ANIMAL SCIENCE
Theses and Projects
Topics for Theses and Projects Available in 2019-2020
Department of Animal Science
Aarhus University
Preface

This catalogue of master thesis projects available in the Department of Animal Science, Aarhus University, is considered to inspire and help you selecting a topic for your master thesis project. The catalogue is intended for students of the Master's Degree Programmes in Agrobiology, in Organic Agriculture and Food Systems (EUR-Organic), in Biology and for other animal science related master degree students who would like to do their master thesis project at Aarhus University. Read more about Agrobiology and the other animal science related Master Degree programmes at http://kandidat.au.dk/en/agrobiology/

A number of project proposals are presented in detail, together with contact addresses and other practical information. However, the catalogue is not exhaustive on the possibilities and should also be read as an inspiration on topic areas and supervisors. Therefore, you should feel free to contact us with your own ideas and to ask for further possibilities. You may also find inspiration and possible supervisors to contact at the Department website: http://anis.au.dk/en/

This catalogue also lists a few animal science related projects from the sister departments Agroecology (http://agro.au.dk/en/) and Food (http://food.au.dk/en/). You will find more projects and information at the mentioned sites.

During your thesis work you will be associated to a research group. Please note that the Department of Animal Science is situated at AU Foulum about one hour’s drive from Campus Aarhus. There are student housing possibilities at AU Foulum and in Viborg which is close by and with regular bus connections. You can find maps at http://www.au.dk/en/about/organisation/find-au/buildingmap/

If you are an international student looking for exchange possibilities at Aarhus University you will find more information at http://www.au.dk/en/exchange/welcome/ and http://www.au.dk/en/internationalcentre/

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## Contents

- Guidelines ........................................................................................................................................................................... 5
- Thesis types offered for students at the MSc Agrobiology programme ................................................................. 5
- Guidelines for the MSc Thesis Research Proposal ............................................................................................................. 6
- Guidelines for writing the Thesis Report ............................................................................................................................. 8
- Topics .................................................................................................................................................................................. 11
- Metabolomics as a tool in nutrition studies ........................................................................................................................... 11
- Animal transport and related management ....................................................................................................................... 12
- 3R – Refinement of animal experimentation ....................................................................................................................... 13
- Insect nuisance in horses ...................................................................................................................................................... 14
- Biobanking as a conservation tool ....................................................................................................................................... 15
- Production diseases in poultry ........................................................................................................................................... 16
- Timing of stereotypy observation in WelFur-Mink .................................................................................................................. 17
- Can we get behavioural information from automatic mink weights? ................................................................................ 18
- Optimized feed bunker space for slaughter calves to maximize feed intake and growth and improve feeding behaviour .......................................................... 19
- Variation in feed intake and feeding behavior of bull calves and its relation to age, ration composition, health and performance .................................................................................................................. 20
- Production performance and slaughter- and carcass quality of heavy Holstein Friesian young bulls .............................................. 21
- Probiotics for unweaned dairy calves – effects on health and performance ........................................................................ 22
- Behaviour at calving on dairy cows kept on pasture ........................................................................................................... 23
- Nitrogen excretion in dry cows ............................................................................................................................................. 24
- Cattle feeding, nutrition and physiology in relation to emissions, efficiency and product quality ........................................... 25
- Feed evaluation for ruminants – fibre ................................................................................................................................. 26
- Phytoestrogens in red clover ................................................................................................................................................. 27
- Seaweed for ruminants ........................................................................................................................................................... 28
- Estimation of body weight based on heart girth measurements in pre weaned dairy calves ........................................... 29
- Organic pig production and prevention of weaning diarrhea .............................................................................................. 30
- Deposition of intramuscular fat in pigs ................................................................................................................................. 31
- Gastric ulcers in pigs ............................................................................................................................................................... 32
- Organic pig production and prevention of weaning diarrhea .............................................................................................. 33
- RobustPig - Early inoculation of probiotics to newborn piglets .............................................................................................. 34
- How does early life experience affect pigs’ ability to cope with early weaning? .............................................................. 35
- Maternal behaviour and early piglet mortality in organic pig production ............................................................................... 36
- Play behaviour in piglets ......................................................................................................................................................... 37
- Fermfeed - A strategy to prevent post-weaning diarrhea in piglets- fermented liquid grains added probiotics from the suckling period .................................................................................. 38
- Reducing use of antibiotics in Danish pig production ........................................................................................................ 39
Guidelines

Thesis types offered for students at the MSc Agrobiology programme

**Thesis 30 ECTS credits**
Theoretical thesis based on literature studies and/or analysis of issued and edited data sets.

**Thesis 45 ECTS credits**
Experimental thesis in which the student is responsible for collection and analysis of original raw data. The quality of the data collection, analysis and editing must be included in the overall assessment.

**Thesis 60 ECTS credits**
Experimental thesis in which the student is responsible for planning of trial design and methods as well as collection and analysis of original raw data. The quality and independence of own trial design, planning of data mining from original data bases or the development of new theories must be included in the overall assessment. The quality of the data collection, analysis and editing must also be included in the overall assessment.

When you have decided on a master thesis subject, a master thesis contract has to be signed, where the conditions and time schedule are described. Contract forms for students enrolled at Aarhus University and further details on requirements can be found here:
Guidelines for the MSc Thesis Research Proposal

The Research Proposal
Broad agreement exists on the basic scientific standards that apply for a scientific study. Above all, the scientific standards that apply (and thus must be met) are the following:

The thesis must be theory-based.
The research must be verifiable.
The research must be in principle replicable.

To make sure that your research is complying with these rules, you should start by making a research proposal attending to these standards. A proposal consists of the following parts:

Problem statement: This gives the motivation for the selection of the topic and a clear description of the problem field, finally resulting in a concise problem statement. This part includes a review of the theoretical and empirical literature, which is most relevant to the topic and ensures that the topic has not already been exhausted by other researchers.

Theoretical framework: This part gives the background of your topic and leads up to your research questions/hypotheses. Which information is already known from the literature? The theory acts as a base for further investigation and comparison with the (future) results. You must indicate which concepts are important to be looked at in answering the research questions.

Research objective(s) and research questions/hypotheses: This clearly states the scientific objectives of the research. It is important that the objectives of the research are strictly related to the research topic. Subsequently, the research objective(s) should be translated into research questions/hypotheses. These are the questions that need to be tested and/or answered in order to fulfill the research objective(s).

Methodology: In this part of the proposal it should be explained how the theory and research questions can be examined and answered empirically. The function of the methodology part within the research proposal (and later in the thesis report) is to specify reliability, validity and replicability of the research.

You need to consider the following points when setting up a sound methodological framework:

Identify the character of the thesis work. For instance: is it an explorative, or comparative, or experimental study?

Design the data collection. This step requires arguing about, and providing an answer to, the following questions:

What is seen as data and from which sources of information do you obtain these data?

What are the criteria for determining and delineating the sources of information?

What methods are employed to derive the data from the sources of information? Is the case of experimental work: what is the experimental design, which factors do you explicitly test for, how many replicates do you have, etc.?

Which instruments will be used? It is important to think about the instruments you need far in advance, because not all equipment is available, or it can be in use elsewhere.
Design the data analysis: It should be pointed out that the description of the methods is necessary for data collection as well as for data analysis. How can the data be processed? Which statistical tests can be applied given the employed data collection methods or experimental design? Note that it is important to think about data analysis before you start to collect data. Certain analyses require certain data formats and experimental set-up.

Working plan and time schedule: The research proposal finally should be completed by a comprehensive working plan, indicating the necessary steps in carrying out the research, as well as their logical order in time, specification of milestones and quarterly status presentations – all to ensure that the workload is realistic and the thesis work is progressing in a sound way.

In some cases you need a financial plan. The general necessity of financial means to carry out the thesis work needs to be discussed and agreed between student and supervisor before the actual thesis work starts.
Guidelines for writing the Thesis Report

The thesis report (max. 100 normal pages), should be written in Danish or English with a summary in English. A normal page for written submissions is 2400 type units (i.e. characters plus spaces). To calculate normal pages, text is included, but not the front page, table of contents, bibliography, appendix, figures, tables and models.

Writing style: The thesis report should be written in an academic writing style. An academic writing style is in its essence short, clear and unambiguous. You use the terminology of the discipline. When you propose a hypothesis or theory, it must be substantiated. You bring documentation for any methods and postulates in terms of reference to scientific, peer reviewed research (scientific journal papers) or in terms of data. You discuss your actual results in relation to the applied methods and relevant peer reviewed research. You conclude on you hypothesis and on your actual results.

Referencing: It is very important that you give proper references when making statements from the literature. References acknowledge the work of others, and provide the reader with information on the sources that you used. Plagiarism is not acceptable and in serious cases students risk to be expelled from the university.

