

Embryology and Teratology (G000715)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 6.0	Study time 180 h	Contact hrs	55.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 2)	Dutch	Gent	clinical seminar	1.25 h
			PDE tutorial	5.0 h
			practicum	5.0 h
			microteaching	2.5 h
			lecture: plenary exercises	1.25 h
			demonstration	1.25 h
			lecture	37.5 h
			group work	1.25 h

B (year)

Lecturers in academic year 2020-2021

Cornillie, Pieter D103 lecturer-in-charge

Offered in the following programmes in 2020-2021

	crdts	offering
Bachelor of Science in Veterinary Medicine	6	A

Teaching languages

Dutch

Keywords

Embryology, Domestic animals, Organogenesis, Placentation, Congenital malformations

Position of the course

The Embryology fits within the package of courses dealing with the normal structure, functioning and development of the healthy animal as scheduled in the Bachelor's programme in Veterinary Medicine. Its goal is to provide knowledge and deeper insights in the prenatal development of domestic animals. Not only the exact events and the different developmental steps that occur to attain the normal anatomical and histological configuration of a fully developed new individual are discussed (morphogenesis), also the whos and wherefores in relation to these processes are investigated (developmental biology). By doing so, a clear link between the Embryology and other courses in the Bachelor's programme such as Genetics, Physiology and Biochemistry is made.

In addition to the normal prenatal development, also the occurrence and origin of congenital malformations and anatomical variations (dysmorphogenesis) are discussed. Teratological specimens are not only useful to explain and understand (errors in) the normal developmental pattern, their study forms an initial step towards veterinary pathology.

Also the typical diversity of the broad range animal species a veterinary student / practitioner is confronted with is illustrated when the species-specific characteristics of the formation of the fetal membranes and placental development are discussed and compared between domestic animals, laboratory animals and man.

The knowledge provided in this course of Embryology is more clinically elaborated in the courses of Reproduction and Obstetrics in the Master's programme.

Contents

The course of Embryology is subdivided in six main subunits:

General introduction: The discipline of Embryology is situated in broader historical, scientific

and veterinary perspective. Also some important terms, definitions and basic principles of both the classical embryology and developmental biology are explained and illustrated so that they can be applied in the further chapters of the course.

Preparation for new life: The different steps from the production of the sperm and egg (gametogenesis) in the parental animals over the processes of fertilisation until the formation of the zygote are discussed in the first two chapters.

Early embryogenesis: the newly formed conceptus passes through the different cleavage stages and develops into a blastocyst. Subsequently, gastrulation and neurulation take place and the primitive embryo is shaped and secluded from its surrounding membranes.

Fetal membranes and placenta: after a brief overview of the general development and function of the fetal membranes and placenta, these extraembryonic parts and associated structures are more profoundly studied in the horse, ruminants, the pig, dog and cat, the fowl, the rabbit, the mouse and rat, the guinea pig and the human.

Congenital malformations: in this general chapter, the different possible outcomes of anomalous development are discussed, with a special focus on the dysmorphogenesis. Subsequently, a short overview is given of the different natures of teratological agents. Specific examples of congenital malformations are integrated within the other chapters and practical courses, and associated with specific aberrations of normal development.

Organogenesis: The development of the different tissues, organs and body regions is systematically discussed in the following chapters:

- Locomotory system
- Body cavities
- The head and neck
- Digestive system
- Respiratory system
- Urogenital system
- Cardiovascular system
- Lymphoid system
- Nervous system
- The eye
- The ear
- The endocrine system
- The integument

The fetus: This last chapter focuses on the recognition of the typical developmental characteristics of the fetus that can be applied for the estimation of the fetal age.

Initial competences

Enrollment for this course has to be in accordance with the regulations on individualised study trajectories for the academic year in which the course will be followed.

Knowledge of general histology and general veterinary anatomy is a prerequisite. Simultaneous enrollment for these courses, apart from having obtained a credit or exemption, is considered sufficient.

Final competences

- 1 Be able to define the different phases of development, and indicate the developmental stages in correct scientific terms.
- 2 Know the normal (average) gestational length / incubation time of all common domestic animals and laboratory animals.
- 3 Clarify from ontogenic point of view the normal anatomy and functioning of animals.
- 4 Describe in correct scientific terminology and illustrate step-by-step by means of simple sketches the different phases of embryogenesis or specific organogenesis.
- 5 Have spatial and functional insights in the organisation of the fetal membranes and placenta of the domestic animals, and be able to illustrate this organisation schematically.
- 6 Know the essentials of the organisation of the fetal membranes in laboratory animals and in man.
- 7 Exemplify the variation in anatomy and organisation of the placenta between the various domestic animals, laboratory animals and man.
- 8 Recognize the mechanisms of regulative development, in particular induction, interaction & differentiation, pattern formation (reaction-diffusion), positional information through morphogens and organizers (French flag) in the different developmental steps of early embryogenesis and specific organogenesis.
- 9 Recognize the most obvious organs and structures of the embryo (macroscopically & histologically).
- 10 Explain the occurrence & development of congenital malformations as deviation from normal

embryogenesis & organogenesis and understand the impact on the functioning of the affected animal.

