

KINE 352 *Nutrition and the Brain*

First Summer Session 2020

Course Outline and Syllabus

*****This Course will be taught REMOTELY ONLINE*****

Instructor: Ken Kambis, PhD
Adair Hall 109
757-221-2779 Office
757-990-9605 Cell
kwkamb@wm.edu

Virtual Office Hours: TW 5:00- 6:00PM

Course Description

This course exposes students to one of the most important elements of health – the effect of what one eats and drinks on health, growth, and maintenance. The initial part of the course emphasizes that, in most strata of our society, we can control what we eat, when we eat it, and how much we eat or drink. Through exploration of past and current research in the area of nutrition science, students will be exposed to the development of the body of literature exploring the effects of various nutrients found in food and how these nutrients affect the brain and subsequent behavior.

Although the science of nutrition and brain function is relatively new and is still evolving, certain nutrients in foods are known to be essential to human brain function. For example, deficiencies in some of these nutrients, such as vitamin B12 and iron, can lead to impaired cognitive function due to neurological complications. The ability to use simple-to-complex information in daily life (cognition) becomes more important as people age. “With 77 million baby boomers now facing retirement, their independence, quality of life, and even economic status will largely be defined by their ability to traffic information signals as they age.”- USDA-ARS. This course will study certain key aspects of the translational links between nutrition, neuroscience, behavior, and, health.

While the aging population presents its own unique challenges for nutritional neuroscience, all individuals need to be aware of the growing body of literature examining the behavioral effects of specific nutrients found in foods. Dietary, nutritional, and functional interventions at any age, particularly very early in life as well as during gestation and even pre-conception, can have important bearings on brain development and function. “...food is about the most important influence in determining the organization of the brain and the behavior that the brain organization dictates. *J.Z. Young (1968).*” This course will also examine the role of specific nutrients in brain function and behavior.

Grading:

- **6-8 page APA style Term Paper (excluding reference and title pages) = 20%**
- **Weekly Graded Assignments (3 each week) = 20%**
- **4 section tests. One each Monday (or date otherwise specified) = 60%**

This course meets the requirements for COLL 200 and resides in the NQR Domain reaching out to the CSI Domain.

The Natural World and Quantitative Reasoning (NQR). Courses in this domain examine the natural world and physical universe and the means by which humans observe, measure, model, and interpret it. Courses explore the process of scientific discovery, including the methods required to gather and assess empirical data, investigate the predictions of existing theories, and develop experimentally testable hypotheses. Courses may also focus on mathematical or computational methods as applied to these investigations. Students develop their understanding not only of the foundations, implications, and uses of scientific knowledge but also how scientific approaches can be used to create tangible products.

Cultures, Societies, and the Individual (CSI). Courses in this domain examine the realm of human cultures, societies, and individuals through their development, organization, and interaction. Some courses employ mathematical modeling, statistical analysis, and scientific experimentation; some, the analysis of artifacts and texts; and others, observation, inference, and extrapolation. Students learn to describe, theorize, and explain human cultures, societies, and individuals in their variety over time and space.

KINE 352 satisfies the NSCI and the KINE writing requirement. It is also a KINE Elective and a NSCI Behavioral Elective.

Required Readings:

Swem Library access to the journal *Nutritional Neuroscience* is required. Selected readings from this indexed journal will supplement lectures and presentations. Additional readings from other indexed journals will be assigned.

Required Text:

The Psychology of Eating & Drinking, A.W. Logue, 4th Ed. Online at Amazon.com in hardback (ISBN: 978-0-415-81708-0) or paperback (ISBN: 978-0-415-81707-3). Your required text may also be purchased from the W&M bookstore.

APA Made Easy, Scott Matkovich, 3rd Edition available from Amazon (or 6th Edition of the APA Publication Manual).

Nutrition and the Brain
Syllabus

- | | |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture Series I: | Introduction: A psychological basis for the study of eating and drinking, evolutionary factors, and species specific issues; the nature of research; antecedents of neuroscience; gross anatomy of the brain; cranial nerves. |
| Lecture Series II: | Basic neuroscience and pharmacology; brain foods; nutrients that affect cognition. |

Section I Quiz: Online Monday 6/8/2020 (5:00 – 11:00PM).

- Lecture Series III: Hunger, consumption volume, physiological basis of normal vs. overconsumption, peripheral cues; and CNS integration.
- Lecture Series IV: Thirst: neurophysiology, drinking behaviors, theories, and aging as a factor.

Section II Quiz: Online Monday 6/15/2020 (5:00-11:00PM).

