



Veterinary Genetics and Genetic Engineering
Course Specifications 2014/2015

1-Basic information	
Course Code:	226
Course title :	Veterinary Genetics and Genetic Engineering
Academic year:	2 nd year (2 nd semester)
Programme title:	Bachelor of Veterinary Medical Sciences
Contact	Lecture: 3 hours/ week
hours/week/semester:	Practical: 2 hours/ week

2-Professional information

1- Overall aims of course
By the end of this course, students should gain the basic knowledge concepts and the essential practices in the field of veterinary cytogenetics, chromosomal aberrations, molecular genetics, genetic engineering, genetics and animal diseases, structure of chromosome, morphology, structure of DNA, changes in genetic materials at cytogenetics and molecular level. In addition to the relationship between the genetic material and diseases of animal

2- Intended learning outcomes of course (ILOs)
a-Knowledge and understanding
By the end of this course the student should be able to: a1- Define the basis of inheritance in relation to animal morphology, development, function, production and behaviour, a2- Discuss mechanisms of chromosomal aberrations and its reflection on individual phenotype and fertility, a3- Describe the characteristics of genetic material and different methods of its manipulation

- a4- Explain the relationship between genome structure, disease and immunity of domestic animals, poultry and fish.
- a5- Outline the methods used for genetic control of infectious and inherited diseases,
- a6 - Identify the role of molecular genetics in the veterinary field.

b-Intellectual skills

By the end of this course, the student should be able to:

- b1- Distinguish between chromosomal aberrations and some kinds of anatomical malformations in newborn and some cases of sterility.
- b2- Correlate between the exposure to environmental pollutants and incidence of chromosomal aberrations and increased incidence of cancer.
- b3- Relate between the variation in genetic structure at the molecular level with normal individual identification (DNA fingerprinting) and abnormal diseased individual (Genetic diseases).
- b4- Distinguish between number and morphology of the chromosome and animal species identification.

c-Professional and practical skills

By the end of this course, the student should be able to

- c1- Determine chromosome number and structure of different species microscopically and in electronic slide within one minuet.
- c2- Investigate phenotypic malformation and sterility problems associated with chromosomal aberrations by chromosome karyotype.
- c3- Demonstrate the use of genetic material (chromosome and/or DNA) as measurement tool to measure genotoxicity of different environmental pollutants.
- c4- Prepare Karyotyping for different species by using different materials (blood, bone marrow, feather bulb from chicken, kidney and gills from fish.
- c5- Apply sexing of animal species based on cytogenetical techniques

d-General and transferable skill

By the end of this course, the student should be able to:

- d1-Handle computers and internet skills.
- d2- Work in team and communicate efficiently.

3-Topics and contents

First semester

Topic	No. of hours		
	Lectures	Practical	Total
A. Chromosome and cell cycle 1. Interphase stage a. The C value b. Chromatin 2. Heterochromatin and Euchromatine.	6	-	10
3. Mitotic chromosome a. Chromosomal shape & nomenclature b. karyotype c. Banding technique in Karyotype d. Genetic Importance of banding technique.	-	4	
B. Chromosomal aberrations 1. Numerical chromosomal aberrations a. Monosomy b. Trisomy c. Monoploidy d. Abnormal diploidy e. Polyploidy	-	4	10
2. Structural chromosomal aberrations a. Balanced rearrangement: Inversion, Shift, Centric fusion, Reciprocal translocation, Insertion, Transposition b. Unbalanced rearrangement: Deletion, Duplication, sochromosome, Ring chromosome, Causes of abnormal karyotype	6	-	
C- Sex determination 1- Sex dtermination in mammals 2. Faetal sex diagnosis.	6	-	10
3. X-chromosome and dosage compensation 4. Fertility as affected by chromosome a- Freemartinism b- Intersex	-	4	
D-The genetic material - Chracterstics of the genetic material -Types of DNA) - The genetic code (The code dictionary)	-	16	40

- Genetic expression - Transcription: RNA synthesis - Translation: Protein synthesis E. Mutation -classification of mutation desirability -Restriction fragment methods for gene mapping - The polymerase chain reaction			
- Structure of nucleic acids - DNA replication (Steps of DNA synthesis) - The genetic code (Nature of genetic code) - Regulation of protein synthesis 1. The Operon system 2. Lac Operon in E.coli 3. Histidine operone in Salmonella typhimurium - Mutagenesis - Mutation and cancer - The genetic manipulation recombinant DNA and genetic engineering. - Methods for studying the genome - Somatic cell hybridization. - Molecular genetic methods for gene mapping - DNA fingerprints	24	-	
Genetics and animal Diseases	3	2	5
Total	45	30	75

