ANIMAL SCIENCE

Master Thesis Projects

Topics for Master Thesis Projects available in 2014-2015

Department of Animal Science

Aarhus University

Jakob Sehested
Associate Professor
Degree programme director for Agrobiology (MSc)
Degree programme director for Sustainable Animal Nutrition and Feeding (MSc)
Email: Jakob.Sehested@agrsci.dk
Tel: +45 8715 7893
Preface
This catalogue of master thesis projects available in 2014-2015 at the Department of Animal Science, Aarhus University, is considered to inspire and help you selecting a topic for your master thesis project. The catalogue is intended for students of the Master’s Degree Programmes in Agrobiology, Sustainable Animal Nutrition and Feeding (EM-SANF), Organic Agriculture and Food Systems (EUR-Organic), Biology and for other animal science related master degree students who would like to do their master thesis project at Aarhus University. Read more about Agrobiology and the other animal science related Master Degree programmes at http://kandidat.au.dk/en/agrobiology/

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

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

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

If you are an international student looking for exchange possibilities at Aarhus University you will find more information at http://www.au.dk/en/exchange/welcome/ and http://www.au.dk/en/internationalcentre/students/
Thesis types offered for students at the MSc Agrobiology programme

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

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

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

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Biosecurity: Infection routes and logistics in herds

Main subject area
Animal Health and Welfare / Management / Dairy/Sows/Slaughter pigs

Department and Supervisor
Department of Animal Science (http://Anis.au.dk)
Anne Braad Kudahl, MSc, PhD, Senior Advisor
E-mail: Anneb.Kudahl@agrsci.dk
Phone: + 45 8715 7935

Project start
Any time

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

Short project description
Background: Infections spread between and within herds via contact between infected animals and infectious material on vectors like humans, tools and machinery. In real herds many infection routes are overlooked but could be closed by changing management or moving things or animals.
Content: With focus on one infection (students own choice) the pathogen is described (literature study), infection routes are identified and described in real herds and options for management changes to close infection routes discussed

Additional information
The student collects data in Danish Dairy herds. If interviews are chosen as a method it is an advantage to speak Danish. Drivers licence necessary.
ECTS 45-60 points
Biosecurity in large dairy herds

Main subject area
Animal Health and Welfare / Management / Dairy

Department and Supervisor
Department of Animal Science (http://Anis.au.dk)
Anne Braad Kudahl, MSc, PhD, Senior Advisor
E-mail: Anneb.Kudahl@agrsci.dk
Phone: + 45 8715 7935

Project start
Any time

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

Short project description
Background: Biosecurity is becoming more and more important in dairy herds. With increasing herd size follows increased difficulties in controlling infectious diseases in the herd and increased risk of introducing new diseases with purchased animals.
Aim: To describe and analyse the relationship between management, infections routes, and infection status of large dairy herds. Focus can be on one of several infections.

Additional information
The student collects data in Danish Dairy herds. If interviews are chosen as a method it is an advantage to speak Danish. Drivers licence necessary.
ECTS 45-60 points
Prolonged weaning age combined with induction of lactational oestrus in organic piglet production

Main subject area
Organic agriculture/ Animal (re)production, health and welfare

Key words: Organic pig production, free-range piglet production, reproduction performance, health and welfare of sow and weaners, overall herd productivity and efficiency

Main supervisor
Scientist Anne Grete, anneg.kongsted@agrsci.dk, phone +45 87157993

Physical location of the project
Department of Agroecology, Foulum

Project start
Any time from ultimo 2014 to ultimo 2015

Physical location of project
AU-Foulum, data collection on private farms

Additional information
The thesis will be based on a literature review combined with experimental work at one or two private farms. The master will be linked to the project ‘pEcosystem – Pig production in eco-efficient organic systems’ led by Dept. Agroecology (AU) in cooperation with Center of Development for outdoor livestock production, Knowledge Centre for Agriculture, Danish Pig Research Centre and Organic Denmark.

Useful reading
Kongsted, AG & Hermansen, JE 2009: Induction of lactational estrus in organic piglet production, Theriogenology, vol 72, nr. 9, s. 1188-1194

Short project description
The current production strategies in organic piglet production are in many ways supporting pig health and welfare. However, the weaning of piglets at seven weeks and the subsequent transfer from free-range to stables is often associated with health problems, and especially weaning diarrhea is a huge challenge in many herds. Diarrhea is treated with antibiotics and prevented by adding zink to the feed, which is problematic in relation to antibiotic resistance and the environment. Experiences from practice indicate that it is possible to reduce weaning diarrhea by increasing the weaning age of the piglets from the required seven weeks to 10-12 weeks. In current pig production, conventional as well as organic, the number of litters per sows per year is limited by the lactation length because pregnancy is established after weaning. The division of pregnancy and lactation into two distinct phases is, however, not the only option in pig production. By inducing ovulation and establishing pregnancy during lactation it is possible to extend lactation without reducing produced litters per year. It is hypothesized that in organic piglet production, it is possible to induce and synchronize lactational ovulation in the majority of sows and thereby improve overall productivity and efficiency. The prolonged weaning age is expected to improve growth, health- and welfare of the weaned piglets. A comparative study will be carried out on an organic farm.
Combined free-range piglet and energy crop production

Main subject area
Organic agriculture/Agroecology/Animal health and welfare

Key words: Organic pig production, free-range piglet production, sow and litter performance, animal welfare, animal behavior, potential nutrient leaching

Main supervisor
Scientist Anne Grete, anneg.kongsted@agrsci.dk, phone +45 87157993, co-supervisor: Senior scientist Tine Rousing, phone +45 87157915

Physical location of the project
Department of Agroecology and Department of Animal Science, Foulum

Project start
Any time from ultimo 2014 to ultimo 2015

Additional information
The thesis will be based on a literature review combined with experimental work at one or two private farms. The master will be linked to the project ‘pEcosystem – Pig production in eco-efficient organic systems’ led by Dept. Agroecology (AU) in cooperation with Center of Development for outdoor livestock production, Knowledge Centre for Agriculture, Danish Pig Research Centre and Organic Denmark.