- 11 Exemplify the critical periods in organogenesis, the possible causes of congenital malformations, the various factors determining the teratogenic effect & the different presentations of abnormal development.
- 12 Be able to define the medical terms associated with the most common congenital malformations in domestic animals and vice versa (i.e. name the anomaly).
- 13 Provide a preliminary judgement on the effect of a congenital malformation on the functioning of the animal, its life quality and life expectancy.
- 14 Know where to find resources and methodologies which are helpful in the estimation of embryonic and fetal age in the various domestic animals.
- 15 Be able to make, on the spot, a rough estimation on the fetal age in farm animals (horse, cattle, sheep, goat, pig).
- 16 Use the correct scientific terminology and appropriate language to describe embryological features and teratological conditions.
- 17 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Adopt a scientific attitude in problem analysis, including the formulation of a hypothesis, the design of a simple experiment to test a certain hypothesis and critical analysis of the results obtained.
- 18 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Develop a certain autonomy in the processing of information and summarizing the obtained data in own formulations.
- 19 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Recognize (=be aware of and accept) the boundaries of scientific knowledge: uncertainty about certain topics, resulting in the coexistence of equivalent but different hypotheses on certain phenomena.
- 20 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Through critical reflection and the adoption of an enquiring attitude be able to analyse and compare different hypotheses on the same topic, and formulate a scientifically sound conclusion.
- 21 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Be aware of the ethical and social issues regarding the use of laboratory animals, in particular in embryotoxicity and teratogenicity studies.
- 22 *Contribution to the competences as part of the general attainment levels of the bachelor's degree:* Have insights in the role of the veterinary surgeon in animal welfare, in particular in the prevention and remediation of congenital anomalies.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Demonstration, group work, lecture, microteaching, PDE tutorial, practicum, lecture: plenary exercises, clinical seminar

Extra information on the teaching methods

Theoretical courses: lectures, interactive lectures, plenary exercises and demonstration. All lessons are supported by projection of drawings made during the session by digital sketch-tablet, powerpoint presentation (photos & videos) and the large screen projection of educative specimens.

Practical sessions: demonstrations (both plenary as in smaller groups), microscopic practical.

PBL: guided analysis of teratological cases. Presenting these cases to fellow students: microteaching.

Learning materials and price

A comprehensive, illustrated syllabus (in Dutch), including an interactive digital extension, containing all photos used during the lessons, can be purchased at the beginning of the series of courses.

Embryological and teratological specimens, models, didactic videos, digital photos, educational software and histological sections are demonstrated during the lessons or made available for the students during the practical sessions.

Drawings made during the lessons are provided afterwards through Minerva. Of the most complex drawings, also a step by step approach in video format is provided.

References

Course content-related study coaching

There is no dedicated course-specific monitoring and support provided. Instructions on the examination form and contents are provided through the digital learning environment. Specific study aims are discussed during each of the theoretical and practical sessions. AP members are permanently present during all exercises. Through specific discussion fora in the digital learning environment, students can post and comment on substantive and practical questions regarding this course. On regular basis, typical exam questions are posted into these discussion fora by the lecturer. All AP-members involved in the course can be contacted for additional information by appointment.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions

Examination methods in case of permanent evaluation

Portfolio, participation

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

Written examination consisting of a maximum of four open main questions, derived from different parts of the course content, followed by one sheet of short additional questions (short blank questions, recognition of photos, yes or no questions). The exam content is built only from the matter as discussed in the lessons and practical sessions, except for the parts that were particularly indicated as matter of secondary importance (especially the items in the syllabus that are displayed in a smaller font size).

Calculation of the examination mark

The presence and active participation during all practical exercises is compulsory. The means of the individual scores to the three main questions (early embryogenesis, fetal membranes, organogenesis) are not calculated arithmetically, but geometrically. The obtained result counts for 1/2 of the score. The sheet with additional questions makes up 1/3rd of this figure, the main question related to the PBL practicals and microteaching the remaining 1/6th.

Facilities for Working Students

Student with an employment may ask the lecturer to attend the practicals on the most convenient date. However, performing an alternative task, in replacement of the compulsory practicals, is not allowed.