

ANIMAL SCIENCE

Master Thesis Projects

Topics for Master Thesis Projects available in 2017-2018

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 Agrobiolology, in Sustainable Animal Nutrition and Feeding (EM-SANF), 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 Agrobiolology and the other animal science related Master Degree programmes at <http://kandidat.au.dk/en/agrobiolology/>

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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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:

<http://studerende.au.dk/en/studies/subject-portals/agroecology-food-and-environment/masters-thesis-and-other-projects/thesis/>

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.:

Ministry of LNV (2002): Forestry on paper. Public brochure, downloadable at <http://www.minlnv.nl/morepaper.pdf>. Information derived on June 15, 2002.

Royall, C.P., B.L.Thiel, and A. Donald. 2001. Radiation damage of water in environmental scanning electron microscopy. *Journal of microscopy* [online]. 204(3), [Accessed 17 March 2009], pp.185-195. Available from: <http://0-www3.interscience.wiley.com.wam.leeds.ac.uk/>

- **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

Estimation of day-to-day variation in feed intake of bull calves and its relation to ration composition, health and performance

Main subject area

Animal Health and Welfare

Animal nutrition and health / 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

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Phone: +45 8715 7843

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 analyses of existing data and literature study.

Short project description

The main subject area is beef production based on dairy bull calves, feed intake recording, performance, and animal health. To investigate the influence of ration composition, e.g., total mixed rations vs. pelleted concentrate feeding, on the feed intake patterns. The aim is to estimate the variation in feed intake between days and within days in growing young bulls and relate the findings to disease recordings/veterinary treatments, performance of animals and health with a long term perspective of minimizing feeding-related stress on rumen function and animal health. (MSc project).

Additional information

Datasets are available in Excel and SAS-files.

Production performance and slaughter- and carcass quality of heavy Holstein Friesian young bulls

Main subject area

Animal Health and Welfare

Animal nutrition / 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

Email: mogens.vestergaard@anis.au.dk

Phone: +45 8715 7843

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 analyses of existing data and 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 will be basis for an international manuscript (MSc project).

Additional information

Datasets are available in Excel and SAS-files.

Metabolomics as a tool in nutrition studies

Main subject area

Animal Health and Welfare / Animal Science / Human health

Department and Supervisor

Department of Animal Science

Mette Skou Hedemann, Senior scientist

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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.

How can we control lameness and hoof disorders in dairy cows?

Main subject area

Animal health and welfare

Department and supervisor

Department of Animal Science

Senior scientist Peter Thomsen, ptt@anis.au.dk, tel. +45 8715 7834

Project start

Any time

Physical location of project and students work

Research Centre Foulum (combined with herd visits and work from home)

Short project description

Hoof disorders and lameness are major problems in modern dairy production due to economic losses and decreased animal welfare. Would you like to address this 'hot topic' and do a thesis focusing on lameness/hoof disorders? I will be able to provide guidance/supervision, help with contact to herds and access to data from databases. The exact aim/area is not fixed, but will be decided together with you. Examples could be: 1) evaluation of risk factors for lameness/hoof disorders in Danish dairy herds based on information from a combination of herd visits, questionnaire surveys and existing data from databases, 2) an evaluation of barriers to lameness control: Why do farmers not invest more time/money in fighting lameness?, or 3) a small clinical trial testing the efficacy of some kind of prevention or treatment of one or more hoof disorders.

A new method to study immunological communication in chickens

Main subject area

Animal science / chicken health / disease protection

Department and Supervisor

Department of Animal Science

Tina Dalgaard MSc, PhD

E-mail: tina.dalgaard@anis.au.dk

Telephone 87 15 80 52

Project start

Project start and ECTS content flexible. Degree of lab work adjustable according to ECTS

Physical location of project and students work

Flexible

Possibility to do office work in Aarhus

Lab work at Department of Animal Science, AU-Foulum, DK-8830 Tjele.

Short project description

Project subject: Validation of an ELISPOT assay for detection of avian interferon gamma

Background: Interferon gamma is an important cytokine in adaptive immunity. Production of interferon gamma can be assessed by numerous methods but the ELISPOT technique provides both qualitative (type of immune protein) and quantitative (number of responding cells) information in a simple and inexpensive way. When established the method will be used for monitoring avian immune responses in experimental vaccination/infection studies.

Aim: To establish and validate an ELISPOT assay for detection of avian interferon gamma as a parameter for T cell mediated immunity.

Methods: The student will coat a polymer membrane in micro plates with capture antibody and add cells of interest stimulated with specific antigen or mitogen. After culture, produced interferon gamma will be visualized on the membrane with a detection antibody. The assessment of interferon gamma production under different conditions by ELISPOT will be compared with interferon gamma detection by other methods e.g. intracellular staining and flow cytometry. If time allows it, the assay will be applied to samples from an experimental infection.

Additional information

The master student will be attached to a group of scientists, post docs, and PhD-students and their experimental work in on-going projects. The student will primarily be trained in cell culture and the ELISPOT technique but other relevant techniques like ELISA and flow cytometry can be included in the project.

The return of an old disease in organic and free-range poultry production

Main subject area

Animal science / chicken health / robustness/ disease resistance

Department and Supervisor

Department of Animal Science

Tina Dalgaard MSc, PhD

E-mail: tina.dalgaard@anis.au.dk

Phone: +45 87 15 80 52

Project start

Project start and ECTS content flexible. Degree of lab work adjustable according to ECTS

Physical location of project and students work

Flexible

Possibility to do office work in Aarhus

Lab work at Department of Animal Science, AU-Foulum, DK-8830 Tjele.

Short project description

Erysipelas is a severe infectious disease caused by the bacterium *Erysipelothrix rhusiopathiae* (ER). Following the change in housing for laying hens in Europe, erysipelas has become an emerging disease in several countries with outbreaks of high mortality in layer flocks in indoor aviaries and free-range/organic production. Erysipelas is a well-known acute disease in pigs and a suspected cause of arthritis and considerable economic losses in organic pigs. Erysipelas is difficult to prevent in the growing sector of animal friendly production systems for pigs and poultry. Moreover, ER infections constitute an occupational hazard for humans (zoonosis).

Although a well-known disease, vital basic knowledge particularly on the infection in chickens, is lacking.

The work will comprise establishment of an experimental model including definition of optimal conditions to reproduce the disease observed in the field. We will then use the model to study the pathogenesis of the disease and immune reactions elicited by the infection.