Plagiarism

Plagiarism is using another person’s text as your own without making precise source references. Plagiarism is considered a very serious offense because it is a theft of another person’s work and because you are assessed on work that in actual fact is not yours. You avoid plagiarism by always making a precise source reference when you use other people’s work – this applies to quotations, reproductions, interpretations, translations, figures, illustrations, etc. When you produce a text, it must appear clearly which is the result of your own ideas and which passages are a result of your processing of other people’s knowledge.

You must be aware that it is your responsibility: If you plagiarise, the consequences may be quite serious.

Suggested structure of the report

- **Front page**: This is the cover of your thesis. It should mention the title of the research, the name of the author, the name of the master’s degree programme, year and date. The front page also needs to carry the logo of the university.

- **Title page**: This page must be in the strict format.
  The title page contains the following elements:
  - Title of the thesis research
  - Your full name (including all initials)
  - Student registration number
  - Name of the master’s degree programme
  - ECTS of the thesis (60, 45 or 30)
  - Year and date of submission
  - Title, name and department of the supervisor(s)
  - A copyright statement – to be discussed
  - The proper logo of the university

- **Preface**: Less than one page.

- **Table of content**: Gives an overview of the chapter structure of the thesis with their respective page numbers. It should also include the summary and possible annexes.
• **Abstract**: Maximum of 250 words that describes the research for the general public.

• **Summary**: Provides a short (1-2 pages) but comprehensive summary of all chapters, i.e. the research objectives, the methods used, the most important results and conclusions.

• **Introduction**: This part includes the problem statement, the scientific objectives as well as the research questions/hypotheses that you have formulated in your proposal. You can also give a characterization of the type of work and a short outline of the structure of the subsequent chapters can complete it.

• **Background/Theoretical Framework**: This section provides a focused review of the theoretical and empirical literature which forms the basis of your work. The section substantiates the research questions/hypotheses of your work. The theoretical framework may be completed by a conceptual model, in which the relations of the relevant concepts of the applied theories are presented. Note that this framework may also be part of the introduction instead of being presented as a separate chapter.

• **Methods**: This part reports on the used information sources, as well as the applied methods and instruments for data collection and statistical data analysis. In contrast to the research proposal - where this section is presenting the ambitions/plan - you must present the situation as it has actually worked (incl. problems that occurred) in the final thesis report. In the case of fieldwork, you should describe the area and sites in which the research was carried out. When you have done experimental work, you should give all relevant details of the followed procedure (protocol). This enables others to evaluate your work, and to reproduce it if needed.

• **Results**: In this section the results should be presented in the most objective and comprehensive manner. Mixing results with subjective interpretation and discussion must be avoided. The challenge is to structure the results in such a way, that the research questions are addressed as best. Where appropriate, the findings should be illustrated or summarized with tables and figures including a statistical data analysis. In any case tables and figures must be drawn in such a way that they can be read on their own, independent from the surrounding text. Do not forget to include measurement units and an explanation of abbreviations. References to tables and figures should be made in the text (e.g., see table 1; cf. figure 2). Note that table captions are given above the table, whereas figure captions are placed below the figure.

• **Discussion**: The discussion section links your own findings, as presented in the result section, with those of others. What do your results mean and imply? The challenge here is to argue for and against the findings and the related theoretical concepts. Literature references are therefore again a requisite in this section. Furthermore, you must discuss your findings in the background of the scientific objective(s) and the research question(s), as well as in the light of the chosen theoretical framework. Last but not least, it should also not be forgotten to discuss to what extent the findings might have been influenced by the chosen methods.

• **Conclusions**: This section brings together the most important findings and consequences of your research. The conclusion must state the answer your work provided to the research questions and/or hypothesis you posed.

• **Implications or Perspectives**: These conclusions normally touch on three aspects: a.) The scientific objective and the research questions (results); b.)Hints for future research on this
topic (theoretical framework and methods); c.) Practical application of the results (consequences in management and policy), however, this last part might also be a separate section named ‘Implications’ or ‘Perspectives’.

- **Bibliography**: In this section a list of all referred literature should be given, sorted in alphabetical order. The style for the different types of publications (articles in journals, books, chapters in books etc.) should be consistent, e.g. according to the Harvard style, see also the [Harvard online referencing tutorial](#).

  When you refer to information on the Internet you should give the complete web-address, as well as the date on which the information has last been accessed, e.g.:


- **Annex/Appendix**: This is optional and the content of the annex/appendix is not evaluated, thus all important and relevant information must be given within the frame of the thesis and its main sections. The annex could include supplementary information about protocols, observations, calculations, etc. This could mean for example: the inclusion of the original data, further detailed statistical analysis, etc. Note that also the annex pages should be numbered consistently with the general text.
Topics

**Metabolomics as a tool in nutrition studies**

**Main subject area**
Animal Nutrition/Animal Science/Human health.

**Department and supervisor**
Department of Animal Science/http://anis.au.dk
Mette Skou Hedemann, Senior scientist
E-mail: Mette.Hedemann@anis.au.dk
Phone: +45 8715 8078

**Project start**
Any time.

**Physical location of project and students work**
Department of Animal Science, AU-Foulum, DK-8830 Tjele.

**Short project description**
Metabolomics is the detection of low molecular weight metabolites and their intermediates from biological samples (blood, urine, digesta, tissue etc.). The metabolome is made up of endogenous metabolites, products of the metabolism, metabolites originating from the microbial fermentation as well as exogenous metabolites originating from the feed, e.g. phytochemicals. Changes in the metabolome may thus reflect altered metabolic pathways or changes in the microflora or its activity.

In the Molecular Nutrition and Reproduction group we have samples from several dietary intervention studies where metabolomics analyses are relevant. We have samples from studies with a human health perspective but it is also possible to do experiments where the aim is studies on animal nutrition and health.

Examples of studies and sample types:
- Urine samples from obese Göttingen minipigs fed diet with low or high protein and low or high dietary fibre.
- Urine samples from horses fed different diets and sampled before and after training.

**Additional information**
The master’s student should be interested in laboratory work as well as extensive data processing using various software tools as well as internet based databases. We have samples for the study at hand.
Animal transport and related management

Main subject area
Animal behaviour and welfare.

Department and supervisor
Department of Animal Science / http://anis.au.dk
Mette S. Herskin, Senior scientist
E-mail: MetteS.Herskin@anis.au.dk
Phone: +4550502969

Project start
Anytime – depends on project availability.

Physical location of project and students work
At ANIS, AU-FOULUM, 8830 Tjele.

Short project description
Within farm animal production, there is a strong international trend towards increased transport of animals – fewer and more specialised slaughter facilities means longer transport distances, and more specialised production means that live animals are often moved between production facilities (even across borders). This trend can be seen across almost all the species relevant in Denmark – pigs, cattle, poultry and mink. However, until recently, the majority of research in farm animal welfare has been focused on ‘on-farm’ issues. At the Department of Animal Science, animal transport is becoming increasingly important, and new master students are welcomed within this area. If you are interested in a thesis focusing on animal transport and related management – such as fitness for transport, cull animals, live exports, long-distance transport or, pick-up facilities, export of breeding animals (in Danish: udleveringsforhold) and wish to be part of a group of researchers committed to animal behaviour and stress biology, you are welcome to contact us.

Additional information
The master project will be connected to an ongoing research project involving animal transport. Depending on the choice of topic, the work will take place at AU-FOULUM, 8830 Tjele or in private herds or slaughterhouses. Driving licence will be an advantage.
3R – Refinement of animal experimentation

Main subject area
Animal welfare.

Department and supervisor
Department of Animal Science / http://anis.au.dk
Mette S. Herskin, Senior scientist
E-mail: MetteS.Herskin@anis.au.dk
Phone: +4550502969

Project start
Anytime – depends on project availability.

Physical location of project and students work
At ANIS, AU-FOULUM, 8830 Tjele.

Short project description
At the Department of Animal Science, new master students are welcomed within this area. If you are interested in a thesis focusing on animal experimentation and the concept of 3R, and wish to be part of a group of researchers committed to animal behaviour and stress biology, you are welcome to contact us.

Additional information
The master project will be connected to an ongoing research project involving animal experimentation, such as for example metabolism chambers, blood sampling, tube feeding, single housing, fixation and seek to examine effects of the experimental procedures on the welfare of the animals as well as to refine procedures.
Insect nuisance in horses

Main subject area
Animal behaviour and stress biology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Janne Winther Christensen, Ph.D., Associate Professor
E-mail: jwc@anis.au.dk
Phone: +45 87158075

Project start
Summer 2019 or later.

Physical location of project and students work
Private horse studs for data collection. Driver’s license is necessary. Data analysis can be in Foulum or Aarhus.

Short project description
Climatic changes mean that grazing animals experience more periods with hot weather during summer as well as increased insect nuisance. This project investigates the effects of access to shelters/buildings on horse behavioural and physiological reactions in relation to insect prevalence and weather conditions during summer. Data collection will be both summer 2019 and 2020 so it is possible to join the research project in 2019 or in 2020.