Useful reading

Short project description
Organic free-range piglet production of today has some disadvantages in terms of nutrient hotspots and poor possibilities for the sows to perform behavioural temperature regulation. Combining perennial energy crop and piglet production might compose a new concept for free-range production with low nitrate leaching and high standards for animal welfare. Results from a previous study indicate that it is possible to combine a production of growing-finishing pigs with a production of energy crops in favor of animal welfare and environment. It is however unknown whether energy crops are suitable for farrowing and lactating sows also. We do e.g. not know how farrowing and lactating sows will use an area of combined energy crops and pasture, e.g. whether the sows will prefer to farrow in the zones with energy crops instead of in the farrowing huts and whether the sows will deposit their faeces and urine in the zones with perennial energy crops which from an environmental point of view would be beneficial. Finally, it is unknown to what degree sows and piglets will destroy well-established energy crops due to their rooting behaviour.
Metabolomics characterisation of sow’s milk during lactation

Main subject area
Animal Health and Welfare / Animal Science / Sow lactation

Department and Supervisor
Department of Animal Science
Mette Skou Hedemann, Senior scientist
E-mail: Mette.Hedemann@agrsci.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
The composition of sow’s milk undergoes large alterations during the lactation period. It is well known that the fat-to-protein ratio changes and that the amount of immunoglobins is decreasing. Milk contains a large amount of low molecular weight metabolites as well but knowledge on how these metabolites are changing during lactation is lacking.
Metabolomics is the detection of low molecular weight metabolites and their intermediates from biofluids or tissues. Studies in cow’s milk have shown that metabolic profiling is a promising tool to find low molecular weight metabolites and demonstrate how their concentration is altered during the course of lactation.
The aim of the present project will be to develop a method for liquid chromatography-mass spectrometry (LC-MS) analysis of sow’s milk and to use this method to investigate changes in the composition of small metabolites in sow’s milk during lactation (e.g. on the day of farrowing, two days after farrowing and two weeks after farrowing).

Additional information
The master’s student should be interested in laboratory work.
We have samples for the study at hand but it will be possible to participate in animal experiments (August 2014) if the student is interested.
What do wild boars use their tail for?

Main subject area
Ethology

Department and Supervisor
Senior Scientist Karen Thodberg, Karen.thodberg@agrsci.dk
87157938

Project start
Any time

Physical location of project and students work
The practical part will be situated in nature parks or farms, where we have access to wild boars.

Short project description
In Danish pig production almost all pigs have most of their tail removed. Besides from the pain inflicted on the pigs by removing the tail, we don’t really know how the missing tail affects their behaviour. We don’t know how pigs use their tail and for what. Is the tail used in intra specific communication, or only to wipe away flies. By making observations of the undisturbed behaviour of wild boars with intact tails we will get more insight.

Additional information
At least one ethology course is mandatory
Are sows suited for transport?

Main subject area
Animal Health and Welfare

Department and Supervisor
Dept. Animal Science, Research Group for Animal Behaviour and Stress Biology
Mette S. Herskin
MetteS.Herskin@agrsci.dk; 50502969

Project start
During 2014 or 2015

Physical location of project and students work
Research Centre Foulum, data collection in private farms

Short project description
Danish sows are slaughtered after finishing the production period. This project aims to gain new knowledge about the suitability of transport for sows – can they cope with the demands put on them during transport and lairage – and how can we check this before deciding to transport them?

Additional information
The project is part of a large on-going research project, and involved ethological as well as clinical data
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, PeterT.Thomsen@agrsci.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. We offer the possibility to do a thesis focusing on lameness/hoof disorders. We 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 the student. Examples could be: 1) evaluation of herd level risk factors for lameness/hoof disorders in Danish dairy herds based on information from a combination of herd visits 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 (a specific) hoof disorder.
Master projects in chicken host-pathogen interactions

- Disease protection
- Host-pathogen interactions
- Work with experimental animals
- Basic science and hands-on laboratory work

In the Chicken Immunology Group in Section for Immunology and Microbiology at Department of Animal Science, we conduct research that is focused on understanding the biology of host-pathogen interaction at the molecular and cellular level using viruses, bacteria, and parasites as models. The work is targeted on the animal’s genetic potential to prevent infectious diseases and the use of this information in disease control e.g. by design of better vaccines. The major research interests include the identification and functional understanding of genes involved in innate and adaptive immune responses in chickens with the aim of identifying selection markers for production of healthier and more robust animals. Furthermore, we conduct research in vaccine-induced immunity with the aim of identifying new adjuvants and determine correlates of protection. In our work, is also included development of new and better methods for assessment of both humoral and cell mediated adaptive immunity in the chicken. The group works mainly with chickens but when funding is available we also have activities on swine.

We are a group of scientists, post-docs, PhD-students and technicians that will be happy to include you in our group. Dependent on the current grants our research change from time to time but most projects can provide spin-off activities suitable for a master project. Usually, the project content can be adjusted to fit your ECTS requirements. So, if you are interested please do not hesitate to contact us also if you have own ideas.

Examples of master projects for 2014

- Assessment of natural antibodies and specific antibodies in serum after an Infectious Bronchitis virus vaccination.
- Detailed characterization of avian macrophages by functional studies of phagocytosis and cytokine production.
- Molecular cloning and characterization of the chicken ficolin gene and search for polymorphism between different chicken breeds.
- Purification of chicken mannose-binding lectin (MBL) and functional characterization of the protein.
- Purification of porcine mannose-binding lectins (MBL-A or MBL-C) and functional characterization of the protein.
- Assessment and comparison of natural immunity in three organic chicken breeds.
- Characterization of vaccine-induced cell mediated immunity in chickens selectively bred for high or low serum concentration of the innate MBL protein.
- Transcription activity of the MBL gene in chickens

Contact
Senior Scientist Helle R. Juul-Madsen, 87 15 78 37, Helle.JuulMadsen@agrsci.dk or Project Scientist Tina S. Dalgaard 87 15 80 52, Tina.Dalgaard@agrsci.dk.
Binding studies of chicken Mannose-Binding Lectin to different pathogens