Additional information

The master student will be linked to a group of scientists, postdocs, and PhD-students and their experimental work in on-going projects. The student will get the possibility to be trained in e.g. animal experimentation, cell culture, flow cytometry, and ELISA.

Study of mink Mannose-Binding Lectin (MBL) expression in different mink tissues

Main subject area

Animal Health and Welfare / Mink immunology / qPCR

Department and Supervisor

Department of Animal Science

Post doc Rikke B. Kjærup

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Telephone 87 15 78 89

Project start

Project start and ECTS content flexible

Physical location of project and students work

Flexible

Possibility to do office work in Aarhus

Lab work at Department of Animal Science, AU-Foulum, DK-8830 Tjele.

Short project description

Background: Mannose-Binding Lectin (MBL) is an important innate factor in disease protection and MBL has a high affinity for binding to mannose and other sugar residues present on the cell wall of bacteria, viruses and parasites. MBL is an acute phase protein and mainly secreted by hepatic cells. Results from our lab have shown that low amount of circulating MBL is associated with increased disease severity after infection. These results as well as other studies from mammals, show that MBL plays a major role in disease resistance. In other species extra-hepatic production of MBL has been reported. So far MBL is unstudied in mink. However, indications of MBL being present in mink have been observed.

Aims: To determine MBL gene expression in selected tissues from healthy and sick mink.

Research plan: The student will purify RNA from the sampled tissues. MBL gene expression will be analyzed by qPCR. If possible the student will also study gene expression of other acute phase molecules.

Additional information

The master student will be linked to a group of scientists, postdocs, and PhD-students and their experimental work in on-going projects. The student will be trained in RNA purification, reverse transcriptase and real-time PCR.

Identification of satiety-inducing ingredients

Main subject area

Animal science/human health/cell biology

Department and Supervisor

Department of Animal Science

Senior scientist Stig Purup, stig.purup@anis.au.dk, tel. 8715 7808

Project start

Open

Physical location of project and students work

Department of Animal science, AU-Foulum

Short project description

Obesity is challenging health problem in Western societies. The food industry is trying to develop and provide healthy alternatives to high-calorie food, i.e. low-calorie food or satiety-inducing products. The satiety cascade indicates a number of biological targets for developing food with appetite suppressing properties, among these are the hormones released in the gastro-intestinal tract in response to food consumption. The aim of the MSc project is to use a cell-based model with entero-endocrine cells to study the release of satiety hormones after incubation with novel food ingredients.

This project will give you the opportunity to work with entero-endocrine cells in culture, including characterization of the cell-based model, investigation of viability of cells treated with active components, and measurement of intestinal hormones by commercial ELISA assays.

Additional information

30-45-60 ECTS. As a MSc student you will be involved in an ongoing project regarding delivery of intestinal satiety inducing ingredients:

http://innovationsfonden.dk/sites/default/files/5158-00011a_ev_disi.docx.pdf

Development of an adipocyte stem cell model

Main subject area

Animal science/human health/cell biology

Department and Supervisor

Department of Animal Science

Senior scientist Stig Purup, stig.purup@anis.au.dk, 8715 7808

Project start

Open

Physical location of project and students work

Department of Animal science, AU-Foulum

Short project description

Type 2 diabetes and obesity are challenging health problems in Western societies. Studies have shown that adipose tissue is not only a passive energy store but also an endocrine organ producing secretions that influence the function of other tissues. The aim of the project is to develop an adipocyte stem cell-based model to study the influence of dietary strategies on adipose tissue functionality.

This project will give you the opportunity to work with adipose tissue biology, including primary adipose stem cells from obese Göttingen minipigs, and development of a cell-based model in which pre-adipocyte stem cells differentiate into mature adipocytes. Functional assays on glucose uptake, insulin sensitivity and lipid accumulation are parameters to study the effect of different dietary strategies.

Additional information

30-45-60 ECTS. As a MSc student you will be involved in an ongoing project regarding mitigation of metabolic syndrome through dietary strategies: <http://anis.au.dk/forskning/projekter/udvikling-og-afboedning-af-metabolisk-syndrom-merits/>

Effect of colostrum treatment on passive calf immunization

Main subject area

Animal Health and Welfare/Ruminant Nutrition

Department and Supervisor

Department of Animal Science

Jakob Sehested, associate professor

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Project start

?

Physical location of project and students work

Aarhus University, Foulum.

Short project description

Colostrum quality and intake is crucial to the new-born calf. In this project you are going to investigate the effect of a new and innovative colostrum pasteurization treatment on colostrum quality and calf immunization, measured as systemic and local Ig status. You and 1-2 other students will take part in planning and performance of the calf experiment. The tasks include colostrum collection and treatment, assistance at calvings, care and experimental treatment of calves, clinical recordings, milk, blood and fecal samplings and analyses, data collection and analyses.

Thesis subjects could be divided into evaluating the effect on the new treatment on the:

1. nutrient composition and total Ig content of the treated colostrum
2. serum protein and IgG status of calves fed the colostrum giving the treatment
3. calves' fecal content of Ig

In 1-3 the effect will be evaluated against the effect of non-treated colostrum or colostrum exposed to low and long term pasteurization. Further, the effects of the three treatments will be associated with the calf growth and the clinical health among the calves during the first month.

Additional information

The project is suitable for a master thesis for 1-3 students with an animal science or veterinary background.

<http://naturerhverv.dk/tvaergaende/gudp/gudp-projekter/2014/optimeret-forarbejdningsmetode-sikrer-ren-raamaelk-til-kalve/>

Effect of trace minerals on ruminal degradability of nutrients

Main subject area

Ruminant nutrition and digestive physiology

Department and Supervisor

Department of Animal Science – <http://anis.au.dk>

Jakob Sehested, associate professor

E-mail: jakob.sehested@anis.au.dk

Phone: +45 8715 7893

Project start

2017

Physical location of project and students work

The project is located at AU Foulum. The student will be involved in planning and completion of the experiment and the analyses, and in publication of results. There might be room for more students on the project.

Short project description

Rumen microorganisms require trace minerals (TM) for proper function. However, most research has shown that microorganism requirements for Cu, Mn, and Zn are minimal, much less than those typically provided by ruminant diets (Hubbert et al., 1958; Martinez and Church, 1970). In vitro data suggest that relatively small concentrations of Cu, Mn, and Zn can negatively affect cellulose digestion, whereas in vivo experimental results have been less consistent. Recently, in situ studies indicated that supplementing rumen soluble trace minerals decreased DM digestibility as compared to supplementing less rumen soluble trace minerals (Genther and Hansen, 2015).

