

ADVS 5820/6820

ANIMAL CYTOGENETICS AND GENE MAPPING

3 Credits

Fall Semester (alternate years beginning 1999)

INSTRUCTORS:

-Dr. Thomas D. Bunch, Department of Animal, Dairy & Veterinary Sciences, AGSC 254, Ext. 7-2148.

-Dr. Noelle Cockett, Department of Animal, Dairy & Veterinary Sciences, BTECH 311, Ext. 7-3903.

-Dr. Shiquan Wang, Department of Animal, Dairy & Veterinary Sciences, Phys. Lab, Ext. 7-3970.

COURSE DESCRIPTION:

Structure, properties and banding of chromosomes, chromosome behavior during cell division, factors that cause changes in chromosome structure and number, chromosomal influence on the phenotype, gene mapping (e.g. quantitative trait loci and economically important trait loci) and the use of genetic markers to genetically improve livestock will be the basis of classroom instruction. Emphasis will be on the application of cytogenetic phenomena and genetic markers to discern clinical problems and for breed improvement of livestock.

PRIMARY TEXTS: (Available in AGSC 254)

- 1. Chromosome Techniques - A Manual by Arun Kumar Sharma and Archana Sharma, 1994.**
- 2. Cytogenetics of Livestock by Franklin E. Elldridge, 1985.**
- 3. Cytogenetics: The Chromosomes in Division, Inheritance and Evolution by Carl Swanson, Timothy Merz and William J. Young, 1981.**
- 4. Domestic Animal Cytogenetics by Richard A. McFeely, 1990.**
- 5. Human Chromosomes: Principles and techniques, 2nd ed. by Rams S. Verma and Arvind Babu, 1995.**
- 6. Human Chromosomes: Structure, Behavior and Effects by Eva Therman, 2nd Ed., 1986.**
- 7. Human and Mammalian Cytogenetics: A Historical Perspective by T.C. Hsu, 1979.**

REQUIREMENTS:

Students will be expected to attend all lecture sessions and participate in classroom discussion. An individual journal will be kept of laboratory exercises. The laboratory will involve either an individual or group project. Projects will include setting up fibroblast and/or leucocyte cultures from selected animal species, and from those cell lines develop karyotypes from G- and C-band preparations. Two laboratory periods will be devoted to molecular genetics and will involve demonstrations of preparing DNA, electrophoresis (southerns) and analyzing genetic markers. Laboratory attendance and participation is required. the laboratory period will be arranged at a time suitable for all students and will last approximately two-three hours (except for the 3-day leucocyte culture). The student normally will complete laboratory assignments within the laboratory period. One laboratory will be equivalent to one lecture period, although the time to complete the laboratory practicum will usually exceed two hours. Laboratory exercises will be held either in a laboratory in the Biotechnology or Physiology Building.

Students enrolled for 682 will be required to prepare a well developed paper on a current topic in cytogenetics or molecular genetics (10-12 typewritten or 14-16 handwritten pages) and make an oral presentation of the term paper. The student will meet with the instructor no later than mid semester and identify a topic to write on. Term papers and laboratory projects will be presented orally on the last day of class. Students enrolled in 5820/6820 must have taken a basic course in college genetics, animal breeding or a class of equivalence.

TESTING:

1. No makeup on missed exams unless prior authorization has been made with the instructor.
2. Notification of exam times will be specified in the course outline, which will be given to each student at the first lecture period. The final exam will be held at the time specified in the Test Period Schedule of the Schedule of Classes.

GRADING:

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|-----------------------------------|------------|-----|
| 1. Lecture: | 1st exam | 100 |
| | 2nd exam | 100 |
| | Final exam | 100 |
| 2. Laboratory Report | | 100 |
| 3. Term paper (682 students only) | | 100 |

Grades will be assigned as follows:

- A = 94% of a total points etc.**
- A- = 90-93%**
- B+ = 87-89%**
- B = 84-86%**
- B- = 80-83%**
- C+ = 77-79%**
- C = 74-76%**
- C- = 70-73%**
- D = accordingly**
- F = less than 60%**

COURSE OUTLINE:

A. Lecture and Laboratory Periods:

1. Introduction (1 lecture)
2. Historical Development of Cytogenetics (1-2 lectures)
3. Historical Development of Cytogenetics (2-2 lectures)
4. Introduction to Laboratory procedures and discuss individual or group projects (Lab. 1)
5. Chromosome Architecture (1-3 lectures)
6. Setting up fibroblast culture (Lab. 2)
7. Chromosome Architecture (2-3 lectures)
8. Setting up leucocyte culture (Lab. 3)
8. Chromosome Architecture (3-3 lectures)
9. Cell Division (1-3 lectures)
10. Techniques for G- and C-banding (Lab. 4)
11. Cell Division (2-3 lectures)
12. Photomicroscopy and prepare karvotypes (Lab. 5)
13. Cell Division (3-3 lectures)
14. Processing fibroblast cultures (Lab. 6)
15. Molecular Cytogenetics (1-2 lectures)
16. Molecular Cytogenetics (2-2 lectures)
17. 1st Exam
18. Chromosome Variation: Nature and Consequences (1-2 lectures)
19. Chromosome Variation: Nature and Consequences (2-2 lectures)
20. Chromosome Variation: Numerical Changes (1 lecture)
21. Chromosome Variation: Variant Systems (1 lecture)
22. Domestic Livestock Cytogenetics (1-5 lectures)
23. Domestic Livestock Cytogenetics (2-5 lectures)
24. Domestic Livestock Cytogenetics (3-5 lectures)
25. Domestic Livestock Cytogenetics (4-5 lectures)
26. Domestic Livestock Cytogenetics (5-5 lectures)
27. Human Cytogenetics (1-3 lectures)
28. Human Cytogenetics (2-3 lectures)
29. Human Cytogenetics (3-3 lectures)

- 30. 2nd Exam
- 30. Genome maps (1 lecture)
- 31. Internet searches of genome databases (Lab. 7)
- 32. Genetic markers (1-2 lectures)
- 33. Genetic markers (2-2 lectures)
- 34. DNA preparation and southernns (Lab. 8)
- 35. Linkage analysis (1-2 lectures)
- 36. Linkage analysis (2-2 lectures)
- 37. Preparation and analysis of genetic markers (Lab. 9)
- 39. Positional cloning (1-3 lectures)
- 40. Positional cloning (2-3 lectures)
- 41. Positional cloning (3-3 lectures)
- 42. Present term papers and discuss projects

FINAL EXAM will be administered as listed in the "Schedule of Classes," and will cover in depth lecture contact periods 30 - 41 and in general periods 1 - 16 and 18 - 29 (comprehensive).