Main subject area
Animal Health and Welfare / Chicken immunology / Binding assays/in vitro studies

Department and Supervisor
Department of Animal Science
Senior Scientist Helle Juul-Madsen
E-mail Helle.JuulMadsen@agrsci.dk
Telephone 87 15 78 37

Project start
Project start and ECTS content flexible

Physical location of project and students work
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 using chickens selected for high or low serum MBL concentration have shown that low amount of circulating MBL is associated with increased disease severity after infection. These results confirm that chicken MBL, as proven in mammals, plays a major role in disease resistance. In humans, it has already been demonstrated that MBL is able to bind to a whole range of different pathogens from bacteria to viruses. However, this has only been demonstrated for a very few pathogens in chickens Thus, we would like to know more about which pathogens chicken MBL is able to bind to and use this knowledge in relation to our experimental disease models.

Aims: To determine which pathogens chicken MBL is able to bind to.

Research plan: The student will grow different pathogen cultures and test for MBL-binding by use of either flow cytometry or ELISA. This study can be expanded by analysis of complement activation if time allows for it.

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 bacterial cultures, virus cultures, flow cytometry, and ELISA.
Functional characterization of chicken CD4+CD8+ double positive cells

Main subject area
Animal Science/ Chicken immunology / Cell culture/ Flow cytometry

Department and Supervisor
Department of Animal Science
Tina Dalggaard MSc, PhD
E-mail: tina.dalgaard@agrsci.dk
Phone: +45 87 15 80 52

Project start
Project start and ECTS content flexible

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

Short project description
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.
Transcription activity of the mannose-binding lectin in chickens

Main subject area
Animal Health and Welfare / Chicken immunology / Cell cultures / gene transcription

Department and Supervisor
Department of Animal Science
Rikke Munkholm Kjærup MSc, PhD
E-mail: RikkeM.Kjaerup@agrsci.dk
Telephone 87 15 42 64

Project start
Project start and ECTS content flexible

Physical location of project and students work
Department of Animal Science, AU-Campus 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 using chickens selected for high or low serum concentration of MBL have shown that a low amount of circulating MBL is associated with increased disease severity after infection. These results confirm that MBL, as proven in mammals, plays a major role in disease resistance in chickens. Research in our lab has also revealed several Single Nucleotide Polymorphisms (SNPs) in the MBL promoter region which correlates with different MBL serum levels.

Aims: To determine important areas of the MBL gene involved in altered transcription activity in different haplotypes.

Research plan: The student will first sequence different parts of the cMBL gene from chickens with different MBL serum concentrations. This work includes PCR and cloning. The student will then grow the chicken liver cell line LMH and transfect it with the constructs made during the sequencing work. This will be tested for MBL transcription activity using a luciferase assay. If there is time multiple cell lines will be tested.

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 cell cultures, PCR, molecular cloning and transcription analysis.
Validation of an ELISPOT assay for detection of avian interferon gamma

Main subject area
Animal Health and Welfare / Chicken immunology / Cell culture

Department and Supervisor
Department of Animal Science
Tina Dalgaard MSc, PhD
E-mail: tina.dalgaard@agrsci.dk
Telephone 87 15 80 52

Project start
Project start and ECTS content flexible

Physical location of project and students work
Department of Animal Science, AU-Foulum, 8803 Tjele

Short project description
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.
Assessment of local innate immune responses in chickens subjected to experimental infection by use of quantitative RT-PCR

Main subject area
Animal Health and Welfare / Chicken immunology / local immunological tissues / qPCR

Department and Supervisor
Department of Animal Science
Rikke Munkholm Kjærup MSc, PhD
E-mail: RikkeM.Kjaerup@agrsci.dk
Telephone +45 87 15 42 64

Project start
Project start and ECTS content flexible

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

Short project description
Background: The innate immune response serves as early defence against the invasion of pathogens. Some molecules belonging to the innate immune response serve directly as initiators of destruction of the pathogen while others serve as facilitators of phagocytosis by macrophages or dendritic cells. A third group of molecules serve as receptors triggering the onset of an inflammation.

At our department we have established a wide range of infection models in chickens. By now the knowledge of the adaptive immunological reactions in chickens towards these infections is widely elaborated, while there is still a need for further investigation of innate immune reactions in the disease models.

Aim: To use the quantitative RT-PCR method for determination of the expression of a variety of innately related immunological genes in local tissues after an infection.

Methods: Generally the student will use purified RNA from earlier infection experiments for the gene expression studies. The studies will be performed by the qPCR method using relevant primers and probes.

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 Reverse Transcription quantitative Real-Time-PCR, but other relevant techniques like cell culture, RNA purification, flow cytometry and ELISA may be included in the project.
Do chicken macrophages produce Mannose-Binding Lectin?

Main subject area
Animal Health and Welfare / Chicken immunology / Cell cultures

Department and Supervisor
Department of Animal Science
Senior Scientist Helle Juul-Madsen
E-mail  Helle.JuulMadsen@agrsci.dk
Telephone 87 15 78 37

Project start
Project start and ECTS content flexible

Physical location of project and students work
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 using chickens selected for a high or a low serum concentration of MBL have shown that a low amount of circulating MBL is associated with increased disease severity after infection. These results confirm that chicken MBL, as proven in mammals, plays a major role in disease resistance. In relation to intestinal disease models we would like to know if functional MBL can be released by chicken macrophages so deposition of MBL can be performed directly during intestinal infection. In humans, it has been demonstrated that a macrophage cell line is capable of transcribing the human MBL gene in response to LPS stimulation.

Aims: To determine if chicken macrophages are capable of transcribing the MBL in order to release functional MBL in response to stimulation with LPS and/or other surface components from bacteria.

Research plan: The student will first grow the cell line HD11 and stimulate it with different surface components from bacteria or whole bacteria. The cells will be analyzed for the transcription of the MBL gene by qPCR and the supernatant will be analyzed for the presence of the MBL protein by ELISA. If the cell line produces MBL, the study will be expanded to include ex vivo stimulation of white blood cells from chickens.

