

# ANIMAL SCIENCE

## Master Thesis Projects

Topics for Master Thesis Projects available in 2016-2017

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/students/>

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## Guidelines

### Thesis types offered for students at the MSc Agrobiolology 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

### **Crossbreeding as a tool to enhance production performance and carcass value of dairy bull calves**

#### **Main subject area**

Animal Health and Welfare / Organic Agriculture

Animal nutrition and health / beef production /organic 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

Email: [mogens.vestergaard@anis.au.dk](mailto:mogens.vestergaard@anis.au.dk)

Phone: +45 8715 7843

#### **Project start**

As soon as possible.

#### **Physical location of 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 and calves arising from crosses between a dairy breed and a beef breed. Recordings from designed experiments include feed intake recording, performance, carcass quality and animal health. How will the various breed and sex-types fit the existing beef productions concepts? Growth, feed intake and carcass data are available for 8 and 12 months animals (MSc-project A). Data from a recent organic beef production experiments also with crossbreeds slaughtered at 17 months of age are available (MSc-project B).

#### **Additional information**

Datasets are available in Excel and SAS-files. Some literature is also available.

# **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

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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**

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

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 Cell Biology 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:

Plasma samples from a rat study where it was studied whether different bread types had preventive effects on the development of type 2 diabetes.

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 87157834

### **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.

## **Animal behaviour – several projects will be possible within this area**

### **Main subject area**

Animal Health and Welfare

### **Department and Supervisor**

At the research group for Animal Behaviour and Stress Biology, we are several potential supervisors, who will welcome new master students. If you are interested in a thesis focusing on animal behaviour, and wish to be part of a group of researchers committed to animal behaviour and stress biology – but with individual focus areas within this research area – you are welcome to contact Tina Albertsen, Tina.Albertsen@anis.au.dk, 8715 7901, and she will connect you with a relevant researcher, or you may contact the researcher directly.

### **Project start**

Spring 2016 and onwards.

### **Physical location of project and students work**

Most of the projects are located at Research Center Foulum near Viborg, but some would require data collection on private farms, and some in other locations.

Specific research areas/key words for the different supervisors within the study of animal behaviour (in alphabetic order):

- Janne W. Christensen (JanneWinther.Christensen@anis.au.dk): horses, social behaviour, learning and training, fear reactions and habituation
- Katrine Kop Fogsgaard (Katrine.KopFogsgaard@anis.au.dk): Welfare of dairy cows; housing and management of sick/injured dairy cows, housing and welfare of cattle housed outdoor
- Mette Herskin (MetteS.Herskin@anis.au.dk): pigs, cattle, animal pain, sickness behavior, hospital pens, animal transportation, shoulder ulcers, tail docking, animal models, umbilical hernia, 3R
- Margit Bak Jensen (MargitBak.Jensen@anis.au.dk): calf housing, calf feeding, calf social behaviour, calf play behaviour, dairy cows, behaviour at calving
- Lene Juul Pedersen (Lene.JuulPedersen@anis.au.dk): pigs, tail biting, enrichment, thermal environment, neonatal survival, loose housing, maternal behavior, organic pig production
- Jens Malmkvist (Jens Malmkvist@anis.au.dk): mink, pigs, early young survival, fear, stress responses, abnormal behaviour such as stereotypies, fur-chewing, maternal-offspring interactions influence on offspring later behaviour, aggression and male reproductive performance in mink
- Lene Munksgaard: (Lene.Munksgaard@anis.au.dk): animal welfare, cattle, timebudgets, automatic recording of behaviour, behavioural needs, housing and management of cattle
- Anja Brinch Riber (Anja.Riber@anis.au.dk): effects of early experiences, environmental enrichment and housing on development of behaviour and welfare, cannibalism, feather pecking, leg problems, welfare assessment in broiler and laying hen production
- Karen Thodberg (Karen.Thodberg@anis.au.dk): dogs, pigs, companion animals, tail biting, tail docking, therapy animals, human-animal interactions.

# **The function of an unknown cell type in chicken blood**

## **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

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**

Project subject: Functional characterization of chicken CD4+CD8+ double positive cells.

Background: Chicken T lymphocytes are essential for adaptive immune responses in the chicken. The cell population comprise CD4+ T helper cells and CD8+ cytotoxic T cells. In several species mature T cells expressing both CD4 and CD8 have also been described. Phenotypic studies of this double positive population (DP) have been performed in the chicken but thorough functional characterization is lacking. In other species, DPs are defined as part of the memory T cells pool increasing with age and antigen contact. In this project we will address if this is also the case in the chicken.

Aim: The aim of the project is to perform detailed functional analyses of chicken DPs in order to elucidate activation status, proliferative capacity and cytokine production potential of these cells.

Methods: The student will study chicken lymphocytes from peripheral blood and spleen ex-vivo. Different activation strategies will be applied and phenotype, proliferation and cytokine production will be addressed by flow cytometry analyses.

## **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 flow cytometry but other relevant techniques like RT-qPCR and ELISA may be included in the project if desired.

# **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](mailto: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.

# Comparison of “immunocompetence” in three commercial chicken lines

## 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

Several components in chicken blood act as natural disease protection molecules. Especially, the opsonins are important for the early/immediate immune responses to infection. The project aim is to establish a method to study the “opsonin potential” of chicken serum and investigate if opsonin potential correlates with general robustness. Samples are available from a large experiment where three commercial chicken lines were compared.

## 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. 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

E-mail: rikke.kjaerup@anis.au.dk

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 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.

# **Diet and development of obesity and metabolic syndrome**

## **Main subject area**

Animal Health and Welfare

Animal science/Human health/Animal models for human nutrition

## **Department and Supervisor**

Department of Animal Science, Foulum

Senior researcher Helle Nygaard Lærke, hellen.laerke@anis.au.dk

## **Project start**

2016/2017

## **Physical location of project and students work**

Department of Animal Science, Foulum.

## **Short project description**

The project aims to study the development of obesity and glucose control in minipigs fed either high-risk or low risk diets by the use of different carbohydrate sources. The possibility to revert effects by feeding high and/or low dietary fibre is studied in a following 8-week intervention study.

The student will be part of a large ongoing project involving a PhD student, a Post Doc and multiple senior researchers covering different aspects. The student will be involved in working with the animals in the barn, data processing and some analytical work.