- Lecture Series V: Taste and smell.
- Lecture Series VI: Naturally occurring drug interactions;
- Lecture Series VII: Disorders of eating and drinking: Cancer anorexia, Mood (state/trait), Anorexia Nervosa, and Bulimia Nervosa; Alcohol and the brain.

Section III Quiz: Online Monday 6/22/2020 (5:00-11:00PM).

- Lecture Series VIII: Overeating and obesity: Characteristics (social, medical, functional), causes, and methods of decreasing overeating and obesity.
- Lecture Series IX: Dietary analgesics; creatine, mood, and behavior;
- Lecture Series X: B vitamins and the brain; fat-soluble vitamins and minerals and the brain; environmental factors and the brain.

Section IV Quiz: Online Monday 6/29/2020 (5:00-11:00PM).

Term Paper Requirements

You must select a term paper topic by 7PM Monday 6/8/2020.

- a. A properly APA formatted paper outline with a paragraph in each section along with 2 APA formatted references is due by 11:59PM Saturday 6/13/2020.
- b. A first version (NOT a Draft) of your paper is due by 11:59PM Saturday 6/27/2020.
- c. The final version of your paper is due by 11:59PM Monday 7/6/2020.

Term Paper Topics

- 1. Food Additives and the Brain**
- 2. Evolution and Food Choice**
- 3. Resveratrol**
- 4. Appetite and Satiety**
- 5. The B-complex vitamins: B₆, B₁₂ and folate**
- 6. Healthy and Sustainable Diets**
- 7. Nutrients and Neurotransmitters**
- 8. Omega-3 fatty acids – neuronal development in children**
- 9. Vitamin K and the Brain**
- 10. Caffeine – improved attention and alertness**
- 11. Alcohol and the Brain**
- 12. Antioxidants and Neurodegenerative Disease**
- 13. Ginkgo Biloba – increased attention**
- 14. Panax Ginseng – improved memory and mental performance**
- 15. Phytoestrogens and Brain Function**
- 16. Breakfast and the Brain**
- 17. Baby formula and Infant Brain Development**
- 18. Folate and Dementia**
- 19. Ketogenic diet for Epilepsy**
- 20. Fish and Alzheimer's Disease**
- 21. Homocysteine and Dementia**
- 22. Causes of Overeating and Obesity**
- 23. EFA's, aggression and behavior**
- 24. Vitamins and Cognition**
- 25. Coffee: nutraceutical or risk factor?**
- 26. Nutrition and Autism**
- 27. Sweet food and Mood**
- 28. Thiamine and the Nervous System**
- 29. Essential Fatty Acids and Depression**
- 30. Micro-supplements and Behavior**
- 31. B-vitamins and Elderly Cognition**
- 32. Melissa Officinalis – increased calmness and reduced stress**
- 33. Nutritional Alterations and Brain Function**
- 34. Nutrition and Cortical Spreading Depression (SD)**
- 35. Insulin and the Brain**
- 36. Glucose and Memory**
- 37. Cerebral Metabolism and Neurodegeneration**
- 38. Effects of Meals on Cognitive Behavior**
- 39. Appetite Regulation (Regulation vs. Hedonics)**
- 40. Opioids: Maintenance and Reward Aspects of Feeding**
- 41. Oxytocin (OT) and Vasopressin (VP) – Satiety to Aversion**
- 42. Neuropeptides and Feeding**
- 43. Tryptophan and Serotonin**
- 44. Phenylalanine, Tyrosine, and Catecholamines**