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 cell cultures, stimulation assays, ELISA, and qPCR.
Gastric ulcers in pigs (1)

Main subject area
Animal Science/Animal nutrition/Gastrointestinal health

Department and Supervisor
Department of Animal Science (homepage: http://agrsci.au.dk)
Charlotte Lauridsen, head of research unit
Email: charlotte.lauridsen@agrsci.dk
Phone: +45 8715 8019

Project start
As soon as possible

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

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

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

1) the potential risk factors for the development of gastric ulcer in swine,

2) to describe potential biomarkers for the development of these health changes,

3) to describe potential feeding strategies to overcome the problem, and, this part of the M.Sc. project could involve a pig experiment to be conducted in collaboration with PhD students/senior scientists.
Potential use of Cannabis in the Danish swine production

Main subject area
Animal Science/Animal nutrition/Gastrointestinal health

Department and Supervisor
Department of Animal Science (homepage: http://agrsci.au.dk)
Charlotte Lauridsen, head of research unit
Email: charlotte.lauridsen@agrsci.dk
Phone: +45 8715 8019

Project start
2014/2015

Physical location of the project and students work
Department of Animal Science, AU Foulum, DK-8830 Tjele
Experimental thesis based on pig experiment and laboratory analyses

Short project description
Cannabis contains bioactive substances, which may be of high relevance as a feed component in animal production, especially pigs and broilers. The leaf and seed part of the plant contains protein, carbohydrate and fatty acids of high nutritional value. Some of the challenges in the Danish pig production are the high piglet mortality and diseases such as diarrhea and gastric ulcer. In addition, the search for cheaper and/or alternative feed sources in the pig- and broiler production makes cannabis of special interest given the high biological value of the protein. 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 the cannabis (and cannabinoid substances)

2) Assist in the perform a feeding experiment with piglets and laboratory analysis with major focus on the gastrointestinal health and liveability of piglets

3) Describe potential use of cannabis in practical swine (and broiler) production.
**Gastric ulcers in pigs (2)**

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

**Department and Supervisor**
Department of Animal Science (homepage: http://agrsci.au.dk)
Karin Hjelholt Jensen, Senior scientist
Email: karinh.jensen@agrsci.dk
Phone: +45 8715 7954

**Project start**
As soon as possible

**Physical location of the project and students work**
Department of Animal Science, AU Foulum, DK-8830 Tjele
Experimental thesis based on laboratory analyses on existing stomach biopsies and data analysis.

**Short project description**
Ulceration of the nonglandular esophageal region of the porcine stomach is a major problem for the swine industry in general. Stomach ulcers can lead to reduced daily growth of slaughter pigs and ultimately lead to increased mortality. Older research has focused on processing of feed as being one of the most predominant etiological factors, however, environmental changes, transportation, lack of access to straw, and crowding, all commonly experienced by pigs in modern production systems, are potentially stressful events or conditions that are associated with increased occurrence of pars esophageal ulcerations. The aim of this thesis is to study the inflammatory state in different regions of the stomach in relation to the absence or presence of ulcer and to the intragastric milieu. The laboratory work includes purification of RNA for gene expression studies by the qPCR method using relevant primers and probes.

**Additional information**
The master student should have a strong interest in laboratory work. The student will primarily be trained in purification of RNA and RT-qPRC, but other relevant techniques may be included in the project.
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@agrsci.dk; 87157901 and she will connect you with a relevant researcher, or you may contact the researcher directly.

Project start
Spring 2014 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)

- Heidi Andersen (HeidiMai-Lis.Andersen@agrsci.dk) : pig housing, pig production, pig behaviour
- Janne W. Christensen (JanneWinther.Christensen@agrsci.dk): horses, social behaviour, learning and training, fear reactions and habituation
- Steffen W. Hansen (SteffenW.Hansen@agrsci.dk): mink, weaning, environmental enrichment, stereotypy, group housing
- Mette Herskin (MetteS.Herskin@agrsci.dk): pigs, cattle, animal pain, sickness behavior, animal transportation, shoulder ulcers, tail docking, animal models
- Margit Bak Jensen (MargitBak.Jensen@agrsci.dk): calf housing, calf feeding, dairy cows, rooting materials
- Lene Juul Pedersen (Lene.JuulPedersen@agrsci.dk): piglet mortality, loose housing, sow production, farrowing
- Jens Malmkvist (Jens Malmkvist@agrsci.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@agrsci.dk): animal welfare, cattle, timebudgets, automatic recording of behaviour, behavioural needs, housing and management of cattle
- Anja Brink Riber (Anja.Riber@agrsci.dk): poultry housing and behaviour
- Karen Thodberg (Karen.Thodberg@agrsci.dk): dogs, pigs, companion animals, tail biting, tail docking, therapy animals, human-animal interactions
Danish grown protein sources for organic laying hens

Main subject area
Animal Nutrition
Organic egg production, organic grown protein, feeding strategies, animal welfare

Department and Supervisor
Department of Animal Science,
Senior scientist Sanna Steenfeldt, e-mail: Sanna.Steenfeldt@agrsci.dk, phone: 8715 8074

Project start
April-October 2014

Physical location of project and students work
Aarhus University-Foulum, Blichers Allé 20, DK-8830 Tjele
The experiment will take place at the organic experimental Farm at AU-Foulum

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 2015 and alternative feeding strategies is needed to optimise production, health and welfare. Aim: introducing alternative protein sources for organic poultry, representing a high quality and at the same time guaranteed GMO free. The focus is on legumes that can be grown in Danish, climatic conditions and since legumes are self-sufficient in nitrogen, they are extremely valuable in organic production. In the present study with laying hens, horse beans will be used as alternative protein source, since only few studies have examined the value of local grown horse bean in layer diets. Horse beans will be included in compound feed for organic hens, either as untreated, fermented or bioprocessed. It is assumed that the processing has an effect on the chemical composition of the raw material (the horse bean seeds) and thus nutritional value.
Methods: Experimental studies will be performed with organic laying hens (20 to 45 weeks of age) on an outdoor area with small poultry houses placed in similar units fed with four experimental diets. The hens will also be given maize silage, since access to foraging material is mandatory in organic poultry production. The following parameters will be recorded during the study: Feed intake (diets, silage), Egg production (number of eggs, egg weight, kg feed / kg eggs), Egg quality (three times during the experiment: shell strength, yolk color), Quality of plumage and food pads (welfare aspects).

