

ANIMAL SCIENCE

Theses and Projects

Topics for Theses and Projects Available in 2020 -2021

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 Agrobiolgy, 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 Agrobiolgy and the other animal science related Master Degree programmes at <http://kandidat.au.dk/en/agrobiolgy/>

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/>

Ricarda Engberg

Associate Professor

Member of the Educational Committee ANIS

Email: Ricarda.engberg@anis.au.dk

Phone: +45 8715 7904

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Guidelines

Thesis types offered for students at the MSc Agrobiography 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:

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

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 fulfil 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? In 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:

- **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

Cattle feeding, nutrition and physiology in relation to emissions, efficiency and product quality

Main subject area

Animal Science, cattle nutrition and physiology.

Department and supervisor

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

Martin Riis Weisbjerg, Professor

E-mail: Martin.Weisbjerg@anis.au.dk,

Tel.: +45 8715 8046

and/or

Peter Lund, Professor

E-mail: Peter.lund@anis.au.dk,

Tel.: +45 40157673

and/or

Mogens Larsen, Senior researcher

E-mail: mogens.larsen@anis.au.dk,

Tel: +4587157983

And/or

Mette Olaf Nielsen, Professor

E-mail: mon@anis.au.dk,

Tel: +45 27265701

Project start

To be decided in agreement with supervisor.

Physical location of project and students work

Department of Animal Science, Foulum.

Short project description

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

Additional information

30-45-60 ECTS as appropriate.

Variation in feed intake and feeding behavior of bull calves and its relation to age, ration composition, health and performance

Main subject area

Animal Science, cattle nutrition and physiology, beef production.

Department and supervisor

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

Mogens Vestergaard, senior scientist

E-mail: mogens.vestergaard@anis.au.dk

Phone: +45 8715 7843

Project start

To be decided in agreement with the supervisor.

Physical location of project and students work

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

Thesis based on analyses of existing feed intake and feeding behavior data from 5-10 experiments performed at DKC/ANIS/Aarhus University.

Short project description

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

Additional information

30-45-60 ECTS thesis as appropriate. The MSc student is invited to co-author a scientific publication.

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

Main subject area

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

Department and supervisor

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

Mogens Vestergaard, senior scientist

E-mail: mogens.vestergaard@anis.au.dk

Phone: +45 8715 7843

Project start

To be decided in agreement with the supervisor.

Physical location of project and students work

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

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

Short project description

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

Additional information

30-45-60 ECTS thesis as appropriate. The MSc student is invited to co-author a scientific publication.

Optimized feed bunker space for slaughter calves to maximize feed intake and growth and improve feeding behaviour

Main subject area

Animal Science, cattle nutrition and physiology, beef production.

Department and supervisor

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

Mogens Vestergaard, senior scientist

E-mail: mogens.vestergaard@anis.au.dk

Phone: +45 8715 7843

Project start

April or August 2020. To be decided in agreement with the supervisor.

Physical location of project and students work

Department of Animal Science, AU Foulum, DK-8830 Tjele but will include experimental work at a private rosé veal/young bull farm and cooperation with SEGES.

Short project description

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

Additional information

45-60 ECTS thesis as appropriate.

Sheep feeding strategies under Arctic conditions

Main subject area

Feed quality and sheep nutrition.

Department and supervisor

Department of Agroecology/ <https://agro.au.dk/>

Jesper Overgård Lehmann, Postdoc,

E-mail: jespero.lehmann@agro.au.dk

Phone: +45 87154776

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

Martin Riis Weisbjerg, Professor,

E-mail: martin.weisbjerg@anis.au.dk

Phone: +45 87158046

Project start

Summer 2020 or as agreed with the student

Physical location of project and students work

Department of Animal Science or Department of Agroecology, AU-Foulum

Short project description

Extensive sheep farming is an important part of the agricultural sector in the Arctic and Subarctic areas of the north. These areas are characterized by harsh conditions, sparse settlements and long distances between farms and villages as well as between farms and the outer part of grazing areas. In Greenland, sheep mainly graze permanent nature areas with a rich plant community during summer where they raise their lambs that are born in spring. Weaning and slaughter of lambs occur in late autumn after which the ewes are kept indoors and fed hay, wrap silage, barley and concentrate. Farmers grow some of the forage for winter-feeding themselves whereas the remaining forage, barley and concentrates are imported from mainly Europe.

The main objective of this project is to develop winter-feeding strategies for ewes housed indoor in the Arctic and Subarctic areas of the north that maximizes the use of homegrown forage and ensures maximum survivability of the lambs. To support this objective, we have sampled a number of homegrown forages on 10 farms in southern Greenland, which should be included in the project. Furthermore, the project can include feeding strategies for increasing the growth of lambs just prior to slaughter.

Extent and type of project

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

Useful reading

- Lehmann et al., 2020. Open Agriculture 5, DOI: 10.1515/opag-2020-0009.
- Ross et al., 2016. Ambio 45, 551-566.
- Westergaard-Nielsen et al., 2015. Science of the Total Environment 512-513, 672-681.

Additional information

Driver's license is necessary.