The project will comprise a literature review on fructose, protein and dietary fibre in relation to obesity and metabolic syndrome in humans and different animal models, data collection, data handling, statistical analysis of collected data. Writing of the thesis should be in format of literature review, paper draft, and general discussion.

## **Additional information**

The student is expected to be located at AU Foulum a great part of the time during the project.

# 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](mailto: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

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 develop a cell-based model with entero-endocrine cells and study the release of satiety hormones after incubation with food ingredients.

This project will give you the opportunity to work with entero-endocrine cells in culture, including characterization and establishment 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](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](mailto: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 isolation of primary adipose stem cells from obese Göttingen minipigs and development of a cell-based model in which pre-adipocyte stem cells are differentiated into adipocytes. Functional assays on glucose uptake, insulin sensitivity and lipid accumulation will be used 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/>

# **Behaviour in calves fed via automated milk feeder; the effect of raceway design on feeding, growth and play behaviour during gradual weaning off milk**

## **Main subject area**

Animal Health and Welfare

Animal science, animal behaviour, animal welfare

## **Department and Supervisor**

Senior Scientist Margit Bak Jensen, [MargitBak.Jensen@ania.au.dk](mailto:MargitBak.Jensen@ania.au.dk)

## **Project start**

1 September 2016.

## **Physical location of project and students work**

AU, Foulum, Blichers Allé 20, Tjele.

## **Short project description**

When calves are fed milk via computer-controlled milk feeders the farmer can program when and how much milk each calf may drink. Unfortunately, there is competition for feeder access. These feeders normally use a raceway to access the teat that limits the ability of one calf to displace another from the teat, but displacements still occur especially with 20 or more calves per feeder (Jensen, 2004; J. Dairy Sci. 87: 3428-3438). During gradual weaning off milk this competition for access to the milk feeder is intensified, because calves visit the feeder more often in an attempt to maintain their milk intake (Jensen, 2006; J. Dairy Sci. 89: 201-206). Therefore, during gradual weaning the calves' focus must be shifted from milk to concentrates. Feeding calves high milk allowances generally makes the transition to solid feed more difficult, but social housing has been found to stimulate early concentrate intake in these calves (Jensen et al., 2015; J. Dairy Sci. 98 :2568–2575). When milk is reduced during gradual weaning, leading the calves directly from milk to the concentrates may also be a way to stimulate concentrate intake during weaning. Play behaviour in calves is very sensitive to feed intake and is typically reduced during weaning (Krachun et al 2010; Appl. Anim. Behav. Sci. 122: 71-76). The present study investigates if a special raceway at the automatic milk feeder, which leads the calf from the milk directly to concentrate, increases time spent feeding concentrates and increases weight gain. The study also measures calf play behaviour during weaning and investigates if this may be used as an additional measure of how well calves are transitioning from a milk diet to solid feeds during waening.

## **Additional information**

Prerequisite is the course Behaviour in Domesticated Animals.

# 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

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

Phone: +45 8715 7893

## Project start

Late August 2016.

## 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](mailto:jakob.sehested@anis.au.dk)

Phone: +45 8715 7893

## **Project start**

2015 or 2016.

## **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.

# **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@anis.au.dk

Senior Scientist Peter Lund, Peter.lund@anis.au.dk

Assoc. Prof. Jakob Sehested, Jakob.sehested@anis.au.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.

## **Animal behaviour – various topics**

### **Main subject area**

Animal health and welfare, behaviour and stress biology, pigs.

### **Department and Supervisor**

Senior researcher Lene Juul Pedersen, lene.juulpedersen@agrsci.dk, tel. 5116 2822.

### **Project start**

September 2016 (or August if possible).

### **Physical location of project and students work**

At AU-Foulum, Blichers allé 20, 8830 Tjele.

### **Short project description**

There are different options within the following topics:

- Methods to prevent tail biting in slaughter pigs
- The influence of floor type and micro climate in the pen on pigs choice of resting behaviour and pen fouling
- Validation of automated recordings by use of image analysis of pig behaviour, lying pattern, activity pattern
- Neonatal piglet mortality in organic production: eg. importance of maternal behaviour and genetics, pre-lying behaviour, thermal environment.

### **Additional information**

Knowledge from “behaviour of domesticated animals”.

## **3R – Reduction, replacement and refinement of animal experimentation - several projects will be possible within this area**

### **Main subject area**

Animal Health and Welfare

### **Department and Supervisor**

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 Mette S. Herskin, [MetteS.Herskin@anis.au.dk](mailto:MetteS.Herskin@anis.au.dk), 8715 7945.

Project key words are: animal behaviour, stress, welfare, animal model, model validation, pain, suffering.

### **Project start**

Spring 2016 and onwards.

### **Physical location of project and students work**

Most of the projects will be located at Research Center Foulum near Viborg.

## **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**

Autumn 2016.

### **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

Autumn 2016.

## 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.

# **Drinking behaviour in mink kits with a drinking nipple close to the nest box in relation to health and welfare during late lactation in mink**

## **Main subject area**

Animal Health and Welfare

Management, length of lactation, animal welfare

## **Department and Supervisor**

Department of Animal Science

Steen Henrik Møller, senior scientist

E-mail: steenh.moller@anis.au.dk

Phone: +45 8715 7926

## **Project start**

On-farm research and observation period is June-July 2016 and 2017.

## **Physical location of project and students work**

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

## **Short project description**

A drinking nipple close to the nest box is tested as an efficient way to supply water for mink kits in the period from 4 weeks pp. where the kits start to eat solid food and 6 weeks pp where they can use the normal watering system. The nipples are tested in large scale on private farms in 2016 and 2017 including behaviour, health and welfare of the dams and their litter as the response.

## **Additional information**

The master student will get a thorough introduction to the on-farm tests, and participate in data recording and analysis. The student must have a drivers licence in order to visit farms around Denmark.

# **Feeding during lactation in relation to health and welfare during late lactation in mink**

## **Main subject area**

Animal Health and Welfare

Feeding management, length of lactation, animal welfare

## **Department and Supervisor**

Department of Animal Science

Steen Henrik Møller, senior scientist

E-mail: steenh.moller@anis.au.dk

Phone: +45 8715 7926

## **Project start**

On-farm research and observation period is June-July 2016 and 2017.