This project will use duodenally fistulated cows to evaluate the effect of ruminal soluble trace minerals on duodenal flow and ruminal degradability of nutrients in vivo.

Additional information

The student is expected to be located at AU Foulum during the project

Change in temperament of mink since 1999

Main subject area

Animal Health and Welfare/On-farm animal behaviour

Department and Supervisor

Department of Animal Science

Steen Henrik Møller, senior scientist

E-mail: steenh.moller@agrsci.dk

Phone: +45 8715 7926

Project start

Any time

Physical location of project and students work

Department of Animal Science, AU Foulum, DK-8830 Tjele and data collection on farms.

Short project description

A fairly simple, yet precise and well-validated test of temperament in mink has been used for more than 25 years. In various projects the test has been applied in private mink farms in 1987 and 1999. As mink farmers cull the most fearful and aggressive animals in the population, the farm populations tend to become more and more explorative and less and less fearful and aggressive. The speed of this process can be estimated by repeating the temperament tests on the same farms and colour types as tested in 1987 or 1999.

By repeating the temperament tests, the master student will be able to calculate the change in frequency of the different outcomes and the rate per year in different farms.

Additional information

The master student will get a thorough introduction to the temperament test, and can get help from data recording already planned in the autumn. The student must have a drivers licence in order to visit farms around Denmark.

Temperament in different colour types of mink

Main subject area

Animal Health and Welfare/On-farm animal behaviour

Department and Supervisor

Department of Animal Science

Steen Henrik Møller, senior scientist

E-mail: steenh.moller@agrsci.dk

Phone: +45 8715 7926

Project start

Any time

Physical location of project and students work

Department of Animal Science, AU Foulum, DK-8830 Tjele and data collection on private farms

Short project description

A fairly simple, yet precise and well-validated test of temperament in mink has been used for more than 25 years. In various projects the test has been applied in private mink farms since 1987. There are results enough to suggest that different colour types of mink do have different distributions of explorative, fearful and aggressive animals at farm level. A systematic assessment of the consistency of such a distribution across different farms is, however, still missing.

By testing the temperament of the four most common colour types on 4 or 5 farms, the difference as well as the consistency of the difference between colour types can be assessed.

Additional information

The master student will get a thorough introduction to the temperament test, and can get help from data recording already planned in the autumn. The student must have a drivers licence in order to visit farms around Denmark.

Evaluation of seasonal calving in Danish dairy cattle herds

Main subject area

The project is within the research area of Animal Science and within the discipline of herd management.

Department and Supervisor

Department of Animal Science, AU

Main supervisor: Senior research scientist Søren Østergaard

E-mail: soren.ostergaard@agrsci.dk

Phone: 8715 7961

Project start

Any time

Physical location of project and students work

In Foulum in the research group of Epidemiology and Management

Short project description

Seasonal calving is when the cows in a herd calve at about the same time. Usually used as a management tool to take maximum advantage of seasonal feed supplies or climate. In countries like New Zealand, Australia, and Ireland this is common practice. In Denmark it is practiced by only a few dairy farmers. Recent years, it has been given more attention in Denmark. One herd ranging in the top among all herds regarding economic net return from the production, have been practicing seasonal calving over some years. There is a need for an overview on various consequences for implementing seasonal calving in Danish dairy herds.

A master thesis could address 1) review of implication of seasonal calving management, 2) outline important factors under Danish conditions at the cow, herd and sector level, and 3) doing scenario analyses at herd and sector level. We will try to get asses to Danish farmers who are practicing seasonal calving. Qualitative and/or quantitative data can then be part of the analyses. It will be possible to use the SimHerd model for the scenario analyses.

Implication of genomic selection for reproduction management in dairy herds

Main subject area

The project is within the research area of Animal Science and within the discipline of herd management.

Department and Supervisor

Department of Animal Science, AU

Main supervisor: Senior research scientist Søren Østergaard

E-mail: soren.ostergaard@agrsci.dk

Phone: 8715 7961

Project start

Any time

Physical location of project and students work

In Foulum in the research group of Epidemiology and Management

Short project description

Until now, genomic information has mainly been used to improve the accuracy of genomic breeding values for breeding animals at a population level. However, use of information from genotyped females also opens up the possibility of reducing genetic lag in a dairy herd, especially if genomic tests are used in combination with sexed semen or a high management level for reproductive performance, because both factors provide the opportunity for generating a reproductive surplus in the herd.

To be able to quantify the economic implication of reproduction management strategies in a dairy herd becomes more complicated when the effect of using genomic selection is included. Examples of such calculation have been demonstrated by Hjortø et al. (2015), who combined calculations from the SimHerd model and the ADAM model. However, there is need for more operational approaches to include genomic selection for on-farm consultancy on reproductions management. A master thesis could address this by 1) review of implication of genomic selection at herd level, 2) development of sub-model or changes to the SimHerd model, and 3) using the revised model to do scenario analyses on the implication of genomic selection for reproduction management in a dairy herd.

Additional information

Hjortø, L.; Ettema, J. F.; Kargo, M.; et al. 2015. Genomic testing interacts with reproductive surplus in reducing genetic lag and increasing economic net return. *J. Dairy Sci.* 98, 646-658.

Development of EVOP as a management tool for dairy herds

Main subject area

The project is within the research area of Animal Science and within the discipline of herd management and animal health economics.

Department and Supervisor

Department of Animal Science, AU

Main supervisor: Senior research scientist Søren Østergaard

E-mail: soren.ostergaard@agrsci.dk

Phone: 8715 7961

Project start

Any time

Physical location of project and students work

In Foulum in the research group of Epidemiology and Management

Short project description

The MSc project will be a well defined subproject within the Nordic project 'Evolutionary management in large dairy herds'. A short description of this project: Currently, numerous management changes to increase productivity, health, and welfare in the dairy herd (e.g. use of feed additives and management procedures) are implemented by the herd managers and advisors despite very questionable scientific evidence of causal effects. This can be due to numerous uncontrolled factors in the current environment providing significant disturbing effects. This problem of unreliable or missing knowledge in the individual herd may lead to considerable waste of resources in the dairy industry. Systematic experimentation (with randomization) is often required to detect and estimate the true causal effects of changing input factors. Effects of such within-herd experiments can now be evaluated with minimal costs because larger herds often have access to automatic or semi-automatic data recordings such as cow activity, milk yield, milk composition, inline milk indicators, body weights, AMS data, recording from the mixer wagon and other feeding equipments. We will implement the concepts of EVolutionary OPerations (EVOP) known from the manufacturing industry. EVOP implies to make systematic (randomized) small changes in production factors and procedures and thereby find ways to a more efficient production. More information about the project can be provided. The M.Sc. project will be related to one or two specific EVOP experiments within areas such as feeding management or moving cows between groups. The content of the project will be involvement in the experiments in the private herds and statistical modelling and analyses.