Extreme concentrate level can decrease methane from dairy cows very significantly

Main subject area

Animal nutrition and impact on climate

Department and supervisor

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

Christian Friis Børsting, Ph.D., Senior Advisor

E-mail: cfb@anis.au.dk,

Phone: +45 87157638, +45 51938665

Project start

You can start at any time.

Physical location of project and students work

Partly Aarhus partly Foulum.

Short project description

In ANIS a lot of efforts are made to reduce methane production from cattle. We take part in a number of projects focused on feeding strategies, feedstuffs and additives, which can reduce methane emission from the cows.

The aim of the present study was to investigate the effect on methane emission when feeding three diets with increasing levels of concentrate to Holstein and Jersey lactating cows. Concentrate constituted 49, 70 or 91 % of dry matter intake (DMI), forage (grass-clover and maize silage 1:1, DM basis) constituted 50, 25 or 0 % of DMI, whereas the remaining 1, 5 or 9 % of DMI was barley straw. Methane emission was measured in respiration chambers during three days.

The enteric methane emission per kg DMI could be reduced by 48 % for Holstein when no forage and 91 % concentrate was fed, but only 23 % for Jersey. This is an outstanding result since no other studies have shown similar effects.

Besides the methane data we have a number of other results measured in milk, in rumen content, chewing activity etc., which we would like a student to work with to help us find some biological explanations for the large effect on methane and reasons for the difference between the two breeds.

Extent and type of project

30 ECTS: Theoretical thesis based on literature studies and analysis of issued and edited data sets.

Additional information

We are looking for a student with interest in mitigation of the climate impact of cattle production, who has an insight in cattle nutrition and who has some skills in data handling

Factors driving the climate impact of milk from dairy cows

Main subject area

Greenhouse gas emission, dairy farming systems, lifecycle assessment, modelling.

Department and supervisor

Department of Agroecology/ <https://agro.au.dk/en/>

Troels Kristensen, Senior Scientist,

E-mail: Troels.Kristensen@agro.au.dk

Jesper Overgård Lehmann, Postdoc,

E-mail: JesperO.Lehmann@agro.au.dk

ARLA FOOD:

Maike Brask, Sustainability Specialist,

E-mail: Maike.Brask@arlafoods.com

Project start

Summer 2020, can be decided individually.

Physical location of project and students work

Department of Agroecology, AU Foulum. A few days per month can be spent at Arla's headquarters in Aarhus

Short project description

Greenhouse gas (GHG) emissions from dairy farming is largely dependent on the ability of the farm to utilize resources efficiently including feed, manure and energy. Several models exist that can calculate the emission from a particular dairy farm based on a number of farm-specific input. The dairy company Arla Foods has created such a model and used it to estimate the GHG emission from a large number of individual farms from mainly Denmark but also other European countries where Arla sources milk. These climate accounts show a large heterogeneity in terms of farm types including breed, size and intensity, with a resulting large heterogeneity in estimated GHG emission per kg of milk produced.

The main objective of this project is to investigate the factors that drive the final GHG emission per kg of milk produced based on the climate accounts that Arla has collected over the years. The project can include specific investigations into emissions from feed production, model build-up and inclusion of various technologies to reduce on-farm emissions. Finally, the project can include strategies for reducing GHG emission from various farm types.

Extent and type of project

45 ECTS.

Additional information

The student should have strong analytical skills and be capable of handling large datasets in excel and preferably R.

Useful reading

Kristensen et al., 2011. Livestock Science 140, 136-148.

Biosecurity: infections, 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

Anytime.

Physical location of project and students work

At ANIS, AU-FOULUM, 8830 Tjele.

Short project description

Infections spread between and within herds via direct contact with infected animals, or indirect via contact to infectious material, sometimes carried around via e.g. humans, insects, 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 are discussed

Extent and type of project

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

Additional information

(E.g. prerequisites, conditions, useful reading, etc.....)

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

Strategies for implementing dam-rearing on Danish dairy farms

Main subject area

Dairy farming, farming strategy.

Department and supervisor

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

Mette Vaarst, Senior scientist,

E-mail: mette.vaarst@anis.au.dk

Phone: +45 8715 7924

Department of Agroecology/ <https://agro.au.dk/>

Jesper Overgård Lehmann, Postdoc,

E-mail: jespero.lehmann@agro.au.dk

Phone: +45 87154776

Project start

Summer 2020, can be decided individually..

Physical location of project and students work

Department of Animal Science or Department of Agroecology, AU Foulum.

Short project description

Dairy farmers throughout Europe have during the past one-two decades begun trials with letting the newborn calf stay with its dam for longer than the traditional 0-48 hours practiced on the majority of farms. Several research projects have investigated or are investigating various consequences and various ways of implementing this change in management, which is termed dam-rearing or mother-bonded calf rearing.

The main objective of this project is to develop potential implementing strategies for 10-15 different organic dairy farms in Denmark that will serve as cases. The three aims of this project is to 1) conduct a literature review required management changes and consequences, 2) Interview 10-15 organic dairy farmers about their concerns and reservations about implementing a dam-rearing system and 3) devise potential concrete implementation strategies and their potential consequences including barn layout on these farms.

Extent and type of project

45 ECTS: Experimental theses in which the student is responsible for collection and analysis of his/her own original data.

Additional information

The student should be sufficiently fluent in Danish for communicating with farmers and hold a valid drivers license.