Additional information
Driver’s license is necessary.
Biobanking as a conservation tool

Main subject area
Animal science/cell biology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Stig Purup, senior researcher
E-mail: stig.purup@anis.au.dk
Phone: 8715 7808 or 29345955

Project start
Any time.

Physical location of project and students work
Department of Animal Science, Blichers Alle 20, Building P25, 8830 Tjele, Denmark.

Short project description
Due to the rapid decline in biodiversity, especially focusing on vertebrate abundance, action must be taken. The extinction rate of vertebrates has become up to 100 times higher than the natural occurring extinction rate. The speed at which species are disappearing, especially key species, are affecting the existence of whole ecosystems (Andrabi & Maxwell, 2007; Ceballos, et al., 2015). Intensified conservation efforts are needed to prevent a mass extinction and an irreversible loss of biodiversity (FAO, 2012). Biobanks and cryoconservation gives the opportunity to store valuable genetic material, and thereby a chance to assist and renew the existing conservation efforts. Cryoconservation of genetic material such as gametes, embryos, somatic cells offer the opportunity to save the genetic diversity within endangered population both in captivity and wild populations (Leon-Quinto et al., 2009).

Another very promising supplement to biobanking is the use of fibroblast cell lines created from tissue samples taken post-mortem. Cell lines are irreplaceable and provide a unique and invaluable resource for conservation management, assisted reproduction technologies, evolutionary biology etc. The usability of these cell lines is extremely high and have already been used to generate induced pluripotent stem cells (iPSC) from the northern white rhinoceros. Induced pluripotent stem cells can divide indefinitely in culture and be differentiated into any cell type in the body, including eggs and sperm. Thus, it may be possible to use assisted reproduction methods to ensure a species on the brink of extinction (Koepfli et al., 2015; Korody et al., 2017).

Questions:
This project will focus on establishing viable cell lines from different species within the class reptiles as well as explore how the results can be used in future conservation strategies.
1) What are the possibilities of biobanking animal tissue? Now and in the future?
2) Theoretical overview of existing research within the class of reptiles.
3) Establishing viable cell cultures for different species within the class
   • Testing and developing new protocols with focus on collection, handling, culture conditions, storage and cryoconservation.
4) Optimization and further development of techniques
   • Focus on culture conditions and cryoconservation such as culture medium, antibiotics, temperature, freezing rates, cryotolerance etc.

Additional information:
45-60 ECTS. This project has an extensive experimental part (see section 3) and 4), which will take place in Foulum (Aarhus University), and students therefore must be able to sort out transport from Aarhus to Foulum by themselves. The project is in collaboration with Randers Regnskov.
Production diseases in poultry

Main subject area
Animal science/poultry/disease resilience/disease control/microbiology/immunology.

Department and supervisors
Department of Animal Science
Research group: Immunology and Microbiology
Ricarda Engberg, e-mail: Ricarda.Engberg@anis.au.dk
Tina Dalgaard, e-mail: Tina.dalgaard@anis.au.dk

Project start
Start and ECTS content are flexible. Projects of 45 and 60 ECTS are preferred. The degree of lab work is adjustable according to ECTS.

Physical location of project and students work.
Lab work and animal experiments at Department of Animal Science, AU-Foulum, DK-8830 Tjele. Possibility to do office work in Aarhus.

Short project description
The general aim is to study the composition and activity of the intestinal microbiota in relation to nutrition, health, and importance for immune development and function. Moreover, studies may include prophylactic disease control strategies like vaccination and immunity regulation aiming at disease prevention. Ongoing projects focus on diseases related to different pathogens including virus (infectious bronchitis), bacteria (erysipelas, campylobacteriosis, necrotic enteritis and dysbacteriosis) and parasites (worm infections and coccidiosis).

Potential study areas include

- Emerging diseases in organic poultry (layers and broiler) with focus on Erysipelas and worm infections
- Studies on the composition and activity of the intestinal microbiome in relation to nutrition and intestinal disease (zoonotic bacteria and poultry pathogens)
- Interaction between intestinal microbiota and immune system in relation to disease resilience.
- The cross field of nutrition, microbiology and immunology

Additional information
The master student will be linked to a group of scientists, postdocs, and PhD-students and the experimental work will be related to on-going projects. The student will get the possibility to be trained in e.g. animal experimentation, microbiology, molecular biology, cell culture, flow cytometry, and ELISA.
Timing of stereotypy observation in WelFur-Mink

Main subject area
Animal science, animal behaviour, animal welfare.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Senior researcher Steen Henrik Møller
E-mail: steenh.moller@anis.au.dk
Phone: 87157926

Project start
Data collection preferably from January 2019, otherwise January 2020.

Physical location of project and students work
AU, Foulum, Blichers Allé 20, Tjele.

Short project description
Stereotypic behaviour in mink is best observed during a period of increased activity prior to feeding or during postponed feeding. This is therefore the procedure in the welfare assessment protocol WelFur-Mink that is now being implemented in all of Europe. Sometimes, however, it is not possible to observe before feeding. The best alternative time of observation has been suggested to be at the period of increasing activity before sunset during the winter, or as the last observation of the day, during the summer and autumn assessment periods. In order to assess the need for a correction factor that should align the prevalence of stereotypic behaviour before sunset with the prevalence before feeding, the relation between the two has been investigated. On 5 farms stereotypy was observed at both times and from the WelFur-Mink assessments the results were calculated. The results showed that there is less stereotypic behaviour before sunset than before feeding. No simple correction factor could be defined as the relation seemed to depend on the level of stereotypy. The level of stereotypy on the 5 farms tested both before feeding and before sunset was higher than the large number of farms tested in WelFur-Mink in January and February 2018. Tests both before feeding and before sunset is therefore needed on more farms including farms with a lower level of stereotypy.

Additional information
Prerequisite is an interest in animal behaviour and welfare and a driving licence.
Can we get behavioural information from automatic mink weights?

**Main subject area**
Animal science, animal behaviour, animal welfare, mink.

**Department and supervisor**
Department of Animal Science/http://anis.au.dk
Senior researcher Steen Henrik Møller
E-mail: steenh.moller@anis.au.dk
Phone: 87157926

**Project start**
Preferably from January 2019.

**Physical location of project and students work**
AU, Foulum, Blichers Allé 20, Tjele.

**Short project description**
Automatic weights have been developed and is now commercially available for mink. ‘WeightLog’ can provide data from all registrations of a weight and may, therefore, be used to log not only the weight but also activity patterns. Video observations from a number of mink with a ‘WeightLog’ can be used to study the relation between activity and loggings at the weight and thereby reveal the potential for getting information on Stereotypic behaviour in mink from ‘WeightLog’.

**Additional information**
Prerequisite is an interest in animal behaviour and welfare.
Optimized feed bunker space for slaughter calves to maximize feed intake and growth and improve feeding behaviour

Main subject area
Animal Science, cattle nutrition and physiology, beef production.

Department and supervisor
Department of Animal Science, Faculty of Science and Technology, Aarhus University
Homepage: http://anis.au.dk
Mogens Vestergaard, senior scientist
E-mail: mogens.vestergaard@anis.au.dk
Phone: +45 8715 7843

Project start
April or August 2019. To be decided in agreement with the supervisor.

Physical location of project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele but will include experimental work at a private rosé veal/young bull farm.

Short project description
The main subject area is beef production based on dairy bull calves. The dairy bull calves used for beef production, e.g., rosé veal calves or young bulls are raised and fed in various types of production systems. In some fattening units, a total mixed ration is fed and in some cases, the feed bunker space is too short to allow for an optimized feed intake for the group of calves in the pen, e.g., 25-30 calves per pen. This might lead to lower feed intake and growth, especially for some weaker calves in the group, which again might lead to a larger variation in growth rate and thus live weight within a group. The objective is to investigate the influence of feed bunk space on animal performance. An experimental trial will be performed at a private farm. The data recording includes video data and animal sensor data to estimate feed intake and feeding behavior (feed bunker visits etc). The long-term perspective is to minimize feeding-related stress and variation in feed intake on performance as well as on rumen function and animal health. Thus, the included literature review should also cover these aspects.

Additional information
45-60 ECTS thesis as appropriate.
Variation in feed intake and feeding behavior of bull calves and its relation to age, ration composition, health and performance.

Main subject area
Animal Science, cattle nutrition and physiology, beef production.

Department and supervisor
Department of Animal Science, Faculty of Science and Technology, Aarhus University
Homepage: http://anis.au.dk
Mogens Vestergaard, senior scientist
E-mail: mogens.vestergaard@anis.au.dk
Phone: +45 8715 7843

Project start
To be decided in agreement with the supervisor.

Physical location of the project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele.

Thesis based on analyses of existing feed intake and feeding behavior data from experiments performed at the Aarhus University combined with a literature study.

