

**ANSC*6460 - Lactation Biology
Course Outline**

Fall '17

An in-depth systems analysis of lactation, comparing the cow, pig, rat, human and seal. Mammary anatomy and development from conception through to lactogenesis, lactation and involution will be covered. Hypotheses of hormonal and nutritional regulation of the biochemical pathways of milk synthesis will be tested in relation to experimental observations. Current areas of research activity will be presented by discussion of cutting-edge and classic publications. Each week will consist of 2 lectures and 1 session for discussion of a scientific paper, including history of the research topic and methodology.

Students will write a term paper in which a hypothesis to explain some phenomenon of lactation is proposed.

outline

week	topic	suggested search strings for Web of Science https://subzero.lib.uoguelph.ca/login?url=http://isi.knowledge.com
1	mammary anatomy mammary development	
2	lactogenesis	"onset of lactation" mammary lactogen* mammary casein expression mammary
3	lactation curve involution	involuti* mammary persistenc* lactati* "extended lactation" serotonin mammary mammary proliferati* apopto* milk
4	milk synthetic pathways and methodology	transport mammary mammary 13c
5	milk secretion and osmotics	milk fat secretion butyrophilin mammary golgi mammary secret*
6	regulation of milk synthesis nutrition	diet* milk composition infus* milk composition "mammary blood flow"
7	regulation of milk synthesis nutrition	"milk fat depress*" "conjugated linoleic acid" milk "conjugated linoleic acid" mammary trans fatty acids milk
8	regulation of milk synthesis hormones	mechanistic model* lactati* mammary (rapamycin or mTOR)
9	gut function	"portal drained viscera" lactati* "food intake" lactati*
10	adipose function	adipose lactati*
11	muscle function	"skeletal muscle" lactati*
12	transgenics breast cancer	

marking scheme

journal article presentation	30 %
participation in discussion	20
term paper	50

paper discussions

One person will be chosen to lead the discussion at the end of each week. The paper to be discussed will be chosen in consultation with me, the instructor, and made available to the rest of the class on CourseLink at the beginning of the week. Everybody should read the paper before class. The discussion leader should be prepared to go over the paper in detail but each person in class will need to bring one question of their own for discussion. It would be a good idea for the leader to bring a few questions as backup in case the others fizzle out early. It is not the job of the leader to answer the questions but to turn them back on the group as a whole and perpetuate the discussion. Furthermore, the discussion points should not be critiques of the paper, trying to find fault. Remember that the authors of the papers are experienced scientists and if there is an aspect that seems wrong to you, it is more than likely a fault of your own, not of the paper. The papers have been peer-reviewed prior to publication. If there are any mysterious aspects to the paper, let them provide you with your discussion points. Things to consider might be: why did they do things in a certain way, as opposed to alternatives? what did they find out from doing the experiment? what did you find out from reading about it? what are (or were) the consequences of this new knowledge? what would you like to know more about? The participation mark will be based on the questions brought to class each week and the contributions made in finding answers to the other questions. The presentation mark for the leaders will be based on the knowledgability of the presenter about the paper, the quality of the questions posed, and the elaboration of discussion.

term paper

The purpose of the term paper is to give you practice with integrating experimental results together to invent an explanation of some well-known phenomenon of lactation. The particular phenomenon to be explained will be chosen by you in consultation with me, the instructor. It might be some effect of diet or nutrient infusion or hormone injection or lighting, season, transgenics, sound, etc. on milk production, composition, mammary function, or lactational performance of cows, pigs, humans, dogs, rats, etc. Something that has been repeatedly observed and recorded in the scientific literature but about which there is no established hypothesis to explain it. A hypothesis is a tentative explanation of the cause of something. Let's take the stimulatory effect of growth hormone on milk production in cows as our example phenomenon. A hypothesis might be that growth hormone hits the mammary receptor, which stimulates expression of such-and-such genes in the secretory cell that lead to a speeding up of the cell cycle and greater numbers of cells accumulating in the udder so that more milk is synthesized per day. The paper would then be a presentation of what the phenomenon is, followed by descriptions of what changes have been observed in the metabolism of cows, or rats or cells during growth hormone administration and how these might explain the effect observed on milk yield. The paper will be marked based on clarity of the presentation, degree of characterization of the phenomenon with citations, the logical sense of the hypothesis, and the strength of the supporting evidence for the hypothesis (i.e. citations).