Nutritional Biochemistry: Indigenous Health
Chem 493
3 credits

Instructor: Kriya Dunlap, 474-2766, kldunlap@alaska.edu

Office Hours: Department of Chemistry and Biochemistry
West Ridge Research Building (WRRB), 230
3 hours TBA

Lecture: TBA (2 hours lecture + 2 hours laboratory)

Text (optional): Martha H. Stipanuk
Biochemical and Physiological Aspects of Human Nutrition, 3rd Edition
Saunders Publishing
ISBN: 1437709591
Published 2012
Supplementary readings: Library, web, manuscripts etc.

Course:
This 3-credit course focuses on integrating introductory concepts from chemistry and biochemistry in structuring research projects addressing nutritional concerns relevant to Alaska or Native health. Topics discussed will include components in Alaska foods, such as phytonutrients and omega-3 fatty acids and the health disparities that are affected by these compounds, such as diabetes, cardiovascular disease, inflammation and metabolic syndrome. We will tackle these issues by studying their biochemical foundation and acquiring an understanding of study design, through the development of testable hypotheses, data interpretation and research presentation. Proposal writing, research compliance, research techniques, and experimental design and execution will be central topics. Each topic will be addressed with a group-lead project, in which the students design, manage, execute and decipher the results of a project. The course is designed for the application of practical biochemical knowledge towards a current nutritional issue, while establishing successful biochemical skills and resource sharing.

Proficiencies: Some knowledge of general, organic and biochemistry.

Course Goals:
- Understanding the biochemical basis of nutrition through indigenous health and Alaska Resources.
- Allow students to integrate concepts learned in general, organic and biochemistry into a nutritional context.
- Use basic concepts to formulate hypotheses, select pertinent literature, interpret experimental data and propose meaningful experimental approaches to solving current questions in nutritional biochemistry.
- Experience the development of mini research project from proposal writing to data presentation.
- Be exposed to ethical and compliance issues required for modern day funded research.
Learning Outcomes:

1. Identify molecular components in Alaska’s food supply and their role in disease prevention.
2. Correlate chemical and physical properties of nutrients with their cellular functions.
3. Write hypothesis-based proposal for each project as a group.
4. Keep a detailed laboratory notebook/record, statistically analyze data, and present findings at the chemistry and biochemistry department end-of-year poster session.
5. Select key concepts from the text and arrange information in a relevant way for group dissemination and for use as a study guide. Use mixed technology or teaching aids. Group interaction will be encouraged.
6. Discuss current IACUC/IRB and address compliance issues pertaining to their projects.

Instructional Methods:

The course will begin with instructor-led lectures aimed at establishing the biochemical foundations needed to design and execute Alaska relevant nutritional research projects. Once the foundations are established, class time will be spent on developing a research project pertaining to that unit. Group discussion will offer a platform for brainstorming, troubleshooting, and collaborative research, while establishing successful laboratory practices. Students will have the opportunity to review supporting literature, relevant to the selected aim and therefore learn how to do a literature search. Student will be expected to share key findings from their literature search with the class in an effort to develop a strong hypothesis, structure a proposal together, write a protocol and perform and interpret their experiments. While, there will be an in-depth text book available as a reference (see above), reading material will include special interest pieces, examples of proposals, IACUC/IRBs and relevant manuscripts. Often I will email the entire class through Blackboard, so please make sure an email address that you check regularly is associated with Blackboard. I will also post grades on blackboard. A class website has been developed and will be used as a central communication platform for announcements, posting of lectures and reading material and a place for students to post. The address of the website is: http://nutritionalbiochemistry.community.uaf.edu/.

Evaluation:

Students will be evaluated in four key areas – hypothesis development, project proposal, laboratory practices, final research report, and poster presentation.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hypothesis development</td>
<td>10%</td>
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<tr>
<td>Literature review</td>
<td>10%</td>
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<tr>
<td>Additional reading / online &amp; in class discussions</td>
<td>20%</td>
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<tr>
<td>Laboratory practices, preparation, notebook keeping</td>
<td>20%</td>
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<tr>
<td>Research Report (Background, Protocol, Results, Conclusions, etc.)</td>
<td>20%</td>
</tr>
<tr>
<td>Poster</td>
<td>20%</td>
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Grading: Totals will be translated into a letter grade. Total point percentages of 90, 80, 70 and 60 correspond to the lower cutoff boundaries for the grades of A, B, C and D respectively. Percentages less than 60 constitute a failing grade (“F”).