Useful reading

- Johnsen et al., 2016. Applied Animal Behaviour Science 181, 1-11.
- Kälber and Barth, 2014. Applied Agricultural and Forestry Research 64, 45-58.
- Weary and von Keyserlingk, 2017. Animal Production Science 57, 1201-1209.

Nutrition and physiology of pigs

Main subject area

Pig nutrition and physiology.

Department and supervisor

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

Jan Værum Nørgaard, Associate professor

E-mail: janvnoergaard@anis.au.dk

Project start

Depending on ongoing projects and your level of participation.

Physical location of project and students work

Department of Animal Science, Foulum.

Short project description

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

Additional information

30-45-60 ECTS as appropriate. The MSc student is invited as a co-author on the outcoming scientific paper.

Feed the pigs and train the enzymes prior to weaning – impact on digestive enzymes

Main subject area

Animal Nutrition/Animal Science.

Department and supervisor

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

Mette Skou Hedemann, Senior scientist

E-mail: Mette.Hedemann@anis.au.dk

Phone: +45 8715 8078

Project start

September/October 2020.

Short project description

Background:

Post-weaning diarrhea (PWD) occurs during the days after weaning due to the social, environmental and dietary stressors imposed to the newly weaned pig and it is one of the primary constraints in modern pig production. One of the tools to prevent PWD has for decades been inclusion of high dosages of zinc in feed for piglets. However due to concerns on increased antimicrobial resistance and environmental impact, the European Union has decided to ban the use of zinc oxide at medical levels by 2022. The ban will undoubtedly lead to an undesirable increase in use of antibiotics, and there is an urgent need for reliable alternatives.

Weaning is a major challenge to the young pig. Initially, the gastrointestinal tract is optimized to digest and absorb sow's milk that is high in protein and fat, which is in contrast to the dry feed offered to the piglet after weaning. The dry feed contains mainly complex plant based material with a different composition of macronutrients and the major part of the energy derives from starch. The secretion of digestive enzymes from the pancreas declines during the immediate post-weaning period which causes a low nutrient digestibility.

Starch and protein digestibility is low in newly weaned pigs and a flow of undigested starch and protein into the large intestine may contribute to unbalanced growth of proteolytic and saccharolytic microbiota which may stimulate growth of pathogenic bacteria and increase the risk of developing PWD. Furthermore, bacterial proteolytic activity in the distal small intestine and proximal colon results in the production of detrimental metabolites such as ammonia, amines, and phenols, which are believed to increase the risk of PWD. The flow of undigested nutrients into the large intestine may be avoided either by feeding low-protein diets or by using highly digestible protein sources in weaner diets. Reducing the content of dietary protein in the post-weaning diet is a strategy with well-documented diarrhea-lowering effect. However, in order to maintain a high performance, the diets have to be supplemented with crystalline amino acids which significantly increases diet costs. In the present project, we want to take the second approach and provide the piglets with a feed with highly digestible protein sources to exploit the full growth potential with a low flow of undigested protein to the large intestine resulting in a lower proteolytic activity in this site.

Objective:

The overall aim of the present project is to develop a feeding concept that ensures weaning without development of diarrhea in a production situation without use of high dosages of zinc.

Activities:

An experiment will be performed with a total of 10 sows and their offspring (approx. 130 piglets) during the period from birth to two weeks post-weaning. Four diets will be optimized for the experiment:

1. A diet high in protein (optimal growth of the piglets) containing optimally processed starch and protein sources with high digestibility.
2. A diet high in protein containing standard ingredients.

3. A diet low in protein (protects against PWD) containing optimally processed starch and protein sources with high digestibility.

4. A diet low in protein containing standard ingredients.

Sows and piglets will be housed in traditional farrowing crates and dry feed will be provided using a feeder that scatters the feed on the floor and takes advantage of the natural rooting behavior of the piglets. As a negative control, a group of piglets will not be provided feed prior to weaning. After weaning, one of the four experimental diets will be fed. From each group, 5 pigs will be euthanized 7 days prior to weaning, at the day of weaning, 5 days post-weaning, and 14 days post-weaning. Samples (pancreas, small intestinal digesta, and small intestinal mucosa) will be collected for determination of digestive enzyme activities, primarily amylase, disaccharidases, proteases, and peptidases.

The outcome of the study is hypothesized to show that providing creep feed with improved starch and protein quality to the piglets will boost the enzyme activity and thereby improve nutrient digestibility post-weaning. This will result in lower amounts of fermentable substrate for the microbiota, which in turn will reduce the risk of developing post-weaning diarrhea. Furthermore, the high digestibility of the nutrients will support optimal growth of the piglets.

Extent and type of project

45-60 ECTS

Additional information

The student will be involved in taking samples from the gastrointestinal tract of the piglets, in the laboratory analyzing the samples taken, and calculating and interpreting the results.

This project is part of a bigger project and also includes the Thesis 'Feed the pigs and train the enzymes prior to weaning – impact on microbiome and microbial metabolites in the gut'. Therefore, although the two theses will be conducted separately, there is the possibility that two students could collaborate in parts of the work if that is a wish from the students.

Feed the pigs and train the enzymes prior to weaning – impact on microbiome and microbial metabolites in the gut

Main subject area

Microbiology and nutrition in piglets.