Additional information

A popular description of the mentioned Nordic project can be read from:

<http://dca.au.dk/en/current-news/news/show/artikel/store-kobesaetninger-oprustes-til-systematisk-afproevning-af-nye-tiltag-for-at-optimere-produktionen/>

Farmers' attitudes to animal welfare

Main subject area

Animal Science, interviews qualitative methodology, farmers' perception/attitudes/understanding

Department and supervisor

Department of Animal Science, AU

Inger Anneberg, post doc, anthropologist

E-mail: inger.anneberg@anis.au.dk

Tel.: 2174 5708

Project start

Any time

Physical location of project and students work

On farms to get data

Short project description

It's shown in different research that farmers traditionally relate their understanding of animal welfare to biology/production-themes, like health, diseases, possible output. A Danish qualitative master-thesis study on young farmers attitudes – made with qualitative in-depth interviews have recently been carried out focusing on newly educated farmers but only in a small scale and not seeking variation for instance including older farmers also or including farmers with different herd sizes. Working in depth with qualitative data on this project gives an opportunity to 1) get new data based on the farmers attitudes/understanding 2) relate this data to previous data on the subject and relate it to theories of animal welfare.

Additional information

The student need to be able to use qualitative methodology and know theory about this, for instace using Kvale and Brinkmann or others and to be able to analyse the data in a qualitative way using Nvivo.

Can we use the same welfare assessment protocol in organic sow herds as in conventional in-door sow herds?

Main subject area

Animal health and welfare/organic agriculture/on-farm welfare assessment

Department and Supervisor

Senior scientist Tine Rousing

Phone: + 45 8715 7915

E-mail: tine.rousing@anis.au.dk

Project start

Any time

Physical location of project and students work

Research Centre Foulum and some farm visits

Short project description

To investigate if selected welfare indicators (from WQ® Protocol) in sows and piglets can be implemented with the same robustness (inter observer agreement and repeatability) in organic and in-door conventional sow farms.

Additional information

Can be organised as 30, 45 or 60 ECTS. Existing data and additional data collection in sow herds.

Leptospirosis in dairy herds on pasture

Main subject area

Veterinary epidemiology

Department and Supervisor

Department of Animal Science – <http://www.anis.au.dk>

Mogens A. Krogh, post doc (Epidemiology and Management)

Email: mogenskrogh@anis.au.dk

Phone: +45 8715 7898

Co-Supervisor

Erik Rattenborg, Specialkonsulent, dyrlæge

SEGES -Kvæg, Team Sundhed, Velfærd og Reproduktion

Project start and extent

Anytime – 45/60 ETCS

Physical location of the project and students work

Can be discussed but some herd visits must be expected

Short project description

In UK and Ireland infection with *Leptospira interrogans* serovar *hardjo* (*L. hardjo*) is very common. A recent Irish study estimate the herd prevalence of infection is around 80% in herds that are not vaccination against *L. hardjo*. About 75% of the Irish herds had an active vaccination program against *L. hardjo*. Infection has been associated with abortion and sudden drop in milk. The routes of infection are not completely understood but it has been associated with pasture based production systems. In Denmark *L. hardjo* have been sporadically isolated in submitted material, but the prevalence on herd level is unknown. The purpose of this project would be to establish the herd prevalence of *L. hardjo* in pasture based dairy production. The project will include an evaluation of the test methods to detect *L. hardjo*, organization of sampling and analysis and subsequent detection of herd level risk factors. Depending on the initial results (like if the herd prevalence is 100% or 0%) this project will evolve according to this.

Additional information

Good and healthy interest in epidemiology would be a huge advance

Biosecurity: Infection routes and logistics in herds

Main subject area

Animal health and welfare/management/dairy/sows/slaughter pigs

Department and Supervisor

Department of Animal Science – <http://Anis.au.dk>

Anne Braad Kudahl, MSc, PhD, senior advisor

E-mail: Anneb.Kudahl@agrsci.dk

Phone: + 45 8715 7935

Project start

Any time

Physical location of project and students work

Dept. of Animal Science, AU Foulum, DK-8830 Tjele

Short project description

Background: Infections spread between and within herds via contact between infected animals and infectious material on vectors like humans, tools and machinery. In real herds many infection routes are overlooked but could be closed by changing management or moving things or animals.

Content: With focus on one infection (students own choice) the pathogen is described (literature study), infection routes are identified and described in real herds and options for management changes to close infection routes discussed.

Additional information

The student collects data in Danish dairy herds. If interviews are chosen as a method it is an advantage to speak Danish. Drivers licence necessary.

ECTS 45-60 points.

Biosecurity in large dairy herds

Main subject area

Animal Health and Welfare/Management / Dairy

Department and Supervisor

Department of Animal Science – <http://Anis.au.dk>

Anne Braad Kudahl, MSc, PhD, senior advisor

E-mail: Anneb.Kudahl@agrsci.dk

Phone: + 45 8715 7935

Project start

Any time

Physical location of project and students work

Dept. of Animal Science, AU Foulum, DK-8830 Tjele

Short project description

Background: Biosecurity is becoming more and more important in dairy herds. With increasing herd size follows increased difficulties in controlling infectious diseases in the herd and increased risk of introducing new diseases with purchased animals.

Aim: To describe and analyse the relationship between management, infections routes, and infection status of large dairy herds. Focus can be on one of several infections.

Additional information

The student collects data in Danish Dairy herds. If interviews are chosen as a method it is an advantage to speak Danish. Drivers licence necessary.

ECTS 45-60 points.

Can dietary hemp prevent post weaning diarrhea in pigs?