Course Policies:

Attendance and participation:
Regular student attendance is expected to ensure consistent discussion and project progress. Active student participation is expected and is subject to a grade.

**Discussion:** Students are expected to participate in discussions for reading assignments as well as group projects. Discussion is not limited to in class; the course website will provide a continuous discussion platform: http://nutritionalbiochemistry.community.uaf.edu/

**Hypothesis development:**
Time will be allocated for each project for thorough group development. The instructor will provide guidelines and limitations so that students can shape a realistic and testable hypothesis surrounding Alaska foods, Indigenous Health or current nutritional issues.

**Literature Review & Project Proposal:**
Before students begin their projects, each student will perform a literature review and share it with the class. The students will work together to write a proposal for each topic project by delegating sections for each person or pair to contribute; person(s) responsible for each section will rotate. The proposal will follow NIH guidelines and more specifically will follow the guidelines established by INBRE for undergraduate and graduate proposals. Instructor approval and input will be required before experimentation begins. A great deal of the class will be dedicated to writing proposals with testable hypotheses and practical approach for completion within the limited time frame.

**Laboratory Practices:**
Laboratory practices encompasses, supply ordering, note-keeping, experiment organization and general laboratory etiquette. Students are expected to keep an up-to-date and detailed laboratory notebook that will be reviewed regularly by the instructor. Students are expected to find best-fit products for the research, taking into account cost, specificity and ease of use, and then fill out a purchase requisition for each item needed. Students will be expected to set up or organize experiments ahead of time (labeling tubes, making reagents etc.) as to minimize waste and expense. General laboratory etiquette is expected and will be subject to grading. This includes, washing dishes, putting away materials, emptying waste, restocking reagents and wearing appropriate protective clothing. Appropriate safety training and research compliance will be addressed.

**Research Report:**
A short report is due at the completion of each project. This will include an introduction, materials and methods, results with statistics, and conclusion. This will be done as a group and each person or pair will be responsible for each section, alternating from week to week.

**Poster:**
The final project is a poster presentation at the Department of Chemistry end-of-year poster session. Students will be graded on over-all aesthetics, layout, organization, figures and generally how easy it is to read and find information. Students will also be graded on their ability to answer questions and engage with their audience.

**Ethical Considerations:**
Any student caught cheating will be assigned a course grade of “F”. The students academic advisor
will be notified of this failing grade and the student will not be allowed to drop the course.

Student Code of Conduct:
As a UAF student, you are subject to the Student Code of Conduct. The university assumes that the integrity of each student and of the student body as a whole will be upheld. Honesty is a primary responsibility of you and every other UAF student. It is your responsibility to help maintain the integrity of the student community. More detailed information about UAF's Student Code of Conduct can be found at [http://www.uaf.edu/catalog/current/academics/regs3.html](http://www.uaf.edu/catalog/current/academics/regs3.html); it goes as follows:

1) Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

2) Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports.

3) No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.

Support Services:
Support services will be provided by the University of Alaska Library system, online resources and the instructor. Additional services are available through Student Support Services ([http://www.uaf.edu/sssp/](http://www.uaf.edu/sssp/)) at UAF.

Disabilities Services:
We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide accommodations for students with disabilities. If you have a disability and require special assistance, please contact the instructor as soon as possible. Students with disabilities must provide a written statement indicating any special requirements that will be necessary as early in the semester as possible (preferably within the first week).
## Tentative Class Schedule