## **Physical location of project and students work**

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

## **Short project description**

Different feeding strategies during early lactation are applied in mink production in order to avoid the 'Sticky kit' syndrome and ease the kits transition from milk to solid feed. These strategies may, however also affect the lactation and maternal care of the dam. Different strategies are tested in large scale on private farms in 2016 and 2017 including behaviour, health and welfare of the dams and their litter as the response.

## **Additional information**

The master student will get a thorough introduction to the on-farm tests, and participate in data recording and analysis. The student must have a drivers licence in order to visit farms around Denmark.

# **Non-inhibited barley -feed enzyme combinations for improved feedstuff value in pigs (MSc thesis/ Internship)**

## **Main subject area**

Animal Health and Welfare

Key words: Animal nutrition, pigs, ileal digestibility

## **Department and Supervisor**

Department of Animal Science, Foulum

Assoc. professor Jan Værum Nørgaard, janvnoergaard@anis.au.dk

## **Project start**

From August-September 2016 or later.

## **Physical location of project and students work**

Department of Animal Science, Foulum.

## **Short project description**

For approx. 2 years, a barley breeding company and an international enzyme company have in collaboration with an AU plant genetic group selected different barley varieties on their expression of xylanase inhibitors. The task is to develop a better match of barley variety and xylanase enzyme for more efficient nutrient utilization and lower environmental impact.

Our job in animal science is to test if the concept works. This will be done by having 6 exp diets with or without enzymes and with different barley varieties, as well as a N free diet. Then ileum cannulated pigs will be fed the diets in a 7\*7 Latin square and we will study ileal digestibility of nutrients. Helle Lærke will participate and do the surgery.

The barley was sown on the fields in late autumn 2015 and we can start doing experiments soon after harvest. In practice we need a few analysis to plan the diets. So the animal experiments will probably run from september depending on our staff in the facilities. Lab technicians will do the lab work but you are welcome to participate. The output should be a published paper on digestibility with you as co-author and of course new barley varieties and types of effective xylanases.

## **Additional information**

The project is funded by GUDP and involves companies who are doing product development. You will meet those companies, but in this text, not too many details can be provided due to confidentiality issues. For a internship, it would be relevant to go visit the companies.

# **Potential of fresh grass for pigs evaluated through nutrient balance and blood and urine metabolites (MSc thesis/ Internship)**

## **Main subject area**

Animal Health and Welfare

Key words: Animal nutrition, pigs, physiology, organic

## **Department and Supervisor**

Department of Animal Science, Foulum

Assoc. professor Jan Værum Nørgaard, janvnoergaard@anis.au.dk

## **Project start**

From August-September 2016 or later.

## **Physical location of project and students work**

Department of Animal Science, Foulum.

## **Short project description**

The study, in which you will be involved, is a part of a larger project with the aim to define nutrient requirements for organic pigs at different stages of life and take into account the physical activity and seasons. Free ranging pigs are fed complete diets but they also forage in the paddocks. This intake of grass may be important to take into account, but both the amount and utilization of the grass intake is uncertain.

The experiment is planned for September 2016. Pigs housed in metabolism/balance cages will be fed increasing levels of fresh clover grass. Feces, urine via catheter and jugular vein blood samples will be collected. The staff in the barn will be responsible but you can assist to the degree you want. Feces and urine will be analyzed for dry matter, ash and nitrogen. Blood and urine samples will be analyzed. Lab technicians will do the lab work but you are welcome to participate. For a 60 ECTS thesis it may also be possible to include data on blood and urine metabolomics to describe physiological effects of the dietary treatments.

The thesis/report can address several topics. To some degree, you will therefore be able to follow your interests and focus more or less on organic production, nutrition, and physiology. The output should be a published paper on digestibility and utilization of grass in pigs with you as co-author. It will be possible to adjust the content and workload to fit 30-60 ECTS.

Additional information.

The project is funded by Innovationsfonden with the project title 'Value added through resource efficient organic pig production'. A PhD student will be employed on the project and you will work in a team of barn- and lab technicians, the PhD student, Jan V Nørgaard (main supervisor), Peter K Theil, Mette S Hedemann, Anne Grethe Kongsted and other scientists. It will be possible for you to participate in the different practical activities as you wish.

# **The perfect way of preparing a steak**

## **Main supervisor**

Margrethe Therkildsen  
Department of Food Science  
Aarhus Faculty of Science and Technology  
Aarhus University  
E-mail: Margrethe.therkildsen@food.au.dk  
Phone: 87158007

## **Physical location of the project**

Department of Food Science, Foulum in collaboration with AAU and AGRO TECH.

## **Project start**

August 2016.

## **Extent and type of project**

60 ECTS thesis.

## **Main subject area**

Meat science, cooking, image analysis, innovation.

## **Additional information**

This is an innovation project in collaboration with students from Aalborg University and Agro tech, Aarhus, and allows for input from an innovative student.

## **Short project description**

The idea is that image analysis could be used to determine if a piece of meat has reached its optimal quality during cooking. This information would be very useful for chefs and the foodservice sector, making sure that meat is cooked to a desired quality (eg. tenderness and juiciness). In order to explore this idea knowledge is required in image analysis (AAU), cooking and software development (Agro tech) and meat science (Dept. of food science). The student would be measuring meat quality traits and changes of these over different cooking methods and relate these to image analysis methods in collaboration with the other partners.

# **Simulated transport of slaughter chickens – effect on metabolism and meat quality**

## **Main supervisor**

Margrethe Therkildsen and Niels Oksbjerg  
Department of Food Science, Aarhus University  
E-mail: Margrethe.therkildsen@food.au.dk  
Phone: +4587158007

## **Physical location of the project**

Department of Food Science, Foulum.

## **Project start**

August 2016.

## **Extent and type of project**

Master Thesis.

## **Main subject area**

Muscle biochemistry and meat quality.

## **Short project description**

Department of Food Science is collaborating with the poultry industry to develop a gentler and more environmentally friendly method of broiler transportation to the slaughterhouse.

The last ride in the life of a broiler to the slaughterhouse can vary greatly depending on the weather. A new concept from Linco Food Systems is attempting to do something about this, while scientists from Aarhus University will be validating the biochemical effects of the system on the chickens. With support from the Green Development and Demonstration Programme, Linco Food Systems and Aarhus University have teamed up to develop a new climate-controlled transport system.