Additional information
The student will be involved in the practical part of the experiment with organic hens, collecting data for analyses. The different parameters will be recorded on a regular basis (1-3 times per week), so the student can participate either throughout the experiment if possible or during a part of the experimental period (in agreement with the supervisor).
Impact of feeding during transition on performance of lactating sows

Main subject area
Nutrition and physiology of sows. Improve feed and feeding strategies for reproductive sows with the overall aim of reducing piglet mortality and improving sow and piglet productivity.

Main supervisor
Peter K. Theil (Peter.Theil@agrsci.dk; 8715 7803)

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

Project start
Any time

Extent and type of project
30 ECTS: Theoretical thesis based on literature studies and/or analyses of issued data sets.
45 ECTS: Experimental theses in which the student is responsible for collection and analysis of his/her own original data.
60 ECTS: Experimental theses in which the student is responsible for planning, trial design and collection and analysis of his/her own original data.

Short project description
Background: Previous science with nutrition of lactating sows has focused on intake and nutrient requirement at peak lactation. Recent science has documented that the transition period is more important for the sows performance than is the period at peak lactation. Feed and feeding of the sow in the transition period is important for several reasons. Firstly, sows are exposed to a dietary shift in late gestation. Secondly, the intermediary metabolism of sows changes from an anabolic to a catabolic state, and thirdly, nutrient allocation is prioritized between foetal growth, udder growth and colostrum production on late gestation while it becomes redirected towards copious milk production after farrowing. A deeper insight into the nutrient metabolism and development of a new feeding strategy is necessary to improve the performance of the sows.

Aim: Improve the performance of lactating sows to reduce the piglet mortality

Methods: Feeding strategy or feed composition or both around parturition may be altered and the impact on the performance of the sow (yield of colostrum and milk) and the performance of piglets (intake of colostrum and milk and their survival) will be measured.

Other possibilities could be focus on development of the sow mammary gland or nutrient requirements of suckling piglet from birth until weaning.

Additional information
You are most welcome to contact me in order to discuss possibilities within the area of sow lactation. You are also welcome to visit my homepage
http://pure.au.dk/portal/da/peter.theil@agrsci.dk
Pig nutrition and physiology in relation to reduce the environmental load and improve production and health by feeding - topic of research

Main subject area
Animal Health and Welfare, pig nutrition and physiology

Department and Supervisor
Department of Animal Science, Foulum.
Assoc. professor Jan Værum Nørgaard, jan.noergaard@agrsci.dk
Prof. Hanne Damgaard Poulsen, HanneDamgaard.Poulsen@agrsci.dk
Post. Doc. Karoline Blaabjerg, Karoline.Blaabjerg@agrsci.dk

Project start

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

Short project description
The aim of my research and the research going on at the section of Animal Nutrition and Environmental Impact is to optimize feeding to reduce the excretion of nutrients and to improve animal production and health. We have several ongoing projects, which may be of interest for you as a part of your thesis, or there might be planned projects in the near future, where your contribution would be valuable. Don’t hesitate to ask if there is a possibility for you to write your thesis at Aarhus University, Foulum, within pig nutrition and physiology.

Additional information
30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcoming scientific paper.
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, head of research unit
Email: mogens.vestergaard@agrsci.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. A recent experiment showed improved performance of crossbreds in an intensive feeding system slaughtered at 8 months of age but will they fit into existing beef production concepts? (MSc-project A). Data from a recent organic beef production experiments also with crossbreds 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, head of research unit
Email: mogens.vestergaard@agrsci.dk
Phone: +45 8715 7843

Project start
As soon as possible

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

Theoretical thesis based on analyses of existing data and literature study.

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

Additional information
Datasets are available in Excel and SAS-files
Production performance and slaughter- and carcass quality of heavy Holstein Friesian young bulls

Main subject area
Animal Health and Welfare
Animal nutrition / beef production / product quality

Department and Supervisor
Department of Animal Science
Faculty of Science and Technology
Aarhus University
Homepage: http://anis.au.dk
Mogens Vestergaard, head of research unit
Email: mogens.vestergaard@agrsci.dk
Phone: +45 8715 7843

Project start
As soon as possible

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

Theoretical thesis based on analyses of existing data and literature study.

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

Additional information
Datasets are available in Excel and SAS-files
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 at AU. Main supervisor will be: Senior research scientist Søren Østergaard, soren.ostergaard@agrsci.dk, Phone: 87157961

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 M.Sc. 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.

The M.Sc. project will be related to EVOP development on 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
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 2013

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: stenh.moller@agrsci.dk
Phone: +45 8715 7926

Project start
Autumn 2013

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.
Development of starch based nutraceuticals – can starch improve colonic health?

Main subject area
Human health, In Vitro Model of digestibility

Department and Supervisor
Dept. Animal Science, AU Foulum
Post Doc, Tina Skau Nielsen
TinaS.Nielsen@agrsci.dk, tlf. 87157962

Project start
From August 2014

Physical location of project and students work
AU Foulum

Short project description
Background: The idea is that human colonic diseases (cancer, inflammatory conditions) can be prevented by intake of new starch based food ingredients/nutraceuticals that boost large intestinal butyrate delivery. Butyrate is a short-chain fatty acid produced by microbial fermentation of dietary fibre (DF) in the large intestine with major positive implications for colonic health. Our typical diet is high in red meat, fat and rapidly digestible carbohydrates and low in DF; the latter limits the production of butyrate in the colon. A more targeted approach to increase large intestinal butyrate supply is needed; i.e. through intake of new starch based food ingredients/nutraceuticals. In this project we will combine enzymatic modification of starches and butyrylation to produce nutraceuticals that much more efficiently than hitherto described deliver butyrate to the large intestine and improve colonic health.
Aim: To perform in vitro digestion analyses to evaluate the functional properties of the modified starches. To evaluate the sensory characteristics of the butyrylated starches.
Methods: The extent and rate of digestion will be determined by The Englyst in vitro procedure with minor modifications. Standard methods for food sensory evaluation.