<table>
<thead>
<tr>
<th>Week beginning on:</th>
<th>Lecture Activity/Topic</th>
<th>Laboratory</th>
<th>Assignment</th>
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| 01/13/14           | - Syllabus/Course outline  
                     - hypotheses development, proposal writing, and experimental design | - Laboratory safety and compliance  
                     - Distribute lab notebooks and discuss record keeping/ lab etiquette | - Discovery News: Inuit Paradox  
                     - INBRE student proposals |
| 01/20/14           | - Indigenous Health: Diabetes, Obesity, metabolic syndrome, CVD  
                     - Alaska Foods: polyphenolic compounds (carotenoids, anthrocyanins, proanthrocyanins) and omega-3 fatty acids | - The principles of ELISA and bioassays.  
                     - how to order materials | - Read protocols for microscopy (how to tag with primary and secondary), ELISAs (GLUT4), and assay kits (nSMase. |
| 01/27/14           | - Quantitative Research: measurable parameters (cytokines, stress hormones, insulin pathway intermediates, antioxidant status, ORAC, fluorescent tags etc.) | - write hypothesis for Assay or ELISA study  
                     - start growing 3T3-L1 cells | - literature review (3 papers or 1 review article) |
| 02/03/14           | - Present summary of literature review  
                     - Discuss experimental protocols | - outline experiment  
                     - layout experiment (label tubes, prep samples etc.)  
                     - crude aqueous extracts of plants | - write section of proposal |
| 02/10/14           | - review statistics (simple t-test, standard deviations, probability, significance) | - run experiment | - write section of report |
| 02/17/14           | Discuss research model systems available: Cell culture, microscopy, archived dog plasma, sled dogs races in march.  
                     - discuss articles | - start differentiating 3T3-L1 cells, layout semester long schedule for the maintenance and differentiation.  
                     - JOVE | - manuscripts on AK berries in neuroinflammation and diabetes.  
                     - manuscript on metabolic syndrome, subsistence foods and cardiovascular disease in AK natives. |
| 02/24/14           | - Qualitative Research: Interviews, Focus groups, analyzing published research, and how to interpret data. | - Formulate interview topic  
                     - select interview questions from student homework and organize in | - read for discussion, selected documents on Qualitative design. |
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<tr>
<th>Date</th>
<th>Task</th>
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<tbody>
<tr>
<td>03/03/14</td>
<td>-Come up with qualitative index in current literature, i.e. smoking and diabetes.</td>
<td>-Class (in laboratory) focus group.</td>
<td>-Write interview questions</td>
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<td>03/10/14</td>
<td>-Create a focus group topic for in class focus groups.</td>
<td>-Lead and participate in class-run focus groups</td>
<td>-Review 3 articles pertaining to qualitative index and compile results into a quantitative measure.</td>
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<td>03/17/14</td>
<td>SPRING BREAK</td>
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<td>03/24/14</td>
<td>-Address laboratory and research compliance: When is an IACUC or IRB necessary? What laboratory training is required for the methodology proposed? Where do you go to get this training?</td>
<td>-Visit IACUC/IRB office or do online training. -In-class IRB/IACUC preparation for real or mock project.</td>
<td>-Read human GLUT4 IRB -Read sled dog IACUC -Prepare section of IRB/IACUC</td>
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<td>03/31/14</td>
<td>-Write hypothesis for Qualitative research -Present literature review</td>
<td>-Write interview or focus group questions or quantitative parameters in lab. -Perform experiment</td>
<td>-Literature review (3 papers or 1 review article)</td>
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<td>04/07/14</td>
<td>-Write hypothesis for Quantitative biochemical experiment. -Discuss experimental design (purpose of duplicates, how to standardize etc.)</td>
<td>-Fluorescently label cells and visualize under microscope. How do you quantify?</td>
<td>-Write section of report for on-campus qualitative study -Literature review (3 papers or 1 review article)</td>
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<tr>
<td>04/14/14</td>
<td>-Data analysis -What is the significance of results of research?</td>
<td>-Run experiment</td>
<td>-Write section of proposal</td>
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<td>04/21/14</td>
<td>-Lecture on food contamination and</td>
<td>-How to structure and make a</td>
<td>-Write report for quantitative</td>
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<td>04/28/14</td>
<td>Present methods from one of our studies with a JOVE type report.</td>
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<td>05/05/14</td>
<td>Poster presentation at Department poster session</td>
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<td>bioaccumulation. -demonstration on augmented reality using mercury and bioaccumulation poster</td>
<td>scientific poster -Augmented reality laboratory/do your own.</td>
<td>project -complete posters -complete posters</td>
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