With air-conditioning during transport the chickens would get a much more comfortable ride. This will improve their welfare, reduce stress levels and make the transport more efficient. The broilers and consumers will also benefit directly from the new system. Project participants expect the mortality during transport to fall by 30 percent – from 0.3 percent to 0.2 percent. When the chickens are exposed to stress this can affect the quality of their meat where the meat becomes pale, soft and 'exudative. This is the so-called PSE meat. Project partners expect that the incidence of PSE meat will be halved from the current 30 percent (estimated average of relevant markets) to 15 percent.

In the project the student will be involved in identifying which parameters during the transport from producer to the slaughter house that influence the energy metabolism and hence the final meat quality. This includes the analysis of glycogen metabolism, pH, protein denaturation and effects on meat quality traits.

# **Wooden breast in Broilers – an abnormality of the muscle tissue**

## **Main supervisor**

Jette Feveile Young, senior scientist  
Department of Food Science, Aarhus University  
E-mail: jettef.young@food.au.dk  
Phone: 23478883

## **Physical location of the project**

Foulum.

## **Project start**

August 2016.

## **Extent and type of project**

60 ECTS, MSc project.

## **Main subject area**

Meat quality (a possible relation to animal welfare).

## **Additional information**

Postdoc Martin Krøyer Rasmussen will be co-supervisor on the project and available for day to day sparring and lab work.

## **Short project description**

Wooden breast (WB) is a phenomenon where the large breast muscle, is characterised by pale and bulging areas of substantial hardness resulting in several implications for the quality of the fresh and processed products. In WB affected tissue the number of fibers is reduced and the fibers are variable in size, rounded and seperated by or replaced by connective tissue.

In the project the role of oxidative stress including acute phase response signalling is to be investigated by gene expression (using real time PCR) and protein synthesis (using western blotting) of stress proteins (e.g. HSP 27, HSP 70 and/or HO-1), as possible biomarkers of WB. Samples from WB affected tissue as well as controls from the slaughter line and few days before slaughter have been collected and awaiting analysis.

## **Two projects: DO LAME COWS BENEFIT FROM A STAY IN A HOSPITAL PEN? DO COWS WITH MASTITIS BENEFIT FROM A STAY IN A HOSPITAL PEN?**

### **Main subject area**

Animal Health and Welfare

Animal Behaviour/ dairy cow welfare / dairy cow health

### **Supervisor**

Mette S. Herskin

MetteS.Herskin@anis.au.dk

Tel. 87 15 79 45

### **Co-supervisor:**

Katrine Kop Fogsgaard

Katrine.KopFogsgaard@anis.au.dk

Tel. 87 15 79 63

### **Project start**

Start is possible from late spring 2016 and forward.

### **Physical location of project and students work**

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

Experimental thesis based on data collection on dairy farms.

### **Short project description**

This description covers two projects which both focus on the effects of housing sick/injured dairy cows in hospital pens. One project focuses on lameness, the other on cows with mastitis infections. Recent studies have shown that lame and mastitis dairy cows display sickness behavior and therefore might have altered motivations and needs compared to healthy herd mates. Hence, they might benefit from a stay in a hospital pen during the recovery period following lameness or mastitis.

These projects aims to include lame or mastitis dairy cows where half is group housed in hospital pens and the remaining part is kept in their home pen with healthy herd mates. For lame cows, they will be housed in hospital pens until they reach lameness score of 2 or a maximum of 6 weeks after diagnosis. Mastitis cows will be housed in hospital pens during antibiotic treatment and the following withdrawal time on milk due to antibiotic residues. Within this experimental period the following will be registered weekly on all experimental cows; medicine use, veterinary treatments, time budget for the farmer spent on handling the cows, lying behavior and lameness score.

Furthermore all cows will be followed for the remaining part of their lactation and information about yield, disease, reproduction, veterinary treatment and culling will be recorded to gain information about the long term effect of a stay in a hospital pen.

Several different topics could be investigated within these projects, so if you are interested please contact us!

### **Additional information**

Data will be based on data collected on private dairy farms, which means that there will be some driving to farms, either alone or together with technicians from AU.

# Design and use of shelters in beef cattle during winter time (two projects)

## Main subject area

Animal Health and Welfare

## Supervisor

Janne W. Christensen  
jwc@anis.au.dk  
Tel. 87 15 80 75

## Co-supervisor (daily supervisor):

Katrine Kop Fogsgaard  
Katrine.KopFogsgaard@anis.au.dk  
Tel. 87 15 79 63

## Project start

Data collection from November 2016-February 2017. Projects can start from summer 2016.

## Physical location of project and students work

Department of Animal Science, AU Foulum, DK-8830 Tjele.  
Experimental project based on data collection.

## Short project description

Meat cattle are often housed outside on pasture all-year around in Denmark. According to Danish Legalisation animals kept outside should be able to seek shelter against wind and weather. As a rule, the shelter should consist of a shelter or a building where they can seek shelter during winter or in periods with winter-like weather. The provided shelter should ensure that all animals in the flock have access to a dry and bedded lying area, and that all animals can lie down in this area at the same time.

Cattle are social animals with a hierarchy structure in the group. This might mean that high ranking animals can block the access to shelter for lower ranking animals. It is therefore important, when establishing shelters to ensure that also lower ranking animals have access to shelter – at the same time as higher ranking animals.

The aim of this project is, by the use of experimental experiments to investigate what combination of size (m<sup>2</sup>/animal), number of entrances and number of shelters results in the best use of the shelters during winter time, including best possible access for lower ranking animals to the shelter.

Data will be collected in the period from November 2016 to February 2017. The data collected will consist of mainly behavioural data – obtained by direct observation and video recordings.

Several different projects is possible within this project, so if you are interested please contact us!

# 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

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

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

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/>

# **Characterization of large herds with a long history of a persistent low somatic cell count in the milk**

## **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  
soren.ostergaard@agrsci.dk

Phone: 8715 7961

Michael Farre from SEGES will be enrolled as supervisor

## **Project start**

Any time.

## **Physical location of project and students work**

In Foulum in the research group of Epidemiology and Management and at SEGES.