Short project description
The main subject area is beef production based on dairy bull calves, feed intake recording, feeding behavior (feeder visits, meal size etc), performance, and animal health. The objective is to investigate the influence of animal age, ration composition, e.g., total mixed rations vs. pelleted concentrate feeding, on the feed intake patterns. The specific objectives are to be decided, but could include estimation of the variation in feed intake between days and within days or quantifying meal size, visits to the feeder, eating time etc. These findings should be related to disease recordings/veterinary treatments, performance of animals and health. The long-term perspective is to minimize feeding-related stress on rumen function and animal health. Datasets are available in Excel and SAS-files.

Additional information
30-45-60 ECTS thesis as appropriate. The MSc student is invited to co-author a scientific publication.
Production performance and slaughter- and carcass quality of heavy Holstein Friesian young bulls.

Main subject area
Animal Science, cattle nutrition and physiology, beef production, product quality.

Department and supervisor
Department of Animal Science, Faculty of Science and Technology, Aarhus University
Homepage: http://anis.au.dk
Mogens Vestergaard, senior scientist
E-mail: mogens.vestergaard@anis.au.dk
Phone: +45 8715 7843

Project start
To be decided in agreement with the supervisor.

Physical location of the project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele.

Thesis based on analyses of existing data from an experiment performed at AU combined with a literature study.

Short project description
Three groups of bull calves were raised on different feeding regimes varying in concentrate/roughage ratio and with or without a compensatory growth period. Even though maize silage (up to 90 % of the ration) was used as roughage and animals were housed indoor this dataset represents interesting aspects also in relation to organic farming and animal welfare. Initial slaughter groups allow for quantitative estimation of accretion rates in body and carcass. Experimental data including health recordings, performance, carcass and meat quality and rumen wall conditions are available for further analyses. There is possibility to decide a specific subject for the thesis. Datasets are available in Excel and SAS-files.

Additional information
30-45-60 ECTS thesis as appropriate. The MSc student is invited to co-author a scientific publication.
Probiotics for unweaned dairy calves – effects on health and performance

Main subject area

Department and supervisor
Department of Animal Science, Faculty of Science and Technology, Aarhus University
Homepage: http://anis.au.dk
Mogens Vestergaard, senior scientist
E-mail: mogens.vestergaard@anis.au.dk
Phone: +45 8715 7843

Project start
April 2019 or August 2019. To be decided in agreement with the supervisor.

Physical location of the project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele but will include experimental work at private dairy farms.

Thesis is based on a field trial with probiotics fed in the milk to unweaned dairy calves from birth to 4 weeks combined with a literature study.

Short project description
Dairy calves often suffer from various types of diarrhea in the first weeks of life. Use of antibiotics is not always effective and is not a sustainable way of solving the problem. Attempts to improve the robustness and health of the dairy calves include strategic feeding interventions. Also, there is a common wish to reduce diseases and the use of medication. Pre- and probiotics could possibly improve the microbiota of the calves and help them to cope with the infectious bacteria and virus in their GIT. Yeast is an example of a probiotic substance with some beneficial effects in young animals. A field trial in a private dairy farm will be performed in mid 2019. Calves will be given the probiotics in the milk from birth to 4 weeks of age. Recordings from calves will include live weights, growth rates, fecal samples, blood samples and clinical scorings. The specific topics will be decided together with the student. Visits to private farms and hands-on recordings can be expected.

Additional information
45-60 ECTS thesis as appropriate.
Behaviour at calving on dairy cows kept on pasture

Main subject area
Animal Health and Welfare.
Animal science, animal behaviour, animal welfare.

Department and supervisor
Senior Scientist Margit Bak Jensen
E-mail: MargitBak.Jensen@anis.au.dk
Tel: 87157941

Project start
1 April 2019.

Physical location of project and students work
AU, Foulum, Blichers Allé 20, Tjele and private farm.

The idea is to investigate the effect of providing dairy cows that calve at pasture with the opportunity to seek isolation. Under natural conditions the cow separate from the herd to calve in a naturally sheltered area, if these are available, where she hides her calf for the first period after calving. Also in indoor housing, cows sought isolation if they had the opportunity (Proudfoot et al., 2014; J. Dairy Sci. 97, 2731–2739). The tendency for cows to seek isolation at pasture depends on the availability of natural hiding places (Lidfors, 1994; Appl. Anim. Behav. Sci. 42, 11–28). Farmers often report that cows often use natural hiding places when they calve at pasture in for instance organic production. Provision of calving hides may therefore fulfil the cows’ need to isolate at calving and also ease surveillance at calving of cows on pasture. There the aim here is to investigate the effect of ‘hides’ in the form of calving hutches placed on pasture on cows isolation seeking, calving behaviour and her maternal behaviour compared to no hides. The project also investigates what a cow perceives as an optimal calving site with a sufficient level of isolation. The project will be carried out on a commercial organic dairy farm.

Additional information
Prerequisite is the course ‘Behaviour in Domesticated Animals’, or ‘Animal Behaviour’, and a driver’s licence.
Nitrogen excretion in dry cows

Main subject area
Animal Science, cattle nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Postdoc, Marianne Johansen, marianne.johansen@anis.au.dk
Professor, Peter Lund, peter.lund@anis.au.dk
Phone: 87157859

Project start
Approx. 1 September 2019 – other alternatives can be decided with the supervisor.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
Correct estimation of excretion of nitrogen (N) in faeces and urine is important to predict the emission of ammonia from a farm, as the emission of ammonia is related to the inorganic N in urine and the emission of ammonia from faeces is considered as zero. Today, the nutrient content in faeces is determined based on dry matter intake and N concentration in the ration and excretion of N in urine is calculated as a difference. For dairy cows, the prediction equations are based on digestibility trials made in the period 1973-1996, and for replacement heifers and bull calves, data are based on digestibility trials with sheep. Additionally, no trials with dry cows have been conducted earlier. Therefore, there is a need to have some updated values for N excretion to have a more accurate prediction of ammonia emission.

A production trial with 8-12 dry cows will be conducted in the autumn 2019, and as MSc student, you will be involved in planning of the experiment, sample collection, data handling and analysis, and interpretation of results.

Additional information
45-60 ETCS as appropriate. The MSc Student is invited as a co-author on the out coming scientific paper.
Cattle feeding, nutrition and physiology in relation to emissions, efficiency and product quality

Main subject area
Animal Science, cattle nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Professor Martin Riis Weisbjerg, Martin.Weisbjerg@anis.au.dk
Professor Peter Lund, Peter.lund@anis.au.dk
Phone: 8715 8046

Project start
To be decided in agreement with supervisor.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
The aim of cattle research at the section of Animal Nutrition and Physiology is to optimize feeding and nutrition to reduce greenhouse gas emissions, environmental impact and to improve animal production, product quality and health. We have several ongoing projects, which may be of interest for you as a part of your thesis, or there might be planned projects in the near future, where your contribution would be valuable. Don't hesitate to ask if there is a possibility for you to write your thesis at Aarhus University, Foulum, within cattle nutrition and physiology.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcome scientific paper.
Feed evaluation for ruminants – fibre

Main subject area
Animal Science, cattle nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Professor Martin Riis Weisbjerg
E-mail: Martin.Weisbjerg@anis.au.dk
Phone: 8715 8046

Project start
To be decided in agreement with supervisor.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
Evaluation of feeds is essential for proper feed ration planning. Especially fibre (NDF) and their degradation and passage is essential for an efficient use of feedstuffs. The project could involve several methods, e.g. in situ degradation profiles, in situ iNDF determination and method development, in vitro digestibility and in vitro gas production, NIR measures etc.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcoming scientific paper.
Phytoestrogens in red clover

Main subject area
Animal Science, cattle nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Professor Martin Riis Weisbjerg, Martin.Weisbjerg@anis.au.dk
Postdoc Marianne Johansen, Marianne.johansen@anis.au.dk
Phone: 8715 8046

Project start
To be decided in agreement with supervisor.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
Red clover contain phytoestrogens, which may have both positive and negative effects when used as feedstuff, and therefore there are recommendations for max inclusion in rations for dairy cows and sheep. The project will comprise data treatment from an experiment with 18 varieties of red clover harvested in four cuts over two years (2015 and 2016) where phytoestrogen concentrations were measured, and a literature review on phytoestrogens in red clover.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcome scientific paper.
Seaweed for ruminants

Main subject area
Animal Science, cattle nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Professor Martin Riis Weisbjerg
E-mail: Martin.Weisbjerg@anis.au.dk
Phone: 8715 8046

Project start
To be decided in agreement with supervisor.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
Interest in the blue biomass is increasing, and seaweed, both cultivated and from the wild, has a great potential. Seaweeds have many compounds not normally seen in common feeds, and their potential as feed has to be studied. As seaweeds grow in the sea they are wet and thereby shelf life is short, and they require preservation as drying or ensiling. The project could involve evaluation of the nutritive value of seaweeds, or the ensiling of seaweeds, or both.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcoming scientific paper.
Estimation of body weight based on heart girth measurements in pre weaned dairy calves

Main subject area
Animal welfare and on-farm animal health-management.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Senior Scientist Tine Rousing
E-mail: tine.rousing@anis.au.dk
Phone: +8715 7915

Project start
Any time.

