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
1	mammary anatomy mammary development
2	lactogenesis
3	lactation curve involution
4	milk synthetic pathways and methodology
5	milk secretion and osmotics
6	regulation of milk synthesis nutrition
7	regulation of milk synthesis nutrition
8	regulation of milk synthesis hormones
9	gut function
10	adipose function
11	muscle function
12	transgenics breast cancer

marking scheme

journal article selection report	15%
journal article leading	15
journal article discussing	20
term paper	50

paper discussions

One person will be chosen to select the paper and lead the friday discussion each week. The paper selection process will be documented in a report the discussion leader submits on the tuesday of their discussion week. The purpose of the process is to find an article that stimulates a lot of comment and questions from your peers in the class, and builds on information that was presented in lecture. The recommended process is to look at the powerpoint slides posted on CourseLink for the discussion week, pick interesting-looking papers cited there, and use Web of Science to find other papers that referenced those citations after they were published. An alternative is to search relevant keywords on

Web of Science but this may yield too many options. Read the interesting-looking papers you find and, of those, pick 3 (no reviews) that would be good candidates for discussion. You want to pick a paper that stimulates other students to ask questions like:

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 the paper?
what are (or were) the consequences of this new knowledge?
what would you like to know more about?

The process is expected to take a few hours. The report due on Tuesday, which will be marked, should list the 3 candidate papers in order of preference, and propose discussion points from each paper. A template for the report is provided on CourseLink.

Everybody should read the paper before friday's discussion. The discussion leader should be prepared to go over the paper in detail but each person in class will need to bring at least 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 and they are written by people familiar with many other papers on this particular topic. If there are any mysterious aspects to the paper, let them provide you with your discussion points, as listed above. The participation mark will be based on the questions brought to class each week and the contributions made in finding answers to the questions brought up during discussion. The presentation mark for the leaders will be based on their familiarity with 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 some phenomenon. 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).