Main subject area

Animal health and welfare, animal science

Department and Supervisor

Senior scientist, head of section, Charlotte Lauridsen (charlotte.lauridsen@anis.au.ak)

Immunology and Microbiology, Department of Animal Science, AU-Foulum

Project start

February 2017

Physical location of project and students work

AU-Foulum

Short project description

Post weaning diarrhoea (PWD) and growth check are common problems in the swine industry. The changes in the gastrointestinal immunology and microbiology, nutrition and environment, and increased exposure to pathogens during weaning are suggested as ethological factors of PWD and growth check in weanling pigs. It is known that the digestive and intestinal immune systems of pigs are not fully developed at the time of weaning. In order to overcome post-weaning diarrhoea, there is a major interest in the feed industry to ensure proper growth and development in pigs through dietary intervention. Hemp (cannabis) contains bioactive substances, which may be of high relevance as a feed component in diets for weaned pigs to enhance their robustness against infectious disease. The leaf and seed part of the plant contains protein, carbohydrate and fatty acids of high nutritional value. Scientific results on other animal species have demonstrated therapeutic effects of cannabis probably due to the anti-inflammatory effects of the plant. American pig farmers have obtained surprising results on performance after feeding of leftover cannabis.

The aim of this thesis project is to:

- 1) Perform a literature synthesis of existing information on the potential biological effects of various hemp products
- 2) Analyze data of an inoculation experiment with *E. coli* and dietary hemp in order to study the influence on gastrointestinal health of piglets after weaning.
- 3) Describe potential use of cannabis in feed for post weaners.

Additional information

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

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 (charlotte.lauridsen@anis.au.ak)
Immunology and Microbiology, Department of Animal Science, AU-Foulum

Project start

February 2017

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 maturity 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 (charlotte.lauridsen@anis.au.dk)
Immunology and Microbiology, Department of Animal Science, AU-Foulum

Project start

September 2017

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.

Social play behaviour in dairy calves

Main subject area

Animal science, animal behaviour, animal welfare

Department and Supervisor

Senior Scientist Margit Bak Jensen, MargitBak.Jensen@anis.au.dk, tel. 8715 7941

Project start

Data collection starts September 2017

Physical location of project and students work

AU Foulum, Blichers Allé 20, Tjele

Short project description

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; *Physiology and Behaviour*, 92: 375-397). Locomotor play behaviour in calves includes fast galloping, interrupted by sudden change of direction, bucking, hind leg kicking, and body rotations and twists. These are elements of defence and flight, but during play behaviour these elements are exaggerated, repeated, and more variable than during the corresponding functional behaviour. Another characteristic of play behaviour is that it lacks the end-point of its serious counterpart. Social play includes postures and interactions seen during aggressive interactions, but social play does not result in flight or submission and social play is typically interspersed with locomotor play and rotations of the head directed towards the play partner, which are interpreted as invitations to play (Jensen et al., 1998; *Appl. Anim. Behav. Sci.* 56: 97-108).

In relation to animal welfare indicators we are interested in the motivation to perform play behaviour. Calves fed high milk allowances perform more locomotor play behaviour more than calves on limited milk (Krachun et al., 2010; *Appl. Anim. Behav. Sci.* 122: 71-76), but this effect of energy intake was not observed for social play behaviour (Jensen et al., 2015, *J. Dairy Sci.* 98: 2568-2575) and two types of play may have different underlying motivations and may thus not relate to animal welfare in the same way. The motivation to perform locomotor play builds up over 3 days (Jensen, 2001, *Appl. Anim. Behav. Sci.* 70: 309-315), which illustrates that there is an endogenous motivation for locomotor play. This project will investigate if there is also an endogenous motivation for social play behaviour. Over a 3 week period 24 Danish Holstein Friesian calves (4-7 weeks of age) will be given access to perform social play at 3 different intervals and their rebound play behaviour will be recorded during after a pause in social play of either zero, 1 or 3 days. This in addition, analysis of the sequence of various locomotor and social play elements may be conducted to investigate underlying motivation of the two types of play behaviour in dairy calves.

Additional information

Prerequisite is the course Behaviour in Domesticated Animals.

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, MargitBak.Jensen@anis.au.dk, 8715 7941

Project start

Data collection starts summer 2017

Physical location of project and students work

AU Foulum, Blichers Allé 20, Tjele and private farm

The idea is 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 and a drivers licence.

Characteristics and digestibility of fibre in protein concentrates from green crops in ileum-cannulated pigs

Main subject area

Animal nutrition

Keywords: Alternative protein sources/dietary fibre/digestibility/pigs

Department and Supervisor

Department of Animal Science – <http://anis.au.dk>

Main supervisor: Senior researcher Helle Nygaard Lærke

E-mail: Hellen.laerke@anis.au.dk, Phone: 87158061

Co-supervisor: Lene Stødkilde-Jørgensen

Project start

Spring 2017 or later

Physical location of project and students work

Department of Animal Science, Foulum

Short project description

Protein extracted from green forages by biorefining is a potential way to meet the globally increasing demands for protein for livestock and serve as an alternative to soy in animal feeding. In an ongoing project, the nutritional quality of protein extracted from green forage is studied in ileum-cannulated pigs. Dietary fibre potentially interferes with the nutritive value of the products. In this project we will investigate the characteristic of the fibre fraction associated to the protein concentrates and the fate of the fibre fraction during digestion. You will be involved in detailed characterization of the fibre fraction in samples obtained from the pig experiment, be responsible collecting data for statistical analyses and presentation of results as a part of your thesis.

Additional information

45-60 ECTS. You are expected to be located at AU Foulum during the project.

Flair for and interest in laboratory work is necessary. You are invited as a co-author on the scientific paper expected to come from this study.

Bioavailability of proteins from green plants – a peptidomic study

Main supervisor

Associate prof. Trine Kastrop Dalsgaard, Department of Food Science, Aarhus Faculty of Science and Technology, Aarhus University, e-mail: trine.dalsgaard@food.au.dk.

Homepage: <http://pure.au.dk/portal/da/trine.dalsgaard@food.au.dk>

Co-supervisors: Helle Nygaard Lærke, Department of Animal Science and Marianne Danielsen, Department of Food Science will be co-supervisors, phone: +45 8715 7998.

Physical location of the project

Blichers allé 20, 8830 Tjele

Project start

August or September 2017

Extent and type of project

45 or 60 ECTS master thesis

Main subject area

The project is within the field of peptidomics (mass spectrometry) and bioavailability

Additional information

The study will be part of a large project on bioavailability of proteins from green plants in collaboration with Department of Animal Science at Aarhus University.