Physical location of project and students work
Data collection on-farm. Desk at the group 'Epidemiology and management' available.

Short project description
Heart girth measurement has been suggested as a rapid estimator of body weight in dairy cattle. However, studies of body weight estimation from heart girth measurements in pre weaned dairy calves are scarce. The master project will focus on on-farm collection of heart girth and body weight measurements in milk fed dairy calves, statistical analyses of the potential inter-relationship between the two, and - based on a literature review - a discussion of the potential of measuring heart girth in dairy calf health management.

Additional information
Driver's license needed.
Organic pig production and prevention of weaning diarrhea

Main subject area
Animal health and welfare, animal science.

Department and supervisor
Senior Scientist, Head of section, Charlotte Lauridsen
Immunology and Microbiology, Department of Animal Science, AU-Foulum
E-mail: charlotte.lauridsen@anis.au.dk

Project start
As soon as possible.

Physical location of project and students work
AU-Foulum.

Short project description
Diarrhoea is a frequently observed production disease in organic pig production, although the weaning age is higher than in conventional production. From a theoretical point of view, the gastrointestinal tract should be more resilient at 7 weeks comparing to 4 weeks of age at weaning. Resilience and robustness against infectious diseases depends on the immunological matureness and the composition of the microflora. Both conditions are probably highly influenced by the dietary treatment, i.e. the provision of sow milk and the intake of feed pre- and post-weaning. In addition, the frequency of diarrhoea seems to depend on the season, as more diarrhoea is observed during the late Summer/Autumn than during Spring-time. In order to identify strategies to ensure an optimal gastrointestinal health in piglets reared in organic production systems, there is a need to investigate how the composition of the microflora and the immune responses of the gut are influenced by the sow and the weaning strategy, and time of the year.

This project consists of the following parts:
- Establish whether microbial composition and immune responses of the gut are influenced by the weaning strategy (abrupt versus gradually weaning)
- Establish whether microbial composition and immune responses of the gut are influenced by the season
- Investigate how diarrhoea in organic piglets can be prevented using alternative strategies to high levels of zinc.

Additional information
The MSc project will be conducted in close connection to similar projects and there will thus be other scientists and technicians involved, who can support the MSc student theoretically as well as practically.
Deposition of intramuscular fat in pigs

Main subject area
Animal nutrition and product quality.

Department and supervisor
Senior scientist, head of section, Charlotte Lauridsen
Immunology and Microbiology, Department of Animal Science, AU-Foulum
E-mail: charlotte.lauridsen@anis.au.dk

Project start
September 2019.

Physical location of project and students work
AU-Foulum.

Short project description
The content and composition of intramuscular fat is of major importance for the quality of pork and pork products. Breeding towards leaner pigs has reduced the content of intramuscular fat, but also other factors such as sex, slaughter weight, and age can influence the content of intramuscular fat. Less researched is the influence of dietary effects on the deposition of intramuscular fat, and there is an increasing interest in the modern swine production to influence the quality of the pork by dietary means. New lipid sources available for pig nutrition and specific fatty acid molecular structure may influence the deposition in the intramuscular fat, and the aim of this thesis project is therefore to perform a literature synthesis of existing information on the potential effects of various lipids sources and derived products on the influence of the formation and deposition of the intramuscular fat in relation to the quality of pork.
Gastric ulcers in pigs

Main subject area
Animal Science/Animal nutrition/Gastrointestinal health.

Department and supervisor
Department of Animal Science/http://agrsci.au.dk
Charlotte Lauridsen, head of research unit
E-mail: charlotte.lauridsen@anis.au.dk
Phone: +45 8715 8019

Project start
As soon as possible.

Physical location of the project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele
Theoretical thesis based on literature study.

Short project description
Ulceration of the porcine stomach is a major problem for the swine industry and has also recently been brought up as a hot topic as described in the news. Stomach ulcers can lead to reduced daily growth of slaughter pigs and ultimately lead to increased mortality. Older research has focused on processing of feed as being one of the most predominant causes, however, the disease is multifactorial and factors such as environmental changes, transportation, lack of access to straw, and crowding, all commonly experienced by pigs in modern production systems, are potentially stressful events or conditions that were associated with increased occurrence of ulcerations.

The aim of this thesis project is to perform a literature synthesis of existing information on:

1) the potential risk factors for the development of gastric ulcer in swine,
2) to describe potential biomarkers for the development of these health changes,
3) to describe potential feeding strategies to overcome the problem, and this part of the M.Sc. project involves data from a pig experiment conducted to study the use of hemp products to prevent gastric ulcer in pigs.
Organic pig production and prevention of weaning diarrhea

**Main subject area**

**Department and supervisor**
Senior Scientist, Head of section, Charlotte Lauridsen
Immunology and Microbiology, Department of Animal Science, AU-Foulum.
E-mail: charlotte.lauridsen@anis.au.dk

**Project start**
February 2019 or any time.

**Physical location of project and students work**
AU-Foulum.

**Short project description**
Diarrhoea is a frequently observed production disease in organic pig production, although the weaning age is higher than in conventional production. From a theoretical point of view, the gastrointestinal tract should be more resilient at 7 weeks comparing to 4 weeks of age at weaning. Resilience and robustness against infectious diseases depends on the immunological matureness and the composition of the microflora. Both conditions are probably highly influenced by the dietary treatment, i.e. the provision of sow milk and the intake of feed pre- and post-weaning. In addition, the frequency of diarrhoea seems to depend on the season, as more diarrhoea is observed during the late Summer/Autumn than during Spring-time. In order to identify strategies to ensure an optimal gastrointestinal health in piglets reared in organic production systems, there is a need to investigate how the composition of the microflora and the immune responses of the gut are influenced by the sow and the weaning strategy, and time of the year.

This project consists of the following parts:

- Establish whether microbial composition and immune responses of the gut are influenced by the weaning strategy (abrupt versus gradually weaning).
- Establish whether microbial composition and immune responses of the gut are influenced by the season.
- Investigate how diarrhoea in organic piglets can be prevented using alternative strategies to high levels of zinc.

**Additional information**
The MSc project will be conducted in close connection to similar projects and there will thus be other scientists and technicians involved, who can support the MSc student theoretically as well as practically.

45 ECTS.
RobustPig - Early inoculation of probiotics to newborn piglets

Main subject area
Pig gut health, microbiology.

Department and supervisor
Department of Animal Science (http://anis.au.dk)
Nuria Canibe, Senior Researcher (and others)
E-mail: nuria.canibe@anis.au.dk
Phone: +45 8715 8058

Project start
Autumn 2019.

Physical location of project and student’s work:
Dept. of Animal Science, AU Foulum, DK-8830 Tjele.

Short project description
The Master Thesis project(s) will include performance of an animal study in which selected probiotics will be provided to piglets from the day of birth, and faecal and digesta samples taken throughout the study and analyzed for microbiota composition and activity. In the second part of the study, piglets will be challenged with E. coli and the ability of the probiotics to reduce post-weaning diarrhoea investigated.

The thesis project will therefore consist of animal experimentation, analyses in the laboratory and the literature study.

The overall objective is to develop a probiotic product for early inoculation to newborn piglets in order to establish a healthy microbiota so the piglet becomes less susceptible to enterotoxigenic Escherichia coli post-weaning diarrhea.
How does early life experience affect pigs’ ability to cope with early weaning?

Main subject area
Animal behaviour and welfare.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Lene Juul Pedersen, Professor
E-mail: Lene.juulpedersen@anis.au.dk
Phone: 5116 2822

Project start
Anytime – depends on project availability.

Physical location of project and students work
At ANIS, AU-FOULUM, 8830 Tjele.

Short project description
The weaning process is a large challenge for pigs, since weaning typically take place at an age where pigs are behavioural, physiological and immunological immature to forage, ingest and digest other feed than sow milk. In addition, weaning is related to many stress full events and pigs not able to cope with these events are in risk of developing abnormal behaviours such as belly nosing and tail biting. Also early life events such as early access to teats and colostrum, competition at the udder and social instability may influence maturity at weaning and the animal’s capability to cope with the many stress full events. At weaning, deprived intake of feed and water during the first days are seen in many pigs resulting in health and growth problems. Methods to promote early experience with feed other than sow milk may therefore be crucial for reducing weaning problems. New master students with an interest in studying behaviour and stress responses in pigs at weaning are therefore welcomed in our research group of Animal Behaviour and Stressbiology to take part in these exiting projects.