## **Short project description**

Mastitis is one of the main health problems in dairy herds. The yearly geometric bulk tank somatic cell count is used as a key measure to monitor over time the occurrence of mastitis within the individual herd and at the national level. Over the last decade the yearly geometric bulk tank somatic cell count has decreased from approximately 250,000 cells/ml to 200,000 cells/ml. A threshold of 200,000 cells/ml is outlined by IDF for a herd to have a good udder health and it is also where the farmer gets the highest milk price.

Modern large herds seem to have more problems with controlling infectious mastitis and to keep a low level of somatic cell count in the milk. On the contrary, it has been observed that a number of large herds manage to keep over years a persistent low geometric bulk tank somatic cell count at no more than 100,000 cells/ml. There is a need to do a systematic analysis of what is characterizing these production and management systems.

A master thesis could address 1) review of production and management systems responsible for a persistent low somatic cell count, 2) identify 15 herds with a a persistent low somatic cell count and a 15 herd control group, 3) retrieve and analyse relevant data from the Danish Cattle Database, 4) interview the 2 times 15 herds about their production and management systems, 5) summarizing the quantitative and qualitative herd data, and 6) write thesis.

## **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, 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 is 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

Email: [tine.rousing@anis.au.dk](mailto: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 (homepage: <http://www.anis.au.dk>)

Mogens A. Krogh, Post.Doc (epidemiology and management)

Email: [mogenskrogh@anis.au.dk](mailto: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

Whenever and 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](mailto: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](mailto: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.

# Economy in welfare improvements of dairy cows

## 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](mailto:Anneb.Kudahl@agrsci.dk)

Phone: + 45 8715 7935

## Project start:

Before September 2016.

## Physical location of project and students work

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

## Short project description

Background: Over the last decades there has been increasingly critical focus on animal welfare in livestock farming including dairy herds. It has led to new legislation on housing and management of cattle, which are being phased in. Therefore, there is an ongoing need for investments to obtain or maintain the desired animal welfare – both in housing facilities and in time and labor when management routines must be changed.

Aim: To estimate the expected welfare- and economic effects, costs and benefits related to implementation of welfare improvements including both changes in management and investments in housing and equipment. The most severe and dominant welfare problems will be pointed out in an on-going project, and the student can choose to focus on one of these problems, and maybe narrow the subject to focus on either costs or benefits of welfare-improvements.

## Additional information

Depending on no of ECTS the student can take part in data collection in Danish Dairy herds in September-October 2016 in addition to literature studies. If interviews are chosen as a method it is an advantage to speak Danish.

## **Pig health in organic slaughter pig herds**

### **Main subject area**

Animal Health and Welfare Organic Agriculture

### **Department and Supervisor**

Dept. Animal Science

Professor Jan Tind Sørensen

E-mail: jantind.sorensen@anis.au.dk

Phone: 2078 3343

### **Project start**

2016-17.

### **Physical location of project and students work**

Research centre Foulum in the research group of Epidemiology and Management.

### **Short project description**

Slaughter pigs in organic pig production is a true alternative to traditional pig production offering the pig access to an outdoor area, forage, straw bedding, and a low stocking density. However survey studies indicate that organic slaughter pigs have health problems such as parasites, tail biting and respiratory diseases. During 2016 and 2017 our research group is conducting studies in organic pig herds for identifying risk factors for health problems in organic slaughters pigs. There will be good opportunities to link a master thesis works to aspect of this work.

# **Calf health and welfare in organic dairy herds**

## **Main subject area**

Animal Health and Welfare Organic Agriculture

## **Department and Supervisor**

Dept. Animal Science

Professor Jan Tind Sørensen

E-mail: jantind.sorensen@anis.au.dk

Phone: 2078 3343

## **Project start**

2016-17.

## **Physical location of project and students work**

Research centre Foulum in the research group of Epidemiology and Management.

## **Short project description**

Calves in organic dairy herds are expected to have a high animal welfare is stimulated several rules for organic production such as longer time spent with dam, group housing, cow milk until 3 month of age and pasturing in summer. However, organic calves also face challenges such a relatively high morbidity and mortality. Our research group conduct a project focusing on preventing calf diarrhoea in six organic dairy herds. There will be several possibilities for linking a master thesis work to this project.

# **Cow health and welfare in organic dairy herds**

## **Main subject area**

Animal Health and Welfare Organic Agriculture

## **Department and Supervisor**

Dept. Animal Science

Professor Jan Tind Sørensen

E-mail: jantind.sorensen@anis.au.dk

Phone: 2078 3343

## **Project start**

2016-17.

## **Physical location of project and students work**

Research centre Foulum in the research group of Epidemiology and Management.

## **Short project description**

Dairy cows in organic dairy herds are on pasture during summer and is provided with 100 % organic feed including a high level of forage. An important aim in organic milk production is to obtain a high level of health and welfare. During 2016 and 17 our research group is coordinating an EU project focusing on improving health in organic dairy herds by management. This includes improved grazing management, and improved prevention of metabolic disease and improved udder health. Further effects on management strategies on productivity and economy are assessed. There will be good opportunities to link a master thesis works to aspect of this international research project.

# **Effect of physical treatment on fibre digestibility in ruminants**

## **Main subject area**

Animal Health and Welfare  
Ruminant nutrition

## **Department and Supervisor**

Senior researcher Martin Riis Weisbjerg  
Tel.: +45 8715 8046  
Email: Martin.Weisbjerg@anis.au.dk

## **Project start**

2016 or 2017.

## **Physical location of project and students work**

The student should be located at AU Foulum.

## **Short project description**

Fibre concentration and digestibility of the fibre is the most influencing quality parameters when evaluating forages value for ruminants. Effect of physical treatment on digestibility of fibre in forage is part of more running projects. In this project in situ (nylon bag) and laboratory methods (fibre analyses, in vitro digestibility, in vitro gas production) will be used to test effect of different forms of physical treatment on fibre (NDF) digestibility. Eventually animal studies (depending on thesis project period) might be part of the project.

## **Ruminant feed evaluation and nutrition**

### **Main subject area**

Animal Health and Welfare  
Ruminant nutrition

### **Department and Supervisor**

Senior researcher Martin Riis Weisbjerg  
Tel.: +45 8715 8046  
Email: [Martin.Weisbjerg@anis.au.dk](mailto:Martin.Weisbjerg@anis.au.dk)

### **Project start**

Any time.

### **Physical location of project and students work**

The student should preferably be located at AU Foulum, however exceptions are possible.