- 45. Methionine and S-Adenosylmethionine**
- 46. Histidine and Histamine**
- 47. Threonine and Glycine**
- 48. Effects of Protein and Carbohydrate Meals on Neurotransmitter Precursor Levels**
- 49. Amino Acids: Foods or Drugs?**
- 50. Amino Acid Deficient Diets and Feeding Behavior**
- 51. Dietary LCPUFA's and Brain Development**
- 52. Brain Docosahexaenoic Acid (DHA) and Cognitive/Behavioral Development**
- 53. Effects of Palatable Foods and Fluids on the Endogenous Opioid System**
- 54. Nutrient Deficiencies and Alterations of Psychostimulant Drug Effects**
- 55. Nicotine, Food Intake, and Body Weight**
- 56. Marijuana and Appetite**
- 57. Indirect Actions of Vitamins on Energy Metabolism of the Brain**
- 58. Brain Function and Vitamin Status (Depletion Studies vs. Epidemiological Studies)**
- 59. Vitamin Intervention Studies and Brain Function: Children, Adults, Elderly**
- 60. Iron and Brain Function**
- 61. Iodine and Brain Function**
- 62. Zinc and the Developing Brain**
- 63. Zinc and Cognitive Development in the Young**
- 64. Zinc and Neurological Degenerative Disorders**
- 65. Copper and Brain Function**
- 66. Copper and Neurodegenerative Disease**
- 67. Selenium and Brain Function**
- 68. Food-Derived Neuroactive Cyclic Dipeptides**
- 69. Tyrosine and the Brain**
- 70. St. John's Wort and the CNS**
- 71. Ginkgo Biloba and the CNS**
- 72. Kava and the CNS**
- 73. Polyphenols in Strawberries and Blueberries**
- 74. Polyphenols in Spinach, Spirulina, Apples, and Cucumbers**
- 75. Polyphenols in Garlic Extract**
- 76. Polyphenols in Red Bell Pepper**
- 77. Polyphenols in Tomatoes**
- 78. Polyphenols in Beans**
- 79. Polyphenols in Persimmon and Grape Seed**
- 80. Polyphenols in Beverages (Wine, Tea, and Grape Juice)**
- 81. Polyphenols in Chocolate**
- 82. Polyphenols in Curcumin**
- 83. Polyphenols in Soy**
- 84. Gut – Brain Interaction**

(or a topic approved by the course instructor)

Important Dates

Monday, June 1:	Course Begins
Monday, June 8:	Term Paper Topic Selection
Friday, June 5:	Drop/Add Ends
Monday, June 8:	Section I Quiz
Saturday, June 13:	Term Paper Outline Due by 11:59PM
Monday, June 15:	Section II Quiz
Monday, June 22:	Section III Quiz
Saturday, June 27:	First Version (not a draft) of Term Paper Due
Monday, June 29:	Section IV Quiz
Monday, July 6:	Final Version of Term Paper Due by 11:59PM

About the Professor

As Professor of Health Sciences, I teach KINE350 *Science of Nutrition*, KINE352 *Nutrition and the Brain*, and KINE354 *Nutrition in Health & Disease*.

After receiving my PhD from UNC-Chapel Hill, I remained at UNC where I conducted research with Dr. Lloyd Yonce and Dr. Carl Blyth and taught various undergraduate and graduate courses in the Department of Exercise Science. Following UNC, I relocated to UC Santa Barbara to teach and develop the Wellness Institute in conjunction with Jon Spaventa and Art Gilbert. Thereafter I moved to Williamsburg to take a position with W&M where I have taught and conducted research for more than 30 years.

As Co-Director (with Dr. Brennan Harris) of the Jack Borgenicht Altitude Physiology Research Facility in the Department of Health Sciences, we conduct research in high altitude physiology. For years my research has focused on nutritional interventions to reduce risk of Acute Mountain Sickness (AMS), collaborating with the U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Having always been fascinated with the relationship between nutrition and health, I developed the first W&M nutrition course (KINE350) more than 20 years ago. As we all know now, two of the most important keys to optimum health are nutrition and exercise, with more convincing good science being published daily. Since neither of these factors can guarantee good health because so many other factors out of our control play roles (heredity, race, age, gender, etc.), it is important to realize that we can control how much of what kind of exercise we do and we determine how much and what kinds of foods we consume. These two very important aspects of public health are almost totally within our control. For those who are at increased risk of disease conditions because of factors out of their control, it is even more important to focus on the things that can be controlled, **nutrition** and **exercise**. For years I have returned to UC Santa Barbara to conduct research in the Environmental Stress Laboratory with Dr. Steven Horvath and most recently (2019) during the fall semester in the UC Santa Barbara Neuroscience Research Institute updating this course and developing future collaborative research concepts.

Accommodations

It is the policy of William & Mary to accommodate students with disabilities and qualifying diagnosed conditions in accordance with federal and state laws. Any student who feels s/he may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact the [Student Accessibility Services](#) staff at 757-221-2509 or at sas@wm.edu. SAS staff will work with you to determine if accommodations are warranted and, if so, to help you obtain an official letter of accommodation.

The College Honor System

"The College of William & Mary has had an honor code since at least 1779. Academic integrity is at the heart of the College, and we all are responsible for upholding the ideals of honor and integrity. The student-led honor system is responsible for resolving any suspected violations of the Honor Code, and I will report all suspected instances of academic dishonesty to the honor system. The Student Handbook (www.wm.edu/studenthandbook) includes your responsibilities as a student and the full Code. Your full participation and observance of the Honor Code is expected. To read the Honor Code, see www.wm.edu/honor"