Additional information
You are most welcome to contact me by E-mail and to visit my homepage
http://pure.au.dk/portal/da/tinas.nielsen@agrsci.dk
Cattle feeding, nutrition and physiology in relation to emissions, efficiency and product quality

Main subject area
Animal Science, cattle nutrition and physiology

Department and Supervisor
Department of Animal Science, AU-Foulum.
Senior Scientist Martin Riis Weisbjerg, Martin.Weisbjerg@agrsci.dk
Senior Scientist Peter Lund, Peter.lund@agrsci.dk
Assoc. Prof. Jakob Sehested, Jakob.sehested@agrsci.dk

Project start

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.
Controlling milk composition by feeding

Main supervisor
Associate professor Mette Krogh Larsen
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html

Physical location of the project
AU Foulum

Project start
Any time

Extent and type of project
60 ECTS

Main subject area
Milk composition and quality

Additional information
The project will be carried out in close cooperation with ongoing projects at the department

Short project description
The technological and nutritional quality of milk is affected by feed composition and especially fatty acid composition and milk content of antioxidants are affected. Feeding high amounts of grass products increases the milk content of polyunsaturated fatty acids as well as the content of tocopherols and carotenoids. Milk with higher content of polyunsaturated fatty acids is more liable to oxidation; however, a higher content of antioxidants may delay this oxidation.
The purpose of the project is to collect milk from a range of cows where feeding details are known. Cows from the Science and Technology Faculty herd in Foulum or cows from the Danish Cattle Research Centre in Foulum may be used for the project, but milk from private farms may also be included as appropriate.
This milk should be analysed for fatty acid composition as well as content of antioxidants. Transfer of other compounds from feed to milk may be studied as well. The oxidative stability of some milk types could be analysed and especially the relation between tocopherol content and oxidation may be studied as tocopherol may act as an antioxidant in early oxidation and a prooxidant in severe oxidation. Other aspects may be studied depending on the ongoing projects.
Vitamins in milk

Main supervisor
Associate professor Mette Krogh Larsen
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html

Physical location of the project
AU Foulum

Project start
Any time

Extent and type of project
45 or 60 ECTS

Main subject area
Vitamins in milk

Additional information
Other aspects may be studied depending on ongoing projects

Short project description
Milk and dairy products are important sources of vitamin B2 and vitamin B12 in human nutrition. However, little is known about the variation in the content of these nutrients in milk and dairy products, and the purpose of the project is to investigate the variation depending on factors like feed, breed and genetic variation within breeds.

In the project, methods of analysis of the desired vitamins will be developed and validated. Variation in the natural vitamin content will be studied based on a range of samples which have been collected in other projects. Besides, additional milk sampling may be carried out to clarify which factors are most important for the variation in vitamin content.
Meat quality of beef produced on natural grassland

Main supervisor
Associate professor Margrethe Therkildsen
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: Margrethe.therkildsen@agrsci.dk
Phone: 87158007
Homepage: www.food.au.dk

Physical location of the project
Department of Food Science, AU, Foulum

Project start
Open

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

Main subject area
Raw meat quality

Additional information
The project will be part of a large project “Smag på landskabet” (taste the environment), which aims at developing a concept for nature conservation through grazing with cattle. The concept involves the full chain trough grazing systems, animal production, meat quality and branding and marketing of meat products. The project runs from 1. January 2013 to 31. December 2014.

Short project description
Development of a concept for nature conservation through grazing with cattle will only succeed if the meat can be differentiated from traditional beef. Thus the aim of the present project is to describe the meat quality of beef produced on extensive grasslands, meadows, heats etc. in order to pinpoint quality differentiations from traditional beef, which can be used in marketing of the concept. Very little is known about the effect of specific Danish biotopes on meat quality traits like colour, structure, fatty acid profile and taste and further on variations in response between breeds, ages, sex and length of access to grassland. These factors will be studied in the present experiment.
Healthy milk from cows fed preserved grass products

Main supervisor
Mette Krogh Larsen
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: http://pure.au.dk/portal/da/persons/mettkrogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html

Physical location of the project
FOOD, Foulum

Project start
2014

Extent and type of project
60 ECTS

Main subject area
Milk composition and quality

Additional information
The project will be carried out in cooperation with a project concerning protein supply and quality.

Short project description
In dairy production, grass feeding is recognized as an important source of linolenic acid and antioxidants such as carotenoids and tocopherols and higher content of these in milk is considered beneficial for human health.

The basis for the project is feeding ensiled grass from 4 different cuts. Prior to the ensiling process the grass is either withered normally for production of grass silage or withered to a higher dry matter content to produce haylage. These resulting 8 different feed products differ in content of nutrients as well as digestibility due to cut, withering and ensiling processes. These differences are likely to affect the rumen microbial processes as well as the milk composition.

In the project, fistulated cows have been fed the different feed products and milk has been sampled, together with samples of feed and intestinal samples. Samples should be analyzed for content of fatty acids, carotenoids, vitamin E and vitamin B2 and the flow of these components from feed to milk should be investigated. Besides, other quality parameters can be studied.
Effect of level of ruminal starch digestion on ruminal environment, fibre digestion, and microbial protein synthesis

**Main subject area**
Animal Health and Welfare/Ruminant nutrition

**Department and Supervisor**
Department of Animal Science, AU-Foulum

Senior scientist Martin R. Weisbjerg
Martin.Weisbjerg@AGRsci.dk
+45 8715 8046

Assistant professor Mogens Larsen
Mogens.Larsen@AGRsci.dk
+45 8718 7983

**Project start**
Any time

**Physical location of project and students work**
Department of Animal Science, AU-Foulum

**Short project description**
High ruminal starch fermentation has often been associated with high acid loads inducing low pH and consequently suboptimal conditions for the cellulolytic bacteria fermenting fibre (NDF) in the rumen of the feed.