Department and supervisor

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

Nuria Canibe, Senior Researcher

E-mail: Nuria.Canibe@anis.au.dk

Phone: +45 87158058

Project start

September/October 2020.

Short project description

Background:

Post-weaning diarrhea (PWD) occurs during the days after weaning due to the social, environmental and dietary stressors imposed to the newly weaned pig and it is one of the primary constraints in modern pig production. One of the tools to prevent PWD has for decades been inclusion of high dosages of zinc in feed for piglets. However due to concerns on increased antimicrobial resistance and environmental impact, the European Union has decided to ban the use of zinc oxide at medical levels by 2022. The ban will undoubtedly lead to an undesirable increase in use of antibiotics, and there is an urgent need for reliable alternatives.

Weaning is a major challenge to the young pig. Initially, the gastrointestinal tract is optimized to digest and absorb sow's milk that is high in protein and fat, which is in contrast to the dry feed offered to the piglet after weaning. The dry feed contains mainly complex plant based material with a different composition of macronutrients and the major part of the energy derives from starch. The secretion of digestive enzymes from the pancreas declines during the immediate post-weaning period which causes a low nutrient digestibility.

Starch and protein digestibility is low in newly weaned pigs and a flow of undigested starch and protein into the large intestine may contribute to unbalanced growth of proteolytic and saccharolytic microbiota which may stimulate growth of pathogenic bacteria and increase the risk of developing PWD. Furthermore, bacterial proteolytic activity in the distal small intestine and proximal colon results in the production of detrimental metabolites such as ammonia, amines, and phenols, which are believed to increase the risk of PWD. The flow of undigested nutrients into the large intestine may be avoided either by feeding low-protein diets or by using highly digestible protein sources in weaner diets. Reducing the content of dietary protein in the post-weaning diet is a strategy with well-documented diarrhea-lowering effect. However, in order to maintain a high performance, the diets have to be supplemented with crystalline amino acids which significantly increases diet costs. In the present project, we want to take the second approach and provide the piglets with a feed with highly digestible protein sources to exploit the full growth potential with a low flow of undigested protein to the large intestine resulting in a lower proteolytic activity in this site.

Objective:

The overall aim of the present project is to develop a feeding concept that ensures weaning without development of diarrhea in a production situation without use of high dosages of zinc.

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2. A diet high in protein containing standard ingredients.

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4. A diet low in protein containing standard ingredients.

Sows and piglets will be housed in traditional farrowing crates and dry feed will be provided using a feeder that scatters the feed on the floor and takes advantage of the natural rooting behavior of the piglets. As a negative control, a group of piglets will not be provided feed prior to weaning. After weaning, one of the four experimental diets will be fed. From each group, 5 pigs will be euthanized 7 days prior to weaning, at the day of weaning, 5 days post-weaning, and 14 days post-weaning. Microbial composition at the end of the ileum and in the first part of the colon will be measured (16S rRNA sequencing and qPCR of specific groups of bacteria) and metabolites of microbial fermentation of protein and carbohydrates will be determined (short chain fatty acids, lactic acid, biogenic amines, ammonia, indoles and phenols).

The outcome of the study is hypothesized to show that providing creep feed with improved starch and protein quality to the piglets will boost the enzyme activity and thereby improve nutrient digestibility post-weaning. This will result in lower amounts of fermentable substrate for the microbiota, which in turn will reduce the risk of developing post-weaning diarrhea. Furthermore, the high digestibility of the nutrients will support optimal growth of the piglets.

Extent and type of project

45-60 ECTS

Additional information

The student will be involved in taking samples from the gastrointestinal tract of the piglets, in the laboratory analysing the samples taken, and calculating and interpreting the results.

This project is part of a bigger one which also includes the Thesis 'Feed the pigs and train the enzymes prior to weaning – impact on digestive enzymes'. Therefore, although the two theses will be conducted separately, there is the possibility that two students could collaborate in parts of the work if that is a wish from the students.

Plant cocktails with antibacterial effect against weaning diarrhea in organic piglets

Main subject area

Microbiology (nutrition) and piglets.

Department and supervisor

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

Nuria Canibe, Senior Researcher

E-mail: Nuria.Canibe@anis.au.dk

Phone: +45 87158058

Project start

September-October 2020.

Short project description

Background:

Weaning diarrhea in piglets constitutes a serious animal welfare and economic problem in Danish pig production, traditionally attempted solved using antibiotics, zinc, copper and synthetic organic acids. The problem of bacterial resistance development and environmental consequences has led to political demands for the reduction of antibiotic use and phasing out of medical zinc. The present project will test the impact of an alternative, natural, plant-based antibacterial feed supplement against weaning diarrhea in organic pigs.

In a previous project, 10 different plant species, with documented antimicrobial properties, were tested in vitro and mixtures of onion (active substance: allicin) and acidic berries (active substances: organic acids) inhibited diarrhea inducing types of coli bacteria (F4 and F18 E. coli), very efficiently. A minor in vivo pilot trial with piglets demonstrated that a cocktail of lingonberry and ramson significantly reduced the number of colibacteria in the gastrointestinal tract and faeces (up to a factor of 100) without inhibiting the good lactic acid bacteria or pig growth (Canibe et al., 2018). A decrease in the coli number is only an indirect measure for better intestinal health and the present project therefore will go further and document that the selected plant cocktails can be used to specifically inhibit weaning diarrhea. Regarding bioactive plant material, there is a need to find the most active species and varieties of allicin containing onions and the best and cheapest raw berry material, including possible use of side streams from production.

