

PROPOSAL FOR A FRESHMAN WRITING SEMINAR

Title: Nutritional Supplements: Real Remedies or Shady Science?

Short title: The Science of Supplements

Instructor: Dr. Mary Purugganan, Senior Lecturer, Wiess School of Natural Sciences

Course choice of incentive: TA

Time slot for course: Spring Semester, T/Th 10:50 AM to 12:05 PM (second choice T/Th 1 to 2:15 PM)

Course description for course catalog (<50 words)

This writing-intensive seminar examines evidence for the use of nutritional supplements in promoting health. Topics include the role of supplements in medicine; the biology of illnesses such as cancer, depression, and autoimmunity; and the molecular mechanisms of supplements in prevention and management of these illnesses. Appropriate for all majors.

Course description for PWC website (<150 words)



This course examines the science behind some of the most highly promoted nutritional supplements for preventing or treating disease. The supplement industry has recently grown to \$33 billion per year, and more than half of Americans now take supplements regularly. Because nutritional supplements are not regulated like pharmaceuticals, consumers have begun to question the safety, purity, and efficacy of these products. Students will examine the challenges in regulating supplements, the role of supplements as alternative or complementary medicine, the biology of common but complex diseases such as cancer and depression, and the molecular mechanisms of supplements' effects on the human body. Through writing assignments and oral presentations, students will explore this rapidly growing but poorly regulated approach to improving health.

Reading assignments

The overall goal of the seminar is to teach students how to critically evaluate evidence for or against supplements promoted to be useful in preventing or managing illness. Students will be introduced to the process of drug development in the U.S., the role of the FDA, and the industry of nutritional supplements. Students will be required to read and critically analyze scientific papers, guided by the instructor. The course will include the following topics and readings:

1. Conventional medications: The long and expensive journey to a new drug.
Reading:
Angell, M. (2004) The Creation of a New Drug. In *The Truth About Drug Companies: How They Deceive Us and What to Do About It* (pp. 21-36). Random House.
2. Nutritional supplements: Evolution of an industry and barriers to clinical trials for molecules that cannot be patented. Reading:
Michelakis, E. D., Webster, L., & Mackey, J. R. (2008). Dichloroacetate (DCA) as a potential metabolic-targeting therapy for cancer. *British journal of cancer*, 99(7), 989-994.
3. Safety, purity, and efficacy of supplements: How do we know?
Readings:
 - Newmaster, S. G., Grguric, M., Shanmughanandhan, D., Ramalingam, S., & Ragupathy, S. (2013). DNA barcoding detects contamination and substitution in North American herbal products. *BMC medicine*, 11(1), 222.
 - O'Connor, A. (2013, Nov 3). Herbal supplements are often not what they seem. *New York Times*.
<http://www.nytimes.com/2013/11/05/science/herbal-supplements-are-often-not-what-they-seem.html>
4. Biology of colorectal cancer and evidence for the use of vitamin D in prevention and treatment. Readings:
 - Markowitz, S. D., & Bertagnolli, M. M. (2009). Molecular basis of colorectal cancer. *New England Journal of Medicine*, 361(25), 2449-2460.
 - Pericleous, M., Mandair, D., & Caplin, M. E. (2013). Diet and supplements and their impact on colorectal cancer. *Journal of gastrointestinal oncology*, 4(4), 409-423.
5. Biology of depression and evidence for the use of fish oil in treatment. Readings:
 - Singh, M. K., & Gotlib, I. H. (2014). The neuroscience of depression: Implications for assessment and intervention. *Behaviour research and therapy*, 62, 60-73.
 - Liu, J. J., Green, P., Mann, J. J., Rapoport, S. I., & Sublette, M. E. (2015). Pathways of polyunsaturated fatty acid utilization: Implications for brain function in neuropsychiatric health and disease. *Brain research*, 1597, 220-246.
6. Biology of rheumatoid arthritis and evidence for the use of green tea epigallocatechin-3 gallate in treatment. Readings:
 - Mackay, I. R., & Rose, N. R. (Eds.). (2014). Rheumatoid Arthritis. In *The Autoimmune Diseases (5th Ed)* (pp. 511-523). Elsevier.
 - Riegsecker, S., Wiczynski, D., Kaplan, M. J., & Ahmed, S. (2013). Potential benefits of green tea polyphenol EGCG in the prevention and treatment of vascular inflammation in rheumatoid arthritis. *Life sciences*, 93(8), 307-312.

Writing assignments will include

1. An initial **diagnostic paper** (250 to 400 words): a personal reflection/opinion essay
2. **One short paper** (800-1200 words) on the topic of ensuring the safety, purity, and efficacy of nutritional supplements in the U.S. (Submitted as **draft** and **final** versions)
3. **Two short papers** (800-1200 words) on the use of supplements in disease prevention or treatment, chosen from the following topics:
 - a. The role of vitamin D in the prevention and treatment of colorectal cancer
 - b. The role of fish oil in treating depression
 - c. The role of green tea epigallocatechin-3 gallate in treating rheumatoid arthritis
4. A **topic proposal** (250 to 500 words) for a research paper, including a bibliography containing 5-15 sources
5. A **research paper** (1600 to 2100 words) on the biology of a fourth illness (not covered in class, but selected from a list provided by the instructor) and scientific evidence supporting the use of a supplement promoted for its prevention or treatment.

The research paper will be submitted as a **draft** (40% of assignment grade) and **final** version (60% of assignment grade).

Oral presentations (8-12 min) will be delivered by each student on the topic of his/her research paper. These presentations will require the use of PowerPoint slides.

Students will also work in teams to create a **TV commercial** (50 to 90 sec) for a clinically proven supplement that focuses on the *molecular* actions of the supplement.