**The project will comprise**
- Statistical analysis of a dataset containing ruminal digestibilities of fibre and starch as well as measures of microbial protein synthesis, ruminal environment (pH and concentrations of volatile fatty acids (VFA)) from 4 in vivo experiments conducted previously.
- Writing of thesis in the format of literature review, paper draft, and general discussion. The paper draft is supposed to be published later in peer reviewed journals.

**Additional information**
It will be advantageous to have good flair for data handling and statistics.
Dry quarters in herds with automatic milking systems

Main subject area
Animal Health and Welfare
Epidemiology, Veterinary Science, Animal Science

Department and Supervisor
Institute of Animal Science, research group of Epidemiology and Management
Senior Advisor Torben Werner Bennedsgaard, Torbenw.bennedsgaard@agrsci.dk

Project start
Any time

Physical location of project and students work
Based from AU Foulum, some farm visits

Short project description
Research questions that can be addressed:
Why do AMS-herds have more cows with dry quarters
Which criteria do the AMS farmers use for drying off individual quarters
To what extend is the milk production affected
Fate of cows with dry quarters: culling or return of quarters in production in next lactation
Infection route of Streptococcus agalactiae in AMS-herds

Main subject area
Animal Health and Welfare
Epidemiology, Veterinary Science, Animal Science

Department and Supervisor
Institute of Animal Science, research group of Epidemiology and Management
Senior Advisor Torben Werner Bennedsgaard, Torbenw.bennedsgaard@agrsci.dk. Tlph 87157824

Project start
Any time

Physical location of project and students work
Based from AU Foulum, some herd visits

Short project description
The project is expected to be a combination of analysis of available data and collection of samples and information from herds.
Some types of automatic milking systems (milking robots) have significantly higher prevalence of Strept. agalactiae than conventionally milked herds.
How are the bacteria transferred between cows – in the barn or in the robot?
Are the any differences in management in infected herd with high and low prevalence of the bacteria?
Liver metabolism of ketone bodies in transition dairy cows fed fodder beets or NaOH treated wheat

Main subject area
Animal Health and Welfare
Ruminant nutrition

Department and Supervisor
Department of Animal Science, AU-Foulum
Assistant professor Mogens Larsen
Mogens.Larsen@agrsci.dk
+45 8718 7983

Project start
Any time

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

Short project description
Ketone bodies are important nutrients in dairy cows and especially during periods with high mobilisation of adipose tissue. Ketone bodies are the end product of the metabolic pathway for breakdown of non-esterified fatty acids released from the adipose tissues. Hence, ketone bodies become water soluble nutrients originating from water insoluble non-esterified fatty acids. Feeding sugar rich diets may increase the risk of ketosis in postpartum transition cows as the greater butyrate production in the rumen from sugar fermentation also will contribute to formation of ketone bodies.

The main task in the project will be to work with data from an experiment conducted with 9 dairy cows from 2 weeks before to 4 weeks after calving. The cows had permanent catheters in an artery, hepatic portal vein, and the hepatic vein. Blood was sampled from these catheters and has been analysed for acetate, propionate, butyrate, and ketone bodies. This allows calculation of absorption from the digestive tract and liver metabolism of these nutrients. From the day of calving cows were subjected to three treatments: NaOH wheat rich diet, fodder beet rich diet, or lucerne silage rich diet.

The preferred thesis format is: literature review, article draft, and general discussion. The article draft is supposed to be published later in peer reviewed journals.

Additional information
It will be advantageous to have good flair for data handling and statistics.
Mastitis (1)

Main subject area
Animal Health and Welfare – Epidemiology and Management

Department and Supervisor
Department of Animal Science, Søren Østergaard, soren.ostergaard@agrsci.dk

Project start
Any time

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

Short project description
Mastitis is an extremely complex disease that results in reduced milk synthesis and changes of the milk composition, reducing the overall milk quality. Reduced milk production is the single largest factor in the total economic loss caused by mastitis. Due to the multifactorial nature of mastitis, various strategies for mastitis control exist. In this project, the economic consequences of different mastitis management strategies should be investigated. The study may be based on a literature review, simulation (SimHerd) and/or empirical data.
Bovine Mastitis

Main subject area
Animal Health and Welfare – Epidemiology and Management

Department and Supervisor
Department of Animal Science, senior researcher Søren Østergaard,
soren.ostergaard@agrsci.dk

Project start
Any time

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

Short project description
Bovine mastitis has been studied exhaustively during many years and research has provided excessive knowledge on causes and effect of the disease. Even so, we have a lot to learn about mastitis. Severity of intra-mammary infections varies considerably, from subclinical to fatal, depending on both pathogen and host factors. The objective of the present study is to investigate the effect of pathogen on SCC, milk yield loss and probability of cure based on a literature review and Veterinary Herd Health Management data.
Mastitis (2)

Main subject area
Animal Health and Welfare – Epidemiology and Management

Department and Supervisor
Department of Animal Science, Søren Østergaard, soren.ostergaard@agrsci.dk

Project start
Any time

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

Short project description
Mastitis results from the introduction and multiplication of pathogenic microorganisms, usually bacteria, in the mammary gland. The causative bacteria can be categorized as either contagious or environmental. Contagious organisms are well adapted to survival and growth in the mammary gland. In fact, the infected gland is the main source of these organisms in a dairy herd and transmission of contagious pathogens to uninfected quarters and cows occurs mainly during milking time. The aim of this project is to describe efficient methods for protection against contagious transmission of mastitis pathogens in a dairy herd based on a literature review and simulation (SimHerd).
Concentrate and milk composition

Main supervisor
Mette Krogh Larsen (Jette Feveile Young, Martin Weisbjerg)
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html

Physical location of the project: FOOD, Foulum

Project start: 2014

Extent and type of project
60 ECTS

Main subject area
Milk composition and quality

Additional information
The project will be carried out in cooperation with a project concerning the palatability (as perceived by cows) of different concentrate feed types.