Short project description

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so called full proteins fulfilling humans' need for indispensable amino acids. However, as we cannot feed the increasing population with only animal protein there is an increasing demand on more sustainable protein sources. Here plant protein from grasses, clover and lucerne make excellent alternative to animal protein. To evaluate the nutritive value, different plant proteins have been tested in ileum-cannulated pigs to assess the ileal digestibility and assess the digestible indispensable amino acid score (DIAAS).

In the present project freeze dried juice collected from the ileum of pigs fed protein extracted from red clover and rye grass will be analysed with LC-MS techniques to investigate the small intestinal digestion of the green protein. Database search, *in silico* digest and *in vitro* digested proteins will be used to characterize the ileum juice for peptides and no-digested protein fragments. Dedicated interest in protein chemistry, bioavailability and in learning an advanced mass spectrometry technique is a necessity.

Impact of cage enrichment on the validity of result in nitrogen balance trials with rats

Main subject area

Animal nutrition/Animal welfare/Animal behaviour

Keywords: Metabolic cages/shelters/nutrient balance/rats

Department and Supervisor

Department of Animal Science – <http://anis.au.dk>

Main supervisor: Senior researcher Helle Nygaard Lærke

E-mail: Hellen.laerke@anis.au.dk, Phone: 8715 8061

Co-supervisor: Mette S. Herskin

Project start

August-September 2017. (Execution of the project is dependent on project funding)

Physical location of project and students work

Department of Animal Science, Foulum

Short project description

Metabolic cage housing is necessary within a wide range of nutritional, metabolic, pharmacokinetic and pharmacodynamic studies in both basic and applied nutritional and biomedical research. However, isolation in metabolic cages without cage enrichment put a strain on the welfare of the experimental animals. Earlier studies confirm that rats prefer a cage with a shelter, but such enrichment is challenging due to the risk of interference with collection of faeces and urine. Several studies have investigated the effect of metabolism cage housing on behavioral, stress hormonal, and physiological responses. In the current study we will investigate how a simple shelter in the metabolism cage will affect behavior and the quality of the quantitative data obtained in metabolism cages with or without shelters.

Additional information

45-60 ECTS. You are expected to be located at AU Foulum during the project.

You will be involved in performing the animal experiment, data handling and interpretation of the results. You are invited as a co-author on the scientific paper expected to come from this study.

Improved housing for pregnant sows

Main subject area

Animal health and welfare

Department and supervisor

Department of Animal Science

Hanne Kongsted, Hanne.Kongsted@anis.au.dk, Phone +45 8715 7853/9350 8454

Project start

Any time

Physical location of project and students work

Herd visits and AU Foulum

Short project description

Housing systems for pregnant sows do not necessarily benefit welfare. Especially, the ability to express natural behavior and the freedom from fear and distress seem compromised in traditional systems. Housing systems for conventional Danish sows mainly belong to one of three systems; loose housing in small groups with manual feeding systems, loose housing in large groups with electronic feeding systems and systems with one box per sow. Systematic comparisons of health and behavior related parameters in different housing systems could provide a better insight to system-related differences and point out conditions to improve. It could also be interesting to look into the attitude of the farm workers and the improvement of work joy that is expected when improving welfare conditions for the sows. Interesting research questions could be: 1) Which of the current housing systems is superior in relation to the welfare of pregnant sows? 2) How can we by low cost methods improve the welfare of pregnant sows in the current systems? 2) How does it affect the work joy of farm workers to be able to contribute positively to the welfare of sows?

How to make interesting and manageable outdoor areas for free-range slaughter pigs?

Main subject area

Animal health and welfare

Department and supervisor

Department of Animal Science

Hanne Kongsted, Hanne.Kongsted@anis.au.dk, tel. +45 8715 7853/9350 8454

Project start

Any time

Physical location of project and students work

Herd visits and AU Foulum

Short project description

Housing systems for slaughter pigs with outdoor areas have an ongoing challenge in keeping the outdoor areas clean, non-slippery and interesting for the pigs to use. Furthermore, in organic systems rooting material in the outdoor areas is mandatory but it can be difficult to choose the best sort of material and to provide it in a practical manner. Some herds have implemented specific strategies and established systems for provision of hay or other materials in the outdoor areas, and it could be interesting to do a systematic follow up on the experiences from these herds. Research questions could e.g. be: 1) Do herds that put an extra effort into providing the outdoor area with rooting material succeed in getting the pigs to use the areas? 2) Do the farmers feel it is worth the effort – in terms of improved work joy and/ or improved welfare? 3) What are the main points to focus on if attempting to improve outdoor areas for slaughter pigs? 4) Which of the current free-range housing systems is best suited to provide an optimal outdoor area?

Disentangling oreganum metabolization in dairy cows by metabolomics

Main subject area

Dairy cow nutrition, strategic feeding to reduce methane emission, metabolomics

Department and Supervisor

Department of Food Science – <http://food.au.dk>

Name, title: Professor Hanne Christine Bertram

E-mail: hannec.bertram@frod.au.dk

Phone: +45 8715 8353

Co-supervisor: Senior scientist Peter Lund, Department of Animal Science, peter.lund@anis.au.dk

Project start

Any time

Physical location of project and students work

Mainly at AU Aarslev, but also at AU Foulum

Short project description

Methane emission from dairy cows contributes considerably to the buildup of greenhouse gas. Consequently, there is an interest in exploring potential opportunities to reduce methane emission from dairy cows. Intriguingly, feed supplementation with oreganum oil has been shown to exert antimicrobial effects and decrease methane production in ruminants^[1]. However, the exact metabolic details in the metabolization of oreganum in dairy cows remain unknown. Metabolomics is a powerful tool to study unidentified metabolic processes as it enables the detection of a wide range of metabolites. The aim of this project is to employ NMR-based metabolomics to study the metabolization of oreganum in dairy cows. The study involves analyses on ruminal fluid, blood, urine, and milk to map the underlying key metabolic pathways across the whole body.

Additional information

Sivropoulou, A., Papanikolaou, E., Nikolaou, C., Kokkini, S., Lanaras, T., & Arsenakis, M. (1996). Antimicrobial and cytotoxic activities of Origanum essential oils. *Journal of agricultural and Food Chemistry*, 44(5), 1202-1205.