### **Short project description**

This is a generic proposal, open for any idea. We do have a large 'base' of experiments wherefrom we could get data, and we do have laboratory and animal facilities for new studies. So you are welcome with any idea, however ideas requesting major laboratory or animal resources will require connection to a financed project.

# **Heat treatment to manipulate rumen protein degradability in 'green protein'**

## **Main subject area**

Animal Health and Welfare  
Ruminant nutrition

## **Department and Supervisor**

Senior researcher Martin Riis Weisbjerg and Søren Krogh Jensen  
Tel.: +45 8715 8046  
Email: Martin.Weisbjerg@anis.au.dk

## **Project start**

2016 or 2017.

## **Physical location of project and students work**

The student should be located at AU Foulum.

## **Short project description**

Protein can be extracted from green forages. Use as protein supplement for single stomached animals has been the obvious choice for such protein, however if dried at right temperature the protein might get properties which could reduce protein degradability in the rumen, and thereby make it a potential source for supply to dairy cows with rumen escape protein.

This thesis project will work with protein pasta (protein precipitated from juice from forages). The pasta will be dried/heat treated in different ways and at different temperatures, and the effect on the protein value for ruminants will be examined using in situ (nylon bag), in vitro and other laboratory methods.

The thesis project will be connected to running research projects within protein extraction from green forages.

## **Turnover of synthetic vitamin E in weaned piglets or mink**

### **Main subject area**

Animal Health and Welfare  
Molecular nutrition

### **Department and Supervisor**

Senior researcher Søren Krogh Jensen  
Tel.: +45 8715 8076  
Email: SKJ@anis.au.dk

### **Project start**

2016 or 2017.

### **Physical location of project and students work**

The student should be located at AU Foulum.

### **Short project description**

$\alpha$ -Tocopherol (Vitamin E) is a very important antioxidant playing a critical role in the immune defence. A common characteristic for piglets and mink kits is a steep drop in their vitamin E status in the period after weaning despite of feeding high amounts. To certain extent this drop is caused by a low absorption of vitamin E in this period, but another explanation may be increased turnover of tocopherols in the body in this period. The project here will focus on quantitative measurements of tocopherols in feed, plasma and tissues of piglets or mink. The project will involve both practical short term animal experiments, advanced quantitative analytical measurements and calculations of tocopherol turnover.

# Effects of phytase on phosphorus digestibility in cereals

## **Main subject area**

Animal Health and Welfare

Animal nutrition and physiology

## **Department and Supervisor**

Professor Hanne Damgaard Poulsen, Animal Science, hdp@anis.au.dk, +45 87 15 78 95

## **Project start**

2016/2017

## **Physical location of project and students work**

Animal Science, AU Foulum

## **Short project description**

Phosphorus is first of all an essential nutrient to all living organisms, but at the same time, excess phosphorus may impose negative environmental impacts. Further, phosphorus is a limited global resource. Taken together, these aspects call for a more efficient and sustainable use of phosphorus in livestock production. One of the drawbacks is that the digestibility of phosphorus in cereals which is a main ingredient in e.g. pig feed. However, new tools like enzyme additions and feeding techniques have shown promising results.

The thesis project will include studies on how to improve the usability of phosphorus in cereals and will comprise literature review as well as experimental studies at lab scale or animal studies (depending on the running activities). Pigs will be the main target animal but the work will also be relevant to other species. The thesis work will be connected to running activities.

# Single cell as an alternative protein and amino acid source

## Main subject area

Animal Health and Welfare

Animal nutrition and physiology

## Department and Supervisor

Professor Hanne Damgaard Poulsen, Animal Science, hdp@anis.au.dk, +45 87 15 78 95

## Project start

2016/2017

## Physical location of project and students work

Animal Science, AU Foulum

## Short project description

The global demand for protein is high and single cell protein produced on the basis of methane constitutes an interesting alternative in animal nutrition. However, the production costs have so far have been too high. A new more cost efficient technique has been developed with focus on tailoring the amino acid profile of the produced single cell to make the product more valuable in pig production.

The thesis project will include studies on the characterisation of the nutritional value of single cell protein with regard to both wanted and unwanted substances like nucleotides based on literature review and experiments. The piglet will be the main target animal, and the thesis work will be connected to a running project.

# **Organic broiler production: effect of genotypes and feeding on foraging behaviour and use of outdoor area with willow and herbs**

## **Main subject area**

Animal Health and welfare

Organic broiler production, feeding strategies, animal behaviour and welfare

## **Department and Supervisor**

Department of Animal Science

Senior scientist Sanna Steinfeldt, e-mail: Sanna.Steenfeldt@anis.au.dk, phone: 8715 8074

## **Project start**

June/July 2016

## **Physical location of project and students work**

Department of Animal Science, Aarhus University, Foulum

The experiment will take place at the organic experimental Farm at AU Foulum

## **Short project description**

Background: The study is part of a larger project, which aims to contribute to growth in the organic broiler production through a re-evaluation of production systems. Integrated plant and organic broiler production (agro-forestry systems) is expected to improve animal welfare due to a more attractive outdoor area and thus a better distribution of more active broilers, with lower incidence of food pad dermatitis. Slow-growing genotypes have a lower protein requirement and are expected to find a part of their nutrients from feed items selected on the outdoor area, reducing protein input to the production and thus nitrogen excretion.

Content and methods: Diets with different protein levels are fed to two slow-growing genotypes (0-90 days of age: June-September) to study the effect on foraging behaviour, feed selection (plant material, seeds, insects, worms etc.) and distribution of broilers on the out-door area, where mobile houses are placed on 12 similar units with willows and different herbs. The broilers will be given access to the outdoor area from 2 weeks of age, and observations will be performed twice each week, by dividing each of the units in different sub-plots. Further, different welfare parameters as plumage quality, food pad dermatitis and walking ability will be assessed 2-3 times during the experiment. Analysis of crop content will be made on selected broilers at three different ages to estimate the prevalence of feed items selected on the outdoor area. Chemical analyses will be performed on different plant material from the out-door area to estimate the contribution of nutrients to the broilers.

## **Additional information**

You will be part of a team (technicians, researchers) working with the project that also include measurements of other variables as weight gain, feed intake and feed conversion, estimated nutrient intake (e.g. amino acids) and nutrient leaching. You will be mainly involved in the practical part of the experiment focussed on behavioural observations, welfare assessment and crop content analysis for your thesis in cooperation with your supervisor. An international publication with you as co-author could be a possibility.