Short project description
In this project a group of 40 Jersey cows have been fed 4 different types of concentrate in a 4x4 latin square design. Milk has been sampled from individual cows. Two of the treatments involve grass pellets which can be distinguished from other types of concentrate due to a higher content of linolenic acid, chlorophyll and carotenoids. This may affect the content of linolenic acid, phytanic acid and carotenoids in milk. Phytanic acid is formed during ruminal degradation of chlorophyll and previous research has shown that phytanic acid can stimulate the uptake of glucose in primary porcine myotubes.

The carotenoid content as well as the fatty acid composition of feed and milk samples should be analyzed and related to each other. Data from feed uptake and milking robot frequency should be analyzed to assess the palatability. Based on the results of phytanic acid in milk samples some extreme samples are selected to test the effect on glucose uptake in muscle cell cultures in an in vitro assay. Besides, other quality parameters can be studied.
Health promoting fatty acids in meat

Main supervisor
Margrethe Therkildsen, Mette Krogh Larsen, Jette Feveile Young
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: [http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html](http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html)

Physical location of the project: FOOD, Foulum

Project start: Summer 2014

Extent and type of project
60 ECTS

Main subject area
Meat composition and ....?

Additional information
Part of the project is a collaboration between AU and South Africa??

Short project description
The fatty acid profile of meat is affected by feeding and one particular health promoting fatty acid in ruminant meat is phytanic acid. The source of this fatty acid is phytol which is cleaved from chlorophyll and subsequently oxidized in the rumen. Thus, green feed items are essential for the formation of phytanic acid. Previous research has shown that phytanic acid can stimulate the uptake of glucose in primary porcine myotubes.

The project is based on samples from a project where grass feeding and corn/grain?? Feeding are compared. For each of the two treatments 30-40 animals are included and 3 muscles have been sampled and fat has been extracted from these muscles. The purpose of the project is to analyze fatty acid composition of these samples, in particular to quantify phytanic acid. These analyses will show how phytanic acid varies depending on feeding, muscle type, age of animal.... Besides phytanic acid the content of other fatty acids, in particular n3 and n6 fatty acids will be assessed. Extreme samples are selected to test the effect on glucose uptake in primary porcine myotubes in an in vitro assay.
Healthy milk from cows fed preserved grass products

Main supervisor
Mette Krogh Larsen
Department of Food Science
Aarhus Faculty of Science and Technology
Aarhus University
E-mail: mette.larsen@agrsci.dk
Phone: 87158062
Homepage: http://pure.au.dk/portal/da/persons/mette-krogh-larsen(5ce6d5da-bd09-4304-a9d9-495e00e51fdd).html

Physical location of the project: FOOD, Foulum

Project start: 2014

Extent and type of project
60 ECTS

Main subject area
Milk composition and quality

Additional information
The project will be carried out in cooperation with a project concerning protein supply and quality.

Short project description
In dairy production grass feeding is recognized as an important source of linolenic acid and antioxidants such as carotenoids and tocopherols and higher content of these in milk is considered beneficial for human health.

The basis for the project is feeding ensiled grass from 4 different cuts. Prior to the ensiling process the grass is either withered normally for production of grass silage or withered to a higher dry matter content to produce haylage. These resulting 8 different feed products differ in content of nutrients as well as digestibility due to cut, withering and ensiling processes. These differences are likely to affect the rumen microbial processes as well as the milk composition.

In the project fistulated cows have been fed the different feed products and milk has been sampled, together with samples of feed and intestinal samples. Samples should be analyzed for content of fatty acids, carotenoids, vitamin E and vitamin B2 and the flow of these components from feed to milk should be investigated. Besides, other quality parameters can be studied.
Guidelines for the MSc Thesis Research Proposal

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

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

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

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

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

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

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

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

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

Design the data collection. This step requires arguing about, and providing an answer to, the following questions:
What is seen as data and from which sources of information do you obtain these data?

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

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

Which instruments will be used? It is important to think about the instruments you need far in advance, because not all equipment is available, or it can be in use elsewhere.

Design the data analysis: It should be pointed out that the description of the methods is necessary for data collection as well as for data analysis. How can the data be processed? Which statistical tests can be applied given the employed data collection methods or experimental design? Note that it is important to think about data analysis before you start to collect data. Certain analyses require certain data formats and experimental set-up.

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

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

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

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

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

Plagiarism

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

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

Suggested structure of the report

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

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

• **Preface:** Less than one page.

• **Table of content:** Gives an overview of the chapter structure of the thesis with their respective page numbers. It should also include the summary and possible annexes.

• **Abstract:** Maximum of 250 words that describes the research for the general public.

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

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

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

• **Methods:** This part reports on the used information sources, as well as the applied methods and instruments for data collection and statistical data analysis. In contrast to the research proposal - where this section is presenting the ambitions/plan - you must present the situation as it has actually worked (incl. problems that occurred) in the final thesis report. In the case of fieldwork, you should describe the area and sites in which the research was carried out. When you have done experimental work, you should give all relevant details of the followed procedure (protocol). This enables others to evaluate your work, and to reproduce it if needed.
• **Results:** In this section the results should be presented in the most objective and comprehensive manner. Mixing results with subjective interpretation and discussion must be avoided. The challenge is to structure the results in such a way, that the research questions are addressed as best. Where appropriate, the findings should be illustrated or summarized with tables and figures including a statistical data analysis. In any case tables and figures must be drawn in such a way that they can be read on their own, independent from the surrounding text. Do not forget to include measurement units and an explanation of abbreviations. References to tables and figures should be made in the text (e.g., see table 1; cf. figure 2). Note that table captions are given above the table, whereas figure captions are placed below the figure.

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

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

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

• **Bibliography:** In this section a list of all referred literature should be given, sorted in alphabetical order. The style for the different types of publications (articles in journals, books, chapters in books etc.) should be consistent, e.g. according to the Harvard style, see also the Harvard online referencing tutorial. When you refer to information on the Internet you should give the complete web-address, as well as the date on which the information has last been accessed, e.g.:


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