Molecular changes in muscle structures with consequences for meat quality

Main supervisor

Jette Feveile Young, senior scientist, Department of Food Science, Aarhus Faculty of Science and Technology, Aarhus University
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Phone: 8715 8051/2347 8883.
Homepage: [http://pure.au.dk/portal/da/persons/id\(93e1c32a-23c8-4141-8799-56c91ff992a2\).html](http://pure.au.dk/portal/da/persons/id(93e1c32a-23c8-4141-8799-56c91ff992a2).html)

Physical location of the project

Foulum

Project start

August 2017

Extent and type of project

60 ECTS MSc project, including practical laboratory work, 11 months

Main subject area

Meat quality at molecular level

Additional information

Postdoc Martin Krøyer Rasmussen will be co-supervisor

Short project description

The etiology of the abnormality of the large breast muscle of chickens, called "wooden breast", is unknown. The development of wooden breast has been registered already 2 weeks prior to slaughter.

The aim of this project is to follow the development of wooden breast from the chickens are small until the time of slaughter and try to identify biomarkers which at an early stage can indicate if wooden breast is developing.

The project include gene and protein regulation analysis (real time PCR and western blotting, respectively) as well as assessment of some meat quality aspects (water holding capacity and texture).

Bioavailability of proteins – a peptidomic study

Main supervisor

Associate prof. Trine Kastrup Dalsgaard, Department of Food Science, Aarhus Faculty of Science and Technology, Aarhus University

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Physical location of the project

Blichers allé 20, 8830 Tjele

Project start

August or September 2017

Extent and type of project

45 or 60 ECTS master thesis

Main subject area

The project is within the field of peptidomics and bioavailability

Additional information

The study will be part of a large project on bioavailability of milk proteins in collaboration with Dept. of Animal Science at Aarhus University.

Short project description

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so called full proteins fulfilling humans' need for indispensable amino acids. Milk has two difference fraction of proteins, the casein and the whey proteins. Caseins are coagulation proteins, which are taken up slowly in the intestine whereas whey is quickly taken up. The two types of proteins has be tested in ileum-cannulated pigs to assess the digestible indispensable amino acid score (DIAAS) according to the recommendations given by the FAO Expert Consultation.

In the present project pigs juice from ilium from pigs fed casein and whey will be analysed with LC-MS techniques to investigate the digestibility and uptake in the small intestine. Database search, *in silico* digest and *in vitro* digested proteins will be used to characterize the ilium juice for peptides and no-digested protein fragments.

Protein co-precipitation between plant and animal proteins

Main supervisor

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Co-supervisor: Associate prof. Marianne Hammershøj

E-mail: marianne.hammershoj@food.au.dk

Physical location of the project

Blichers allé 20, 8830 Tjele

Project start

August or September 2017

Extent and type of project

60 ECTS master thesis (shorter project can be conducted within the area but with fewer tasks)

Main subject area

The project is within the field of metabolomics

Additional information

The study will be part of a collaboration between Arla Foods Amba and Arla Food Ingredients and AU-FOOD Aarhus University.

Short project description

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as milk proteins are recognized as so called full proteins fulfilling humans' need for indispensable amino acids. Expensive proteins like milk proteins could be complemented partly by plant proteins and still fulfil the need for indispensable amino acids, and thereby help to fulfil the needs of proteins to feed the world. Most recently, we saw very interesting result with respect to co-precipitation and improved enzymatic digestibility, which we will like to investigate more in details. It might be due to changes in protein structure or to interaction with anti-nutritional factors (ANFs), which is known to reduce the bioavailability of the proteins. Co-precipitation of plant proteins with animal protein is a novel technology applied to remove ANFs from plant proteins and improve functional properties. It will improve bioavailability of the plant proteins, making them candidates as proteins for human consumption.

The project aim at using a co-precipitation of plant proteins with milk proteins to obtain high quality protein blends. We will investigate the protein-protein interaction and changes in functional properties. Protein quality will be characterized according enzymatic digestibility.

Oxidative changes in fish feed and its effect on digestibility – Better proteins to feed the world

Main supervisor

Associate prof. Trine Kastrup Dalsgaard, Department of Food Science, Aarhus Faculty of Science and Technology, Aarhus University
E-mail: trine.dalsgaard@food.au.dk
Phone: +45 8715 7998

Physical location of the project

Blichers allé 20, 8830 Tjele

Project start

August or September 2017

Extent and type of project

45 or 60 ECTS master thesis

Main subject area

The project is within the field of protein quality and digestibility

Additional information

The study will be part of a bigger project “New physicochemical and technological approach for High Quality and Sustainable Fish Feed production – ExiPro” a collaboration between Biomar, DTU-aqua, KU and AU. A PhD student is linked to the project.

Short project description

An increasing world population demands increasing amounts of proteins. Proteins of animal origin such as fish, meat, egg and milk proteins are recognized as so called full proteins fulfilling humans’ need for indispensable amino acids. Thus animal protein like fish protein is a good source to fulfill some of our needs for proteins. Fish also needs protein to grow and plant proteins are cheaper than proteins from e.g. fish meal but the plant proteins do not cover all the essential amino acids for optimal growth. Expensive proteins like fish proteins could be complemented partly by plant proteins and still fulfil the need for indispensable amino acids, and thereby help to produce fish for human consumption to fulfil the needs of proteins to feed the world. Furthermore, the processing in the feed production is highly relevant to study to optimize bioavailability. It is of utmost importance that the available raw materials are fully utilized by optimizing feed process technology and protecting nutritional quality of the feed.

The project will focus on how the protein quality and the extrusion treatment in the production of fish feed will induce oxidative changes in the proteins and reduce the digestibility of the proteins. The student will learn many different techniques, including mass spectrometry, to investigate oxidative changes and digestibility of different types of proteins.

Genetic variation in specific genes/gene families in livestock species

Main subject area

Molecular genetics

Department and Supervisor

Department of Molecular Biology and Genetics – <http://mbg.au.dk>

Senior scientist Lars-Erik Holm, senior scientist Frank Panitz, associate professor Bo Thomsen

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Phone: 8715 7917, 8715 7919, 8715 7982

Project start

Any time

Physical location of project and students work

Foulum, Build. K25

Short project description

Recent years have seen a tremendous generation of new genetic data in several species based on the next-generation sequencing technologies. These data provide information on genome-wide genetic variation, which will be utilised in these projects. The idea is to mine specific genes or gene families of interest based on knowledge on the function of these genes/gene families in other species, like human or mice. The project will describe the variants in the selected genes and predict consequences of these variants in the investigated species. If possible, some of these consequences will be evaluated experimentally (either in silico or in the laboratory).