# Protein from organic green crops for organic laying hens

## Main subject area

Animal Health and Welfare

Organic egg production, alternative protein sources, nutrient digestibility, welfare

## Department and Supervisor

Department of Animal Science

Senior scientist Sanna Steinfeldt, e-mail: Sanna.Steenfeldt@anis.au.dk, phone: 8715 8074

## Project start

August/September 2016

## Physical location of project and students work

Department of Animal Science, Aarhus University, Foulum

The study will take place in an experimental unit with floor pens and digestibility cages

## Short project description

Background: Supplying organic hens with appropriate amounts of protein and essential amino acids become problematic with the introduction of 100% organic feed from 2018 and alternative feeding strategies and protein sources is needed to optimise production, health and welfare.

Content and method: Protein extracted from organic green crops as red clover/grass has potential to substitute imported protein as soya beans in organic poultry diets. Preliminary analysis of a protein paste of red clover/grass from harvest 2015 has showed interesting high content of methionine and cysteine and could be considered as a valuable protein and amino acid source for organic poultry, grown locally, which is important for a sustainable production. The red clover/grass paste used in the present experiment will be harvested in July 2016, and analysed for nutrient composition for a more optimised feed formulation of diets. The experimental study will be performed with organic laying hens (20 to 32 weeks of age: August-November) in a floor pen system for measurement of production and welfare parameters. The hens will be fed increasing level of a dried red clover/grass paste (0 (control), 4, 6 and 8%) and at the end of the study, a digestibility trial will be performed on all diets in order to calculate nutrient digestibility of especially amino acids. The digestibility trial will involve a total quantitative collection of excreta over three consecutive days. The chemical analyses on diets and excreta will be performed by lab technicians, but you are welcome to participate if you are interested. In addition the following parameters will be recorded during the study: Feed intake (diets, silage), egg production (number of eggs, egg weight, kg feed / kg eggs) and quality of plumage and food pads.

## Additional information

You will be involved in the practical part of the experiment with organic hens together with the responsible technicians in the barn, collecting data for statistical and chemical analyses for your thesis in cooperation with your supervisor. An international publication with you as co-author could be a possibility.

# Adsorbing materials to reduce boar taint

## Main subject area

Animal Health and Welfare, animal science

## Department and Supervisor

Senior researcher Nuria Canibe ([Nuria.canibe@anis.au.dk](mailto:Nuria.canibe@anis.au.dk)), Immunology and Microbiology, Department of Animal Science, AU-Foulum

## Project start

September 2016

## Physical location of project and students work

AU-Foulum

## Short project description

Boar taint is an unpleasant odor or taste that is often noted in connection with the preparation or eating of pork or pork products from non-castrated male pigs. Boar taint in the meat is caused by two components, skatole and androstenone. In order to avoid boar taint, piglets are castrated in most countries without surgical anesthesia within 2 to 7 days of life. Surgical castration without anesthesia is painful, and there is today no a method that can completely relieve the pain and discomfort associated with castration of piglets. An EU declaration was signed in 2010, stating that surgical castration in the EU should be phased out by 1 January 2018.

Skatole is formed by microbial degradation of tryptophan in the caecum and colon. The skatole that is not metabolized in the liver but is deposited in adipose tissue. Feed strategies have a marked effect on the deposition of skatole in fat. Androstenone is formed mainly in the testes of sexually mature male pigs. The 'excess' androsterone in the blood is in equilibrium with the adipose tissue. Androstenone production increased in connection with sexual maturation and production cannot be reduced enough through feeding and management. New Canadian studies show that the feeding with adsorbents, i.e., activated carbon, can reduce the plasma androstenone. The reduction of androstenone in the Canadian study was significant. The strategy may therefore have potential as an alternative to castration. This project consists of the following parts:

- Establish whether activated carbon reduces androstenone in Danish pigs.
- Establish whether androstenone recirculates.
- Establish the half-life of androstenone in adipose tissue in pigs.
- Develop and validate an in vitro method for testing different materials.

## Additional information

The MSc project will be a part of the larger project described above.

# Enhancing gastrointestinal robustness to prevent major pig and poultry production diseases

## Main subject area

Animal Health and Welfare, animal science, intestinal microbiology

## Department and Supervisor

Senior researcher Ole Højberg (ole.hojberg@anis.au.dk), senior researcher Nuria Canibe, associate professor Ricarda Engberg, section manager Charlotte Lauridsen, Immunology and Microbiology, Department of Animal Science, AU

## Project start

September 2016

## Physical location of project and students work

AU-Foulum

## Short project description

It is pivotal for livestock production globally to be able to rear robust animals with minimum use of antibiotics or zinc and copper, and to identify alternative strategies for suppressing infectious diseases like *E. coli* diarrhoea in piglets and *Clostridium perfringens*-mediated necrotic enteritis in chickens as well as the spread of zoonoses like *Salmonella* to humans. Gastric ulcers are common in Danish pigs; although there is no clear evidence of pathogen involvement, there is an overlap in strategies for preventing ulceration and infectious gastrointestinal (GI) diseases, and enhancing GI robustness.

Strategies include use of fermented feed, coarse-structured feed and organic acids. Lactic acid bacteria (LAB) produce organic acids in fermented feed prior to ingestion, and coarse-structured feed supports LAB growth the pig stomach or stimulates HCl secretion in the poultry gizzard; the pH of the upper GI tract is thus decreased and the barrier function enhanced, killing e.g. *Salmonella* and *E. coli* before entering the small intestine. Use of coarse structured feed also prevents gastric ulceration, probably because firm stomach digesta suppresses mobility of hazardous components (like HCl) in the stomach content. In poultry, LAB dominate the upper GI tract microbiota; though mostly beneficial, LAB also compete with the host for nutrients and some degrade bile salts, thereby compromising lipid digestion and bird performance. Ionophore coccidiostats, used to prevent the parasite disease coccidiosis in chickens, also inhibits bacteria like LAB and *C. perfringens*. Likewise, zinc oxide, used in to prevent piglet post-weaning diarrhoea, suppresses not only pathogens but also LAB; reducing LAB in the proximal GI tract may explain the growth promoting effects of these additives and is important to bear in mind when searching for alternative strategies to their use.