Objective:

Investigate whether plant product candidates, with the best antibacterial effect as tested in vitro, reduce susceptibility to E. coli induced-postweaning diarrhea and faecal E. coli shedding in organic piglets.

Activities:

Piglets will be challenged (infected) with E. coli F18 on days 1 and 2 after weaning at 7 weeks and followed for 3 weeks. The trial will include 4 treatments: 1) Control feed (CF) without challenge; 2) CF with challenge; 3) CF + Product A + challenge; 4) CF + Product B + challenge. From each litter (6 litters in total), 8 piglets (housed in pairs) are distributed on the 4 treatments. Piglet feed intake, growth, general health condition are recorded. Fecal samples are taken directly from rectum every day the first week and 3 times a week for the rest of the period. The fecal consistency is evaluated (defined scale) and analyzed for dry matter content, and quantification of E. coli F18 and E. coli toxins.

Extent and type of project

45-60 ECTS

Additional information

The student will be involved in the work with the animals and in the laboratory analyzing the samples taken, as well as analyzing and interpreting the results

Can garlic and acidic berries prevent post-weaning diarrhea in piglets?

Main subject area

Livestock health.

Department and supervisor

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

Ole Højberg, senior researcher

E-mail: ole.hojberg@anis.au.dk

Phone: +45 87157792/+45 61384070

Project start

September 2020.

Physical location of project and students work

AU-Foulum, Dept. Animal Science, Health Section.

Short project description

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

Garlic and certain other related plants contain the natural defense compound allicin that has a historical reputation and recognition for its antimicrobial properties. Allicin is typically not as potent an antimicrobial compound as classical antibiotics. Recently, however, it has been observed that the antimicrobial effect of garlic (allicin) can be enhanced significantly by mixing garlic with acidic berries.

In piglets, post-weaning diarrhea is a severe problem, typically caused by specific pathogenic strains of *E. coli*. It has been observed that *E. coli* may be more sensitive to garlic (allicin) than other bacteria, like lactic acid bacteria. Thus, adding a cocktail of garlic and acidic berries to the feed may be one way of preventing post-weaning diarrhea in piglets by inhibiting growth of *E. coli*, including the pathogenic strains.

The purpose of the master project is to test differences in sensitivity to garlic (allicin) for a number of *E. coli* strains to investigate, if e.g. pathogenic strains may be more or less sensitive than non-pathogenic (commensal) strains. Further, garlic sensitivity will be tested for a range of other, commensal pig gut bacteria.

Additional information

None

Occurrence of MRSA in pigs and people in free-range pig production systems

Main subject area

One health

Department and supervisor

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

Hanne Kongsted, Postdoc

E-mail: hanne.kongsted@anis.au.dk

Phone: +45 9350 8454

Project start

The project started in 2019 – and will be running for two years

Physical location of project and students work

The study is conducted in commercial free-range based pig herds. Expect to spend some time at Foulum also – and perhaps at Statens Serum Institut, Copenhagen.

Short project description

As it is established, that pigs in free-range based productions systems have a lower prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) than pigs in conventional indoor herds, the project aims to find out more about the background. Does access to fresh air and the use of antibiotics have an influence? – Do the employees in these herds carry MRSA? Does it matter, whether the herds buy gilts from conventional indoor herds?... – And more questions could be asked...

Additional information

As the project runs in commercial production herds, a driver's license is necessary.

Sow mortality – exploring the background of fatal liver torsions

Main subject area

Sow health and welfare

Department and supervisor

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

Hanne Kongsted, Postdoc

E-mail: hanne.kongsted@anis.au.dk

Phone: +45 9350 8454

Project start

Project is expected to start in the autumn 2020

Physical location of project and students work

More possibilities: Daka, Randers, SEGES, Laboratory for Pig Diseases, Kjellerup, Danish Crown, Skærbæk.

Short project description

In a recent study, we saw very surprising results, when spontaneously dead sows from the farrowing unit were necropsied. 42% of deaths in ten herds were caused by liver torsions. We need to dig into this problem and find out why they happen and how to prevent it. The project will be broad-spectered with examinations of dead sows and anatomical descriptions of livers from slaughtered sows.

Additional information

A report on the project forming the basis of this study can be found here:

<https://dcapub.au.dk/djfpublikation/djfpdf/DCArapport162.pdf>

For participation in the project, a driver's license is useful.

Reducing antibiotic and zinc-oxide use in pig production

Main subject area

Pig health and welfare

Department and supervisor

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

Hanne Kongsted, Postdoc

E-mail: hanne.kongsted@anis.au.dk

Phone: +45 9350 8454

Project start

Any time.

Physical location of project and students work

Commercial pig herd.