4-Teaching and learning methods

4.1. Lectures.

4.2. Practical lessons.

4.3. Assay writing.

5-Student assessment

5.1. Assessments methods

1- Written exam	For assessment of knowledge, back calling and Intellectual skills
2- Practical exam	For assessment of practical and professional skills.
3- Oral exam	For assessment of knowledge and Intellectual skills
4- Student activities	For assessment of knowledge and general and transferable skills

Method	Matrix alignment of the measured ILOs/ Assessments methods			
	K&U (a)	I.S (b)	P&P.S (c)	G.S (d)
Student activities and periodical exam	a1, a2	b1, b2	-	D1,d2
Practical exam	--	--	c1,c2,c3,c4, c5	--
Oral exam	a1,a3,a5 a6	b1,b2,b3	--	--
Written exam	a1,a2,a3,a4,a5 a6	b1,b2,b3,b4	--	--

<u>5.2-Assessment schedules/semester</u>	
Assessments methods	Time of Assessments
Student activities	Along the semester
Midterm exam	8 th Week
Practical exam	16 th Week
Written exam	16 th Week
Oral exam	16 th Week

5.3-Weight of assessments

Assessment	Allocated Mark		
	1 st term	2 nd term	Total
Periodical exams and activities	--	10	10
Practical exam	--	20	20
Oral exam	--	20	20
Written exam	--	50	50
Total	--	100	100

6- List of references

6.1. Departmental Notes

Genetics and Genetic engineering (lectures and practice) El-Fiky, S Hemed, S. H, and El-Nahas, A. F.

6.2. Essential books

R. Frankham, et al.: Introduction to Conservation Genetics
Cambridge University Press 2005

James D. Watson, Nancy H. Hopkins, Jeffrey W. Roberts, Joan Argetsinger Steitz + Alan M. Weiner Molecular Biology of the Gene
- a comprehensive overview of the entire field of molecular genetics
Benjamin/Cummings

Griggith, A. J. F., Gelbart, W. M., Lewentin, R. C. and Miller, J. H. (2002):
Modern Genetic Analysis . 2nd ed.

Benjamin I. (2008) : Genes IX . Jones and Barlett. Canada, UK
Molecular Biology of the Gene (2007) 2. James D. Watson, Stephen P. Bell,
Alexander Gann, Michael Levine, Tania A. Baker Paperback, Addison-
Wesley (2008).

Leland Hartwel (2006). Genetics: From Genes to Genomes McGraw-Hill
Science/Engineering/Math, published: 2006-10-09

6.3- Periodicals, Web Sites, ... etc

- Mutation Research

- Chromosoma

- Heridats

- J. Heredity

- Nature Genetics

- Animal Genetics

- **Web sites**

- <http://learn.genetics.utah.edu/>

- <http://ghr.nlm.nih.gov/>

- <http://www.dnafb.org/>

- http://www.ornl.gov/sci/techresources/Human_Genome/genetics.shtml

Course coordinator: Dr. Hanem Haikal

Head of department: Dr. M. Atef

Matrix alignment of the course topics and ILOs

Topic	No. of hours /week		Total hours /year	Hours for lect.	Hours for pract.	ILOs				Lect.	Pract.	Self& active leaning	Audiovi sual	
	Lect.	Pract.				K&U (a)	I.S (b)	P.P. S (c)	G.T.S (d)					
Part I. Cytogenetics	3	2												
A. Chromosome and cell cycle			10	3	2	a1	b1	c1	D1	√	√	√	√	
B. Chromosomal aberrations			10	3	2	a2	b2	c2	D2	√	√	√	√	
C- Sex determination			5	3	2	a1	b1	c5		√	√	√	√	
D. Fertility as affected by chromosome			5	3	2	a1	b1	c4, c5	D2	√	√	√	√	
<u>Part II. Molecular Genetics</u>														
A. The genetic material			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√	
B. DNA replication			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√	
C- The genetic code			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√	
D. Genetic expression			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√	
E- Regulation of protein synthesis	5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√			

F. Mutation			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√
G. The genetic manipulation		2	5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√
H. Methods for studying the genome			5	3	2	a3, a6	b3, b4	c3	D2	√	√	√	√
Part III. Genetics and animal Diseases			5	3	2	a4, a5	b3	c3	D1	√	√	√	√

Head of department: Dr. Mohamed Atef Helal

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