This will involve bioinformatics analyses of DNA data. Identified DNA variants need validation in the laboratory and probably characterization in one or more populations. Prediction of consequences of identified genetic variants will be done by literature mining, use of tools to annotate the variants, use of tools to predict changes in proteins, and use of tools to predict genetic pathways and potential other proteins being affected.

Prerequisites

Basic knowledge in bioinformatics corresponding to for instance participation in the course: Bioinformatic analyses of genomics data.

Genomic selection improving feed efficiency in a new synthetic pig line.

Main subject area

Animal breeding and genetics; genomics; feed efficiency and growth; pigs

Department and Supervisor

Department of Molecular Biology and Genetics – <http://mbg.au.dk>

Dr. Mahmoud Shirali/Prof. Just Jensen

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Phone: +45 8715 8013

Project start

Preferably April-August or any time

Physical location of project and students work

Preferably QGG, Foulum, Tjele, Denmark. Office work can partly be carried out in Aarhus.

Short project description

Feed efficiency is one of the main breeding goals in the breeding programs due to its economic benefits and reduction of environmental pollution due to emissions. Genomic selection methodology has been shown to improve the genetic progress of traits in the breeding programs especially for traits that are difficult and expensive to measure such as feed efficiency and related traits.

Phenotypic records for feed intake, growth and body composition are available from routine breeding program for a new synthetic line. The genomic information has been recorded for over 2000 individuals consisting of 60K and 80K Illumina SNP chips.

The overall objective of this project is to show the advantage of using genomic selection compared to pedigree information for predicting genetic merit of animals.

The tasks could include:

- 1) combining 60K and 80K genomic information using imputation software
- 2) combining pedigree and genomic information using mixed model methodology
- 3) modelling of the feed efficiency complex using genetic residual feed intake
- 4) better modelling of the genomic relationships using haplotype information

Additional information

Knowledge and interest in animal breeding; statistical genetics; computing; pig breeding; and scientific writing are preferable. Software packages are available to conduct all necessary analysis.

Useful reading

Shirali M, Strathe AB, Mark T, Nielsen B, Jensen J. 2017. Joint analysis of longitudinal feed intake and single recorded production traits in pigs using a novel Horizontal model. *J.Anim.Sci.* 95:1–14.

Guo X, Christensen OF, Ostersen T, Wang Y, Lund MS and Su G 2015. Improving genetic evaluation of litter size and piglet mortality for both genotyped and nongenotyped individuals using a single-step method. *93*, 503-512.

Genomic architecture of feed efficiency and feeding behavior traits in a new synthetic pig line

Main subject area

Genome wide association analysis; feed efficiency; feeding behaviour; pigs

Department and Supervisor

Department of Molecular Biology and Genetics – <http://mbg.au.dk>

Dr. Mahmoud Shirali/Prof. Just Jensen

E-mail: Mahmoud.Shirali@mbg.au.dk/Just.Jensen@mbg.au.dk

Phone: +45 8715 8013

Project start

Preferably April-August 2017 or any time

Physical location of project and students work

Preferably QGG, Foulum, Tjele, Denmark. Office work can partly be carried out in Aarhus

Short project description

Feed efficiency and feeding behavior traits have shown to have varying genetic background across the growth period of animals (Shirali et al., 2017). This could be due to different genes regulating the genomic architecture of these traits (Shirali et al., 2013). Statistical and bioinformatics approaches can be used to dissect the genetic architecture of feed efficiency and feeding behavior longitudinally across the animal's growth period. Feed intake information for each visit of animals to the electronic feeder is available on more than 2000 synthetic pigs. The genomic information has been recorded for these individuals using 60K and 80K Illumina SNP chips.

The overall objective of this project is to give insight into the genomic architecture of feed efficiency and feeding behavior traits during animal's growth period to better understand the genetic and biological complexity behind these traits.

The tasks could include:

- 1) combining 60K and 80K genomic information using imputation software.
- 2) modelling of the feed efficiency and feeding behavior traits longitudinally.
- 3) comparing classical genome wide association studies with novel approach of regional haplotype heritability mapping (Shirali et al., 2016)
- 4) utilizing bioinformatics tools such as pathway and machine learning analysis

Additional information

Knowledge and interest in animal breeding/biology/bioinformatics and scientific writing are preferable.

Software packages are available to conduct all necessary analysis.

Useful reading:

Shirali M, Duthie CA, Doeschl-Wilson A, Knap PW, Kanis E, van Arendonk JAM, Roehe R. 2013. Novel insight into the genomic architecture of feed and nitrogen efficiency measured by residual energy intake and nitrogen excretion in growing pigs. *BMC Genetics* 14:121.

Shirali M, Pong-Wong R, Navarro P, Knott S, Hayward C, Vitart V, Rudan I, Campbell H, Hastie ND, Wright AF, Haley CS. Regional heritability mapping method helps explain missing heritability of blood lipid traits in isolated populations. *Heredity*. 116, 333–338.

Shirali M, Strathe AB, Mark T, Nielsen B, Jensen J. 2017. Joint analysis of longitudinal feed intake and single recorded production traits in pigs using a novel Horizontal model. *J.Anim.Sci.* 95:1–14.

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, AU-Foulum

Senior Scientist Martin Riis Weisbjerg, Martin.Weisbjerg@agrsci.dk

Senior Scientist Peter Lund, Peter.lund@agrsci.dk

Assoc. Prof. Jakob Sehested, Jakob.sehested@agrsci.dk

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 Environmental Impact 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 outcoming scientific paper.

Pig nutrition and physiology in relation to reduce the environmental load and improve production and health by feeding - topic of research.

Main subject area

Animal Health and Welfare, pig nutrition and physiology

Department and Supervisor

Department of Animal Science, Foulum

Assoc. professor Jan Værum Nørgaard, jan.noergaard@agrsci.dk

Physical location of project and students work

Department of Animal Science, Foulum.

Short project description

The aim of my research and the research going on at the section of Animal Nutrition and Environmental Impact is to optimize feeding to reduce the excretion of nutrients and to improve animal production 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 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.