Short project description

An experiment is conducted in four commercial sow herds during 2019-2021. In this experiment, metaphylactic treatment with antibiotics and use of zinc-oxide is not allowed. There will be different possibilities for joining this study for a Master's project. Suggestions could be for you to look into the effect of birth weight and weaning weight on health, look into the effect of non-use of zinc-oxide in the weaning section or measure the effect of non-use of antibiotics on navel and leg infections

Additional information

You should be ready to record data in commercial pig herds. We expect you to have a driver's license.

Application of local anesthesia in piglets before castration – best practice and quantification of affective states in newborn pigs

Main subject area

Welfare in pigs

Department and supervisor

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

Hanne Kongsted, Postdoc

E-mail: hanne.kongsted@anis.au.dk

Phone: +45 9350 8454

Project start

The experimental phase of this project begins in June 2020 and runs for a period of half a year.

Physical location of project and students work

Commercial pig herd with loosed housed farrowing sows in Hjortshøj.

Short project description

It is mandatory, that all castrated pigs in Denmark receive local anesthesia prior to castration. We aim to find out how this is carried out in a way that provides the best possible animal welfare – taking into account that the procedure is carried out by the farmers themselves. An experimental study on different methods for application of anesthesia and the optimal timing between application of anesthesia and castration is carried out. In addition, this study will provide new knowledge on the expression of pain in newborn pigs.

Do pigs in free-range based systems have weaning diarrhea?

Main subject area

Health and welfare in pigs

Department and supervisor

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

Hanne Kongsted, Postdoc

E-mail: hanne.kongsted@anis.au.dk

Phone: +45 9350 8454

Project start

The project started in 2019 – and will be running for two years.

Physical location of project and students work

The study is conducted in commercial free-range based pig herds. Expect to spend some time at Foulum also

Short project description

The use of antibiotics is lower in free-range based systems than in indoor conventional systems for pigs. There could be several explanations for this, and one obvious one is, that the legislation is more restrictive in organic systems. In this project, we aim to find out, whether the free-range based herds seem to manage well without much use of antibiotics, in terms of not having significant problems with weaning diarrhea. We also expect to gain insights in the use of medical zinc-oxide in the systems.

Additional information

As the project runs in commercial production herds, a driver's license is necessary.

Animal transport and related management

Main subject area

Animal behaviour and welfare.

Department and supervisor

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

Mette S. Herskin, Senior scientist

E-mail: MetteS.Herskin@anis.au.dk

Phone: +45 50502969

Project start

Anytime – depends on project availability.

Physical location of project and students work

At ANIS, AU-FOULUM, 8830 Tjele.

Short project description

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

Additional information

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

3R – Refinement of animal experimentation

Main subject area

Animal welfare.

Department and supervisor

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

Mette S. Herskin, Senior scientist

E-mail: MetteS.Herskin@anis.au.dk

Phone: +45 50502969

Project start

Anytime – depends on project availability..

Physical location of project and students work

At ANIS, AU-FOULUM, 8830 Tjele.

Short project description

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

Additional information

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

Play behaviour in piglets – effects of body weight

Main subject area

Animal science, animal behaviour, animal welfare.

Department and supervisor

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

Margit Bak Jensen, Senior Scientist,

E-mail: MargitBak.Jensen@anis.au.dk

Tel.: +45 87157941

Co-supervisor

Lene Juul Pedersen, Professor

Project start

Spring 2020.

Physical location of project and students work

AU, Foulum, Blichers Allé 20, Tjele.

Short project description

Good animal welfare is about the absence of negative experiences and the presence of positive experiences. Play behaviour is suggested to a good indicator of animal welfare (Boissy et al. 2007, *Physiol Behav* 92:375-397). Play behaviour in piglets includes locomotor play and social play. Play behaviour includes elements of defence and flight, but during play behaviour these elements are exaggerated, repeated, and more variable than during the corresponding functional behaviour. Young animals are motivated to play when their primary needs are met and there is no danger, while the occurrence of play is reduced when there are threats to welfare. Studies of piglets and calves have found that the occurrence of play is reduced by weaning (Krachun et al. 2010 *Appl Anim Behav Sci* 122:71-76; Donaldson et al. 2002 *Appl Anim Behav Sci* 79:221-231). In cattle, more dependent young respond more to weaning than less dependent young, but, but the effect of this has not been studied in piglets.

The study aims to investigate the effect of piglet body weight on the occurrence of play behaviour and the decline in play behaviour at weaning. In each litter a heavy piglet, a medium weight piglet and a light piglet are selected and marked for individual identification on video. Before and after weaning at d 28 of age, data for play behaviour, weight and health are collected for these three piglets in each of 32 litters before and after weaning. As part of another study piglets are weaned by either by traditional management or by alternative management (where piglets stay in the farrowing pen after removal of the dam).

Additional information

Prerequisite is the course Behaviour in Domesticated Animals

Play behaviour in piglets – effects of weaning management

Main subject area

Animal science, animal behaviour, animal welfare.

Department and supervisor

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

Margit Bak Jensen, Senior Scientist,

E-mail: MargitBak.Jensen@anis.au.dk

Tel.: +45 87157941

Co-supervisor

Lene Juul Pedersen, Professor

Project start

Spring 2020.

Physical location of project and students work

AU, Foulum, Blichers Allé 20, Tjele.