The aim of our research group is to investigate and develop strategies for optimizing GI robustness to prevent major GI diseases in pigs and poultry, enhancing animal welfare and reducing the use of antibiotics or zinc and copper.

## Additional information

This is a generic project description, describing parts of the ongoing work in the research group of Immunology and Microbiology. If you find the area interesting, please do not hesitate to contact any of us for further details on topics that could form the basis for a specific MSc project.

# Effect of Roundup (glyphosate) on the rumen microbiota of dairy cows

## Main subject area

Animal Health and Welfare, Animal science, Intestinal microbiology

## Department and Supervisor

Senior researcher Ole Højberg (ole.hojberg@anis.au.dk) & senior researcher Martin Tang Sørensen (martint.sorensen@anis.au.dk), Department of Animal Science, AU-Foulum

## Project start

September 2016

## Physical location of project and students work

AU-Foulum

## Short project description

There is increasing concern that feed residues of Roundup, the globally most widely used pesticide type, may affect the gut microbiota of farm animals and thereby compromise their health and performance. The broad-spectrum, nonselective, systemic Roundup-like herbicides are typically composed of the isopropylamine (IPA) salt of glyphosate (the active compound), dissolved in water and added a surfactant, like polyethoxylated tallowamine (POEA).

The working mechanism of glyphosate is that it inhibits the activity of the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) in the so-called shikimate-pathway; a biochemical pathway leading to formation of aromatic amino acids. As the shikimate-pathway is found in plants, fungi and bacteria, but not in animals, glyphosate has been marketed as being non-toxic to animals. However, potential effects of glyphosate, as well as the used surfactants, on the gut microbiota may indirectly affect health and performance of farm animals that are fed diets, containing glyphosate residues. It has thus been indicated by recent studies that glyphosate has an inhibitory effect on commensal (non-pathogenic) bacteria, normally occupying the gut of farm animals, whereas potential pathogens, in general, seem to be more tolerant. The glyphosate sensitivity of different commensal bacteria is moreover highly variable, which may cause perturbations in composition and activity of the normal gut microbiota, if exposed to glyphosate.

The MSc project will focus on investigating the effects of glyphosate on the rumen microbiota of dairy cows, applying an already established *in vitro* technique, where rumen content obtained from fistulated cows is incubated in laboratory fermenters and exposed to, in this case, different concentrations of glyphosate; in this way it is possible to investigate changes in composition and activity of the rumen microbiota under highly controlled *in vitro* conditions, simulating the *in vivo* conditions of the rumen.

## 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.

# **Multicomponent antibacterial feed additive for weaning piglets against intestinal diseases**

## **Main subject area**

Animal Health and Welfare, Animal science, Intestinal microbiology, Alternatives to antibiotics

## **Department and Supervisor**

Senior researcher Ole Højberg (ole.hojberg@anis.au.dk) & senior researcher Nuria Canibe  
Immunology and Microbiology, Department of Animal Science, AU-Foulum

## **Project start**

September 2016

## **Physical location of project and students work**

AU-Foulum

## **Short project description**

Intestinal diseases in pigs are a serious ethical and economical challenge in organic pig production, leading to compromised animal welfare and performance as well as high mortality. Natural organic solutions for increasing animal robustness against gastrointestinal diseases and reduce the need for antibiotics, zinc or copper in feed are needed to improve environmental and economic sustainability of organic pig production and reduce risk of developing antibiotic resistant bacteria. In two previous projects, REPLACE and BERRYMEAT, a range of plants with antibacterial properties were identified. The concentration of antibacterial compounds of individual plants is however often too low to reduce bacterial growth *in vivo* and sensory acceptance by pigs can be a challenge.

The present project aims at combining several plant species, shortlisted in the previous projects, into multicomponent antibacterial cocktails displaying strong additive antibacterial effect against gut pathogens with no or minimal effect against beneficial commensal gut bacteria and with a sensory profile acceptable for pigs. The identified plant products will be tested *in vitro* in laboratory assays using gastrointestinal models to identify the best mixture for future *in vivo* trials. The new cocktail concept will provide a future tool for improving and maintaining gut health in organic pigs, reduce the need for antibiotics, zinc and copper and reduce the risk of developing antibiotic resistant bacteria.

## **Additional information**

The MSc project will be a sub-part of the larger project described above and will be applying an already established *in vitro* assay technique for testing the antibacterial effects of selected plant material against bacteria like *E. coli* and *Clostridium perfringens*. There will therefore also be other scientists and technicians involved, who can support the MSc student theoretically and practically.

# 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

September 2016 (or before)

## 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

September 2016 (or before)

## Physical location of project and students work

AU-Foulum

## Short project description

Diarrhoea is also 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.

# **Effect of physical treatment on the ability of green forages to compact**

## **Main subject area**

Animal Science, cattle nutrition and physiology

## **Department and supervisor**

Main supervisor: Senior Scientist Martin Weisbjerg, martin.weisbjerg@anis.au.dk

Senior Scientist Troels Kristensen, troels.kristensen@agro.au.dk

Scientist Jesper Overgaard Lehmann, JesperO.Lehmann@agro.au.dk

## **Project start**

Preferably spring 2017 (the project is dependent on access to green forages)

## **Physical location of project and student work**

Department of Animal Science and Department of Agroecology, AU Foulum

## **Short project description**

This M.Sc. thesis project will focus on methods for assessing the degree of physical treatment of forage during harvest and the effect on silage density and quality. Physical treatment of green forages at harvest might affect fiber digestibility, ability to ensile, and the ability of the forage to compact. However, to develop equipment for physical treatment, it is important that the degree of physical treatment can be measured.

The methods to be assessed will be a measure of compaction using volume after vacuum packing in plastic bags as parameter. Further, measure of conductivity will possibly be used as second measure (has earlier been used but with little success). The compaction/vacuum bag method has to our knowledge not been used earlier for this purpose. The material to be used will be different green forages, which after harvest will be physically treated at different degrees before the tests. Green forages could include different forages harvested at different growths and at different maturities in combination with different prewilting time (DM content).

The literature part of the thesis could, apart from the above methods, be a review of the effect of physical treatment (maceration, chopping) on the silage quality.

## **Additional Information**

This project will be part of the GUDP project BEGROME in cooperation with Kverneland.