Additional information
The master project will be connected to ongoing projects aiming to reduce weaning stress and weaning diarrhea as part of the ongoing VetForligIII. The project is carried out in collaboration between several research groups at the Department of Animal Science allowing the student a broad experience and insight into different research disciplines. Depending on the choice of topic, the work will take place at AU-FOULUM, 8830 Tjele or in private herds.
Maternal behaviour and early piglet mortality in organic pig production

**Main subject area**
Animal behaviour and welfare.

**Department and supervisor**
Department of Animal Science/http://anis.au.dk
Lene Juul Pedersen, Professor
E-mail: Lene.juulpedersen@anis.au.dk
Phone: +4551162822

**Project start**
Anytime – depends on project availability.

**Physical location of project and students work**
At ANIS, AU-FOULUM, 8830 Tjele.

**Short project description**
Outdoor production of pigs has many advantages for animal welfare. However, a large challenge remain to be solved: early piglet mortality. Recent studies have shown mortality rates from 25-29 % of total born piglets, with large litter size, thermal conditions within the hut and lack of possibilities to assist piglets in large litters as major risk factors. In two projects we target these challenges both by genetic tools and by improved design of huts for outdoor production of pigs. Within these projects, there are several possibilities for studying maternal behaviour and risk situations related to neonatal crushing between different genotypes and hut design. New master students are therefore welcomed within this area. If you are interested in a thesis focusing on organic pig production and welfare, maternal behavior, early piglet mortality and wish to be part of a group of researchers committed to animal behaviour and stress biology, you are welcome to contact us.

**Additional information**
The master project will be connected to ongoing projects aiming to reduce neonatal piglet mortality in organic pig production. The project is carried out in collaboration with Danish organic pig farmers, commercial companies, and international partners with an interest in organic pig production. Depending on the choice of topic, the work will take place at AU-FOULUM, 8830 Tjele or in private herds.
Play behaviour in piglets

Main subject area
Animal science, animal behaviour, animal welfare.

Department and supervisor
Department of Animal Science
Senior Scientist Margit Bak Jensen,
E-mail: MargitBak.Jensen@anis.au.dk
Tel: 87157941
Co-supervisor Senior Scientist Lene Juul Pedersen

Project start
Maj or September 2019.

Physical location of project and students work
AU, Foulum, Blichers Allé 20, Tjele.

Good animal welfare is about the absence of negative experiences and the presence of positive experiences. Play behaviour is suggested to a good indicator of animal welfare (Boissy et al. 2007, Physiol Behav 92:375-397). Play behaviour in piglets includes locomotor play and social play. Play behaviour includes elements of defence and flight, but during play behaviour these elements are exaggerated, repeated, and more variable than during the corresponding functional behaviour. Young animals are motivated to play when their primary needs are meet and there is no danger. Studies of piglets and calves have found that the occurrence of play is reduced by weaning (Krachun et al. 2010 Appl Anim Behav Sci 122:71-76; Donaldson et al. 2002 Appl Anim Behav Sci 79:221-231), and feeding calves a low milk allowance reduces play behaviour (Jensen et al. 2015 J Dairy Sci 98: 2568-2575). Litter size affects the risk of teat competition with increased risk of piglets missing milk let-down in large litters (Miligan et al. 2001 Appl Anim Behav Sci 73: 179-191; Andersen et al. 2011 Behav Ecol Sociobiol 65: 1159) and thus litter size is important for piglet growth (Pedersen et al. 2016 ANIMAL 9: 1529-1536) Offering extra milk to large litters is suggested as a solution to a low gain in large litters, but the effect of milk intake on play behaviour is not known. The space allowance affects animals' opportunity to express their motivation to perform play behaviour. For instance, calves housed under small space allowances play less (Jensen et al. 1998 Appl Anim. Behav. Sci. 56: 97-108) and piglets housed in crates play less (Martin et al. 2015 Appl Anim Behav Sci 69–79) than animals housed under more spatial conditions.

The study aims to investigate the effect of litter size and milk supplementation under small and large space allowances from 7 days of age until weaning at 28 days of age. The study is conducted in a 2 x 2 x 2 factor design with 108 litters in total. Information on piglet weight is available, as well as video recordings at 7, 14, 21 and 28 days of age for analysis of piglet play and its relation to weight gain as an indicator of whether piglets’ primary needs are meet and the presence of positive welfare

Additional information
Prerequisite is the course Behaviour in Domesticated Animals.
Fermfeed - A strategy to prevent post-weaning diarrhea in piglets - fermented liquid grains added probiotics from the suckling period

Main subject area
Pig gut health, microbiology.

Department and supervisor
Department of Animal Science (http://anis.au.dk)
Nuria Canibe, Senior Researcher (and others)
E-mail: nuria.canibe@anis.au.dk
Phone: +45 8715 8058

Project start
Autumn 2019.

Physical location of project and student’s work: Dept. of Animal Science, AU Foulum, DK-8830 Tjele.

Short project description
Antibiotic-resistant pathogenic bacteria increasingly threaten human health. Widespread use of antibiotics for production animals, including pigs, selects for and contributes to the development of resistant pathogenic bacteria. In pig production, high amounts of zinc oxide (ZnO) are used as an alternative to antibiotics to combat weaning diarrhea. However, this practice has negative consequences for the environment and promotes the maintenance of multi-resistant bacteria. Therefore, there is great focus on finding feeding and management strategies that can contribute to reducing the use of antibiotics and ZnO, and thereby counteract the development of antibiotic resistance.

The Master Thesis project(s) will include an animal study in which piglets will be given liquid feed containing fermented cereals and a probiotic. Various parameters indicative of gut health will be measured at various time points before and after weaning in faeces and in digesta from the gastrointestinal tract. In the second part of the study, piglets will be challenged with E. coli and the ability of this feeding strategy to reduce post-weaning diarrhoea will be investigated.

The thesis project will therefore consist of animal experimentation, analyses in the laboratory and the literature study.

The overall objective is to develop a feeding strategy that increases robustness of piglets and thereby improves their ability to cope with the weaning process without the use of antibiotics.
Reducing use of antibiotics in Danish pig production

Main subject area
Herd health management.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Hanne Kongsted, Postdoc
E-mail: hanne.kongsted@anis.au.dk
Phone: 9350 8454

Project start
Any time.

Physical location of project and students work
Research Centre Foulum and in a commercial production herd approximately 30 minutes from Foulum.

Short project description
Usage of antibiotics in weaner pigs (7-30 kg) should be reduced in order to reduce risk of resistance problems for animals and humans. Changed management in the farrowing section is expected to improve weaner weight and thereby reduce the risk of diarrhoea in the weaner section. An experiment is conducted in four commercial sow herds during 2019-2021. In this experiment, metaphylactic treatment with antibiotics and use of zinc-oxide is not allowed. The student will be able to conduct a project in attachment to the major experimental design – eg. look into the effect of birthweight and weaning weight on health, look into the effect of non-use of zinc-oxide in the weaning section or measure the effect of non-use of antibiotics on navel and leg infections

Additional information
You should be ready to record data in commercial pig herds. We expect you to have a driver’s license.
Reducing pain during castration

Main subject area
Welfare of pigs.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Hanne Kongsted, Postdoc
E-mail: hanne.kongsted@anis.au.dk
Phone: 9350 8454

Project start
Autumn 2019.

Physical location of project and students work
Research Centre Foulum and in a commercial production herd.

Short project description
All castrated pigs in Denmark must receive local anesthesia prior to castration. We aim to find out how this is carried out in a way that provides the best possible animal welfare – taking into account that the procedure is carried out by the farmers themselves. In autumn 2019 a pilot-study will be carried out. In this study, methods for measuring pain in suckling pigs being castrated using different methods for local anesthesia are evaluated.

Additional information
For background information check this out:
http://web.agrsci.dk/djfpublikation/index.asp?action=show&id=1276
Experimental studies will be carried out in a production herd. We therefore expect you to have a driver’s license.
Free-range production systems for pigs: How can they manage without antibiotics and zinc and how is MRSA status out there?

Main subject area
One-Health.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Hanne Kongsted, Postdoc
E-mail: hanne.kongsted@anis.au.dk
Phone: 9350 8454

Project start
Autumn 2019 or later (project runs from 2019 to 2021).

Physical location of project and students work
Research Centre Foulum and in a commercial production herd.

Short project description
Organic pigs that grow up on free-range receive much less antibiotics than conventional indoor raised pigs. In this project, we intend to investigate whether this has negative consequences on health (e.g. on the occurrence of weaning diarrhea) – or if good management procedures prevent these pigs from needing antibiotics. Apart from looking at the health of pigs, the project also measures the occurrence of MRSA (methicillin-resistant Staphylococcus Aureus) bacteria in both pigs and personnel in organic- and free-range conventional herds. The project is a collaboration between Aarhus University and Statens Seruminstitut (SSI). During the project period, approximately 20 different herds will be visited.

Additional information
You should be ready to record data in commercial pig herds. We expect you to have a driver's license.
Impact of feeding during transition and/or lactation on performance of sows and newborn piglets

Main supervisor
Peter K. Theil
E-mail: Peter.Theil@anis.au.dk

Physical location of the project
Department of Animal Science, Aarhus University, Foulum

Project start
Any time.