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Good animal welfare is about the absence of negative experiences and the presence of positive experiences. Play behaviour is suggested to a good indicator of animal welfare (Boissy et al. 2007, *Physiol Behav* 92:375-397). Play behaviour in piglets includes locomotor play and social play. Play behaviour includes elements of defence and flight, but during play behaviour these elements are exaggerated, repeated, and more variable than during the corresponding functional behaviour. Young animals are motivated to play when their primary needs are met and there is no danger, while the occurrence of play is reduced when there are threats to welfare. Studies of piglets and calves have found that the occurrence of play is reduced by weaning (Krachun et al. 2010 *Appl Anim Behav Sci* 122:71-76; Donaldson et al. 2002 *Appl Anim Behav Sci* 79:221-231). In piglets, weaning typically includes both separation from the dam, introduction to a novel environment and regrouping, but the effect of these separate factors are not known.

The study aims to investigate the effect of two different weaning management on the occurrence of play behaviour. Piglets are weaned at d 28 of age, either by traditional management where piglets are moved and regrouped in weaner pens, or by alternative management, where piglets stay in the farrowing pen after removal of the dam. As part of another study, the effect of genotype on play behaviour is investigated. The design includes 32 litters and data for play behaviour, weight and health are collected for three piglets per litter before and after weaning

Additional information

Prerequisite is the course Behaviour in Domesticated Animals.

Cow'n'Calf: Separation and Weaning of Dam-Reared Calves

Main subject area

Animal science, animal behaviour, animal welfare.

Department and supervisor

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

Margit Bak Jensen, Senior Scientist,

E-mail: MargitBak.Jensen@anis.au.dk

Tel.: +45 87157941

Co-Supervisor:

Maja Bertelsen, PhD Fellow

E-mail: Maja@anis.au.dk

Project start

Autumn 2020 and/or spring 2021.

Physical location of project and students work

AU Foulum and Organic Dairy Herd yet to be decided on.

Short background description:

Cow and calf are typically separated within 24h of birth in the dairy production. This allows the cow only little expression of maternal behavior and deprives the calf of maternal care. An increased focus on the effect of this early separation for animal welfare and the importance of positive affective states has initiated research, which focuses on whether a later separation of cow and calf can be a feasible management option.

Prolonged cow and calf contact has been shown to promote normal social behaviour, reduce abnormal behaviour and reduce stress and fear responses. On the other hand, the presence of the dam reduced the effect of human handling and increased the response to separation (see Meagher et al., 2019; J. Dairy Sci. 102:5765–5783 for review).

Thus, the right management needs to be developed to facilitate increased animal welfare and a feasible production. This includes research on the best way to separate and wean the calf from the cow – this could be using fence-line separation, nose-flaps and comparing different pre-weaning management systems with either full or part time contact (see Jensen et al., 2018; Chapter 6 - The role of social behavior in cattle welfare in <https://www-sciencedirect-com.ez.statsbiblioteket.dk:12048/book/9780081009383/advances-in-cattle-welfare> for review).

The thesis will be part of a larger experimental study conducted on a commercial organic farm in Denmark during the winter 2020-2021 where we will compare ways to keep cow and calf together in a barn with milking robots vs. early separation. The study is part of the project Calf'n'Cow (KalvVedKo) aiming is to help develop the required knowledge to keep cow and calf together for an extended period of time in the organic dairy production.

Feel free to contact us for further information or if you have alternative suggestions to research questions within the project.

Extent and type of project:

Can be adapted to 45 or 60 ECTS

Additional information:

Prerequisite is the course Behaviour in Domesticated Animals or Animal Behaviour

Driving license can be an advantage

Ileal digestibility of green protein

Main subject area

Animal Nutrition/Animal Science.

Department and supervisor

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

Søren Krogh Jensen, Senior Scientist

E-mail: skj@anis.au.dk

Phone: +45 8715 8076

Co-supervisor:

Lene Stødkilde-Jørgensen, Assistant Professor,

E-mail: lsj@anis.au.dk,

Phone: +45 8715 4284

Project start

Any time, depending on project extent, but the animal experiments will take place in the fall of 2020.

Physical location of project and students work

Practical work will take place at Department of Animal Science, AU-Foulum, DK-8830 Tjele. Possibility to do office work in Aarhus..

Short project description

Green protein from the biorefinery process holds the potential of replacing soya proteins in Danish animal husbandry, if protein yield and quality are optimised. Previous feeding trials have emphasized the feed potential of green protein; however, knowledge is needed of the digestibility of essential amino acids. In this project, the digestibility of protein extracted from different local biomasses will be evaluated in an ileum-cannulated pig model. The protein sources include red clover, lucerne, and a white clover/ryegrass mixture with varying protein- and fibre composition, all compared to a soya protein source.

Extent and type of project

30-45-60 ECTS as appropriate.

Additional information

The student will get the opportunity of assisting with the animal experimentation, which will take place during fall 2020.

The master project will be connected to an ongoing research projects involving various aspects of green protein.

The master's student should be interested in laboratory work in collaboration with scientists and lab technicians, as well as data processing.

Insect nuisance in horses

Main subject area

The focus of the project can be on horse welfare (behaviour and stress biology) or insect biology.

