heart, especially in congestive heart failure and angina (chest pain), at 100 to 200 mg per day. However, some studies show it is *not* effective. Due to inconclusive evidence, and the fact that long-term studies have not been conducted to test its safety and effectiveness, the American Heart Association does not recommend taking coenzyme Q10 for heart disease. Studies supporting the efficacy of coenzyme Q10 appear most promising for neurodegenerative disorders, such as Parkinson's disease. Several investigations have found improvements in athletic performance and antioxidant potential. In fact, ubiquinone supplementation (90 milligrams/day) was reported to improve aspects of physical performance in Finnish top-level cross-country skiers. Despite some promising results, experts are hesitant to recommend use until further studies are completed.
  2. **Carnitine.** Carnitine is the substance that transports fatty acids into the mitochondria for metabolism, so the thinking is as follows: more carnitine, more transport, and therefore more fat burned. The flaw in this thinking is that you already have all the carnitine you need, and more is not better. It’s available in foods, and you readily synthesize it from amino acids. Carnitine supplements provide no performance advantage.

1. Are supplements a necessary part of a healthy diet?