Main subject area
Nutrition and physiology of late gestating / lactating sows. Shortened farrowing length, and enhanced production of colostrum and milk yield with the overall aim of increasing survival and robustness of suckling piglets.

Short project description
Background: Recent research has documented that feeding during transition and lactation periods is highly important to maximize performance of sows and piglets. The transition period is characterized by an abrupt change from gestation to lactation, and feeding is important to ensure a short farrowing, which in turn will minimize stillborn piglets. Furthermore, colostrum is produced by the mammary gland and that is crucial for the piglets in order to survive the first few days after birth. At d 2, milk production is initiated and then the milk yield increases greatly from day to day until the third week of lactation. A deeper insight into the nutrient requirements and development of new feeding strategies is necessary to improve the performance of the sows.

Aim: Improve the performance of suckling piglets and/or performance of lactating sows

Methods: Feeding supply and intake is recorded, colostrum and milk composition and yield may be recorded, mobilization from the sow body (weight loss and backfat loss) is measured along with other performance traits.

Additional information
You are most welcome to contact me by E-mail and to visit my homepage 

Extent and type of project:
30 ECTS: Theoretical thesis based on literature studies and/or analyses of issued data sets.
45 ECTS: Experimental theses in which the student is responsible for collection and analysis of his/her own original data.
60 ECTS: Experimental theses in which the student is responsible for planning, trial design and collection and analysis of his/her own original data.
Can garlic and acidic berries prevent post-weaning diarrhea in piglets?

Main subject area
Livestock health.

Department and supervisor
Animal Science/http://anis.au.dk
Senior researcher Ole Højberg
E-mail: ole.hojberg@anis.au.dk
Phone: 8715 7792/6138 4070

Project start
September 2019.

Physical location of project and students work
AU-Foulum, Dept. Animal Science, Immunology and Microbiology Section.

Short project description
Antimicrobial resistance (AMR) of bacteria is today considered to be one of the major threats to public health worldwide. A contributing cause to the increase in AMR incidence is improper or excessive use of antibiotics in livestock production and alternatives to antibiotics are highly requested.

Garlic and certain other related plants contain the compound allicin that has long been known and recognized for its antimicrobial properties, even though allicin is not as effective as classical antibiotics. Recently, it has however been observed that the antimicrobial effect of garlic (allicin) can be improved significantly by mixing garlic with acidic berries.

In piglets, post-weaning diarrhea is typically caused by specific pathogenic strains of E. coli and it has been observed that these strains may be more sensitive to garlic (allicin) than many other bacteria. Thus, adding a cocktail of garlic and acidic berries to the feed may prevent post-weaning diarrhea in piglets by inhibiting growth of pathogenic E. coli.

The purpose of the master project is to test differences in sensitivity to garlic (allicin) for a number of strains of E. coli and other bacteria and to investigate, whether pathogenic strains may be more sensitive than non-pathogenic strains.
Can glyphosate induce post-weaning diarrhea in piglets?

Main subject area
Livestock health.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Senior researcher Ole Højberg
E-mail: ole.hojberg@anis.au.dk
Phone: 8715 7792/6138 4070

Project start
September 2019.

Physical location of project and students work
AU-Foulum, Dept. of Animal Science, Immunology and Microbiology Section.

Short project description
Glyphosate is the active substance in Roundup®, which globally is the bestselling and most widely used herbicide, and residues of glyphosate can be found in livestock feed.

Glyphosate works by inhibiting an enzyme (5-enolpyruvylshikimate-3-phosphate synthase, EPSPS), involved in the formation of essential aromatic amino acids (phenylalanine, tyrosine and tryptophan), and therefore the plant dies due to the lack of these. Cells of higher animals do not form these amino acids themselves and are therefore not affected by glyphosate. However, some microorganisms, including gut bacteria, also have the EPSPS enzyme and can be inhibited by glyphosate, which may indirectly affect animal health and productivity.

In piglets, post-weaning diarrhea is typically caused by specific pathogenic strains of E. coli and it has been observed that these strains may be less sensitive to glyphosate than many other bacteria. Thus, residues of glyphosate present in the feed may induce post-weaning diarrhea in piglets by favoring growth of pathogenic E. coli.

The purpose of the master project is to test differences in sensitivity to glyphosate for a number of strains of E. coli and other bacteria and to investigate whether pathogenic strains may be less sensitive than non-pathogenic strains.
Growth and growth markers in weaned piglets fed milk and plant based protein

**Main subject area**
Animal Health and Welfare/Monogastric nutrition.

**Department and supervisor**
Department of Animal Science  
Senior researcher Helle Nygaard Lærke  
E-mail: HelleN.Lærke@anis.au.dk  
Phone: +45 8715 8061

**Project start**
Open.

**Physical location of project and students work**
Flexible. Possibility to do office work in Aarhus. Lab work at Department of Animal Science, AU-Foulum.

**Short project description**
Globally there is an increased demand for high quality protein for human and animal consumption, and the need for accurate determination of nutritional needs and quantity and quality of protein supply by food ingredients is more important than ever. There are indications that some protein sources influence growth beyond their ability to match amino acid requirements probably through different signalling pathways. The project will include a literature review on regulation of growth and dietary factors influencing growth with emphasis on milk and vegetable protein sources, handling of data from an already performed animal experiment, and perform supplementary laboratory analyses on bone growth.

**Additional information**
30-45 ECTS. The MSc student will work with data from a project regarding evaluation of protein quality of vegetable and animal protein sources for human consumption and its effect on growth. The MSc student is invited as a co-author on the outcoming scientific paper.
In vitro determination of feed quality for weaning pigs

Main subject area
Animal Health and Welfare/Monogastric nutrition.

Department and supervisor
Department of Animal Science
Senior researcher Helle Nygaard Lærke
E-mail: HelleN.Lærke@anis.au.dk
Phone: +45 8715 8061

Project start
Summer 2019.

Physical location of project and students work
Lab work at Department of Animal Science, AU-Foulum. Possibility to do office work in Aarhus.

Short project description
Weaning is a major challenge to the young pig going from sow’s milk to dry feed offered to the piglet after weaning, and post-weaning diarrhea associated with this transition is one of the primary constraints in modern pig production. In contrast to milk, the dry feed contains mainly complex plant based material. At the same time, the secretion of digestive enzymes declines during the immediate post-weaning period. Maintaining a high feed intake without a high flow of undigested starch and protein may be a key to prevent diarrhea. Optimal processing of feed components such as cereals and soybean meal and other protein sources used for weaner pigs has great impact on the nutritional value. In the optimization of ingredients and processing methods, vitro methods (starch and/or protein digestion kinetics) can be used to screen products prior to evaluation in in vivo trials. The student will participate in the in vitro evaluation of ingredients for feed formulation.

Additional information
45-60 ECTS. The MSc student should be interested in laboratory work. The student will work in an environment in collaborations with scientists and lab technicians and companies involved in an ongoing project.
Nutrition and physiology of pigs

Main subject area
Pig nutrition and physiology.

Department and supervisor
Department of Animal Science/http://anis.au.dk
Associate professor Jan Værum Nørgaard
E-mail: janvnoergaard@anis.au.dk

Project start
Depending on ongoing projects and your level of participation.

Physical location of project and students work
Department of Animal Science, Foulum.

Short project description
Our projects within nutrition and physiology of pigs are with a focus on applied research. The objectives are often to optimize pig production while minimizing the environmental impact. Main keywords are: feed, feedstuff and nutrient utilization, as well as utilization and requirement of especially protein, amino acids and minerals. Several of our projects are on product development and documentation of nutritive value of new feedstuffs and feed additives in collaboration with both the scientific environment and the industry. We have several ongoing projects, which may be of interest for you as a part of your thesis, or there might be planned projects in the near future, where your contribution would be valuable. Don't hesitate to ask if there is a possibility for you to write your thesis at Aarhus University, Foulum, within pig nutrition and physiology.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcoming scientific paper.
Production diseases in pigs

Main subject area
Animal science/pigs/disease resilience/disease control/microbiology/immunology

Department and supervisors
Department of Animal Science
Immunology and Microbiology
Charlotte Lauridsen, E-mail: charlotte.Lauridsen@anis.au.dk
Nuria Canibe, E-mail: Nuria.Canibe@anis.au.dk
Ole Højberg, E-mail: Ole.Højberg@anis.au.dk

Project start
Start and ECTS content are flexible. Projects of 45 and 60 ECTS are preferred. The degree of lab work is adjustable according to ECTS.

Physical location of project and students work
Lab work and animal experiments at Department of Animal Science, AU-Foulum, DK-8830 Tjele.
Possibility to do office work in Aarhus.

Short project description
The general aim is to study the composition and activity of the intestinal microbiota in relation to nutrition, health, and importance for immune development and function. Moreover, studies may include prophylactic disease control strategies like passive immunity and immune response regulation aiming at disease prevention. Ongoing projects focus on diseases related to different pathogens including E. coli (post weaning diarrhea), and non-infectious diarrhea of pigs.

Potential study areas include:
- Manipulation of robustness and disease resistance in pigs (conventional and organic) with focus on major production diseases
- Studies on the composition and activity of the intestinal microbiome in relation to nutrition and enteric disease (pig and human)
- Interaction between intestinal microbiota and immune system in relation to disease resilience.
- The cross field of nutrition, microbiology and immunology

Additional information
The master student will be linked to a group of scientists, postdocs, and PhD-students and the experimental work will be related to on-going projects. The student will get the possibility to be trained in e.g. animal experimentation, microbiology, molecular biology, cell culture, flow cytometry, and ELISA.
Botanical composition of organic clover-grass

Main subject area
Pasture, grazing, herbage intake, herbage composition, animal preference.

Department and supervisor
Department of Agroecology
Troels Kristensen, Senior scientist, e-mail: troels.kristensen@agro.au.dk
Jørgen Eriksen, Professor, e-mail: jorgen.eriksen@agro.au.dk

Project start
Preferably may 2019 – alternative at the latest end of June 2019.

Physical location of the project and students work
Research center Foulum as daily working place and field registration at a commercial dairy farm located 45 minutes drive from Foulum.

Short project description
In an on-going research and development project “Grasmilk” http://agro.au.dk/forskning/projekter/graesmaelk/ the aim is to produce organic certified milk from cows that are feed entirely with clover-grass, either as pasture during summer or as silage during the winter season. This raise the question, which botanical composition of the clover-grass mixture can balance the nutritional needs of the cows and at the same time insure a high dry matter net production per area over the season and over years maintain both botanical composition and productivity.

The aim of this MSc project is therefore to investigate how different clover-grass mixtures develop in productivity and quality over a grazing season and in addition to investigate the variation between the mixtures in intake preference when grazing with dairy cows.

The empirical material is one field (9 ha), with five different clover-grass mixtures established in 2018 with three replicates, in total 15 field plot. The herd of 100 dairy cows will be grazing the field – as part of other field – in a rotation grazing system with 3 to 5 weeks interval.

This gives possibilities for looking at productivity and botanical composition during a season, potentially in combination with different frequency of grazing. The planning of this and the registration is part of the MSc project in close cooperation with the supervisor.

We expect that you can work intensively during the summer season with registrations in the field and during the following period make data analysis and literature review with focus on persistency of different clover-grass mixtures and the effect on livestock productivity.

Additional information
45 or 60 ECT point.
Improved weaning strategy in outdoor pig production

Main subject area
Outdoor pig production systems, weaning strategies, feeding, animal behaviour.

Department and supervisor
Dept. of Agroecology, Blichers Allé 20, 8830 Tjele
Heidi Mai-Lis Andersen
E-mail: HeidiMai-Lis.Andersen@agro.au.dk
Phone: 8715 4781

Project start
Flexible.

Physical location of project and students work
AU-Foulum, Blichers Allé 20, 8830 Tjele. Data collection on private farm.

Short project description
A number of problems are associated with weaning of piglets including diarrhoea, decline in growth and a risk of unwanted behaviour. The problems are seen in both indoor and outdoor production systems and is due to the abrupt change in the piglets' environment, nutrient and social group at weaning. In order to reduce weaning problems, zinc is often added to the weaning feed. Which, from an environmental point of view, is a problem and not in line with the ecological principles. Hence, alternative measures are needed to reduce the risk of weaning problems.

This project focus on reducing the changes around weaning in the ecological systems, whit main focus on weaning strategy (indoor versus outdoor) and the feed composition around weaning. However, the project is also open for students interested in a more detailed literature study regarding the issue.

Additional information
The experiment is part of the GUDP project 'Intensiv mobil svineproduktion integreret i markdriften' (SV-AR), You can read/see more about the SV-AR project here (In Danish):
Mobile systems to improve nutrient efficiency in outdoor pig production

Main subject area
Outdoor pig production systems, nutrient management, feeding strategies, nutrition, animal behaviour.

Department and supervisor
Department of Agroecology
Anne Grete Kongsted, senior researcher (main supervisor)
E-mail: anneg.kongsted@agro.au.dk
Phone: +45 87157993

Project start
Flexible.

Physical location of project and students work
Experimental activities at AU-Foulum, Blichers Allé 20, 8830 Tjele.

Short project description
Despite clear animal-welfare benefits of outdoor production, growing-finishing pigs on pasture are very rare in Denmark. This relates partly to high feed uses - and therefore high feed costs - and high risk of nutrient losses in current pasture systems. New management strategies to improve nutrient efficiency are important to promote the ecological and economic competitiveness of the system.

This project investigates whether a mobile system (daily allocation of new land) combined with a restricted feeding regime and a high-yielding foraging crop (sugar beets) improves the nutrient efficiency of outdoor pig production compared to current stationary pasture systems.

The focus of the master project can be tailored to the student’s main interests (e.g. nutrition, animal behavior) and a co-supervisor from Dept. Animal Science can be involved to support if beneficial.

Additional information
The experiment is part of the GUDP project ‘Intensiv mobil svineproduktion integreret i markdriften’ (SV-AR). You can read/see more about the mobile system here (In Danish):
https://okologi.dk/landbrug/projekter/svin/intensiv-mobil-svineproduktion;
https://www.youtube.com/watch?v=51ohiCd2Kyg
Impact of incubation temperature on muscle metabolism in broilers

Main supervisor
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Aarhus Faculty of Science and Technology
Aarhus University
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Physical location of the project
At department of Food Science, Foulum/Agro Food Park.

Project start
August or September 2019.

Extent and type of project
Master thesis 45 or 60 ECTS.

Main subject area
In this project, you can use your knowledge from biochemistry, muscle growth, structure of muscle based food, enzymes in food and impact on meat quality.

Short project description
Meat from broilers is highly appreciated by the consumers, and specifically the demand for the breast fillet is increasing. The demand has been met by genetic selection of lines characterized by fast post-hatch growth and greater yield of the breast fillet but not leg muscles. This focus in the selection has caused an imbalance in the body of the chickens, leading to very large pectoralis muscles but decreased leg strength, which cause impaired animal welfare because of decreased ability to walk. In this project, we study fetal programming by manipulation with temperature during incubation of chicks. The early incubation temperature has been shown to affect the number of muscle fibres in the leg muscle of chick embryos and this may support a more balanced development post-hatch between the breast and leg muscles, supporting the chickens ability to walk. An increased incubation temperature from 37.5 to 38.5°C from day 4 to 7 increase the embryonic movements and this may explain the increased number of muscle fibres and ratio of nuclei per fibre at day 18 of the incubation period (Hammond et al. 2007). Also, the muscle metabolism might be affected, which could have an impact on the meat quality. Thus, this project aim at describing the glycogen content and activity of metabolic enzymes [e.g. citrate synthase, lactate dehydrogenase and beta-hydroxy CoA dehydrogenase] in broilers, which have been exposed to fetal programming.
Intramuscular fat in Danish Beef

Main supervisor
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Aarhus University
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Phone: +4587158007
Homepage: www.food.au.dk

Physical location of the project
Research centre Foulum/Agro Food Park.

Project start
August/September 2019.

Extent and type of project
45 or 60 ECTS master thesis.

Main subject area
Meat science, animal science and meat quality.

Additional information
This project is part of large GUDP project “High Quality Beef from Sustainable Crossbred Calves - FutureBeefCross” which is a collaboration project with among others SEGES, Danish Crown, Viking Genetics and Department of Molecular Biology and Genetics.

Short project description
Eating satisfaction of beef is the one quality trait identified by both meat packing industry, food service buyers and retailers, which can stimulate to an increased payment (Igo et al. 2013). Beef tenderness, juiciness and flavor are characteristics that affect satiety (Frank et al. 2017; Møller, 2015) and this can have an overall impact on consumption, but also less food waste because of fulfilment of expectations, and possibly a better economy in the sector. The amount of intramuscular fat is the one factor contributing mostly to the flavor of beef (Therkildsen et al. 2017), and flavor is highly linked to the overall liking of beef (Corbin et al. 2015). Thus in order to optimize eating satisfaction of beef, focus should be on increased amount of intramuscular fat and decreased shear force. In this project, we have the opportunity to screen 1,000 Danish beef carcasses for the content of intramuscular fat and texture and possible also evaluate the fatty acid composition depending on breed and crossbreed. This information will be matched with results from images captured of the meat at the slaughterhouse in order to predict the overall eating quality. The final frame of the project is open for your own interest with in this field.
Topics in cooperation with SEGES, Aarhus

Master projects can also be conducted in cooperation with SEGES, Aarhus. In this case, the main supervisor has to be from AU, Department of Animal Science and the co-supervisor from SEGES.

For inspiration and information regarding ongoing projects on pigs, ruminants and poultry at SEGES, the student is referred to:

**Regarding pigs:**
Thomas Sønderby Bruun
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**Regarding ruminants:**
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