Department and supervisor

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

Janne Winther Christensen, Ph.D., Associate Professor

E-mail: jwc@anis.au.dk

Phone: +45 87158075

Project start

Summer 2020.

Physical location of project and students work

Private horse studs for data collection. Driver's license is necessary. Data analysis can be in Foulum or Aarhus.

Short project description

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

Additional information

Driver's license is necessary.

Natural disease protection in horses

Main subject area

Animal science/horses/immunology/disease control.

Department and supervisor

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

Rikke Brødsgaard Kjærup, post doc

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

Phone: +45 87157889

Tina Sørensen Dalgaard, associate professor

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

Phone: +45 87158052

Project start

Any time.

Physical location of project and students work

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

Possibility to do office work in Aarhus.

Private horse stables for sample collection.

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. The immune-related genes have extensive polymorphisms creating diversity and influencing the immune response of the organism.

The general aim is to study the innate immune genes in the horse and their polymorphisms. This will be done by a literature review and by sequencing selected genes and identifying polymorphisms that may influence the expression and functionality of the proteins.

Extent and type of project

ECTS content is flexible. The degree of lab work is adjustable according to ECTS and interest.

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 molecular biology and ELISA.

Welfare in dogs, cats and horses

Main subject area

Welfare in family animals (cats, dogs or horses), e.g. within selective breeding, nutrition and feeding, training and behavioural problems, reproductive control, veterinary treatment, abandoned and stray animals; see further description via the link below (in Danish), or contact us for more information:

<https://dyreetik.ku.dk/center-for-forskning-i-velfaerd-hos-familiedyr/>

Department and supervisor

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

Janne Winther Christensen, Ph.D., Associate Professor

E-mail: jwc@anis.au.dk

Phone: +45 87158075

Peter Sandøe, Professor, Department of Veterinary and Animal Sciences, KU,

E-mail: pes@sund.ku,

Phone: +45 35333059 (Center leader);

Or one of the other senior researchers in the newly established Center for Research on the Welfare of Family Animals, depending on subject, see:

<https://dyreetik.ku.dk/center-for-forskning-i-velfaerd-hos-familiedyr/>

Project start

Any time.

Physical location of project and students work

Anywhere.

Short project description

The newly established Center for Research on the Welfare of Family Animals provides good opportunities for students with an interest in welfare of dogs, cats and horses to conduct their MSc project under supervision of the affiliated senior scientists. Their expertise comprises a range of welfare-related subjects, such as animal behaviour and training, stress biology, breeding, nutrition and veterinary treatment.

Additional information

Driver's license is necessary.

Natural disease protection in mink

Main subject area

Animal science/mink/immunology/disease control.

Department and supervisor

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

Rikke Brødsgaard Kjærup, post doc

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

Phone: +45 87157889

Tina Sørensen Dalgaard, associate professor

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

Phone: +45 87158052

Project start

Any time.

Short project description

Recurrent problems regarding reproduction occurs in the mink production. Therefore, it is of a general interest to produce robust mink, but the definition of robustness is broad and specific measurements are needed. One importance factor in robustness is health and this project will focus on immune competence and how to measure it in the mink. The project will work with immune markers and the establishment of methods to detect them.

Potential study areas include

- Content of selected plasma proteins with relevance for immune competence (e.g. Mannose-binding lectin, Haptoglobin, Fibrinogen, "natural" antibodies)
- Content of plasma opsonins (the potential of serum proteins to stimulate phagocytosis in macrophages in vitro)
- The capacity of leukocytes to phagocytose and destroy pathogens (full blood phagocytose assay)
- The capacity of leukocytes to activate via the Toll-like receptors (e.g. LPS induced TNFA-alpha response)
- Proliferation of lymphocytes after mitogen stimulation
- Sequencing of innate immune genes

Extent and type of project

ECTS content is flexible. The degree of lab work is adjustable according to ECTS and interest.

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 molecular biology, cell culture, flow cytometry and ELISA.

Assessment of broiler welfare

Main subject area

Animal behaviour and welfare.

Department and supervisor

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

Anja Brinch Riber, Ph.D., Senior Researcher

E-mail: anja.riber@anis.au.dk

Phone: +45 87157949

Project start

1st September 2020 (flexible to some degree)

Physical location of project and students work

AU, Foulum, Blichers Allé 20, Tjele and private farms.

Short project description

In broiler production, the rapid growth, high body weight and low levels of activity induce issues such as various degrees of lameness and contact dermatitis (i.e. footpad lesions and hock burns). Another welfare challenge is unwanted behaviours instigated by fearfulness. Exaggerated fear responses may cause smothering, resulting in scratches or even mortality due to suffocation. Finally, the reduced mobility of the birds, the barren environment and the high stocking densities limit the performance of natural behaviours such as dustbathing. The described issues are unwanted from an animal welfare point of view and results in economic losses for the farmer.

The aim of the master project is to investigate the link between welfare indicators collected at different ages, e.g. can walking ability at 3 weeks of age be used to predict the level of welfare at slaughter age? During the master project, the candidate will be part of a large international and interdisciplinary research project that aims to improve broiler welfare using Precision Livestock Farming (PLF). The responsibility of the master student concerns welfare assessments of conventional broilers, based on data collected directly on-farm and via video recordings, using traditional welfare assessment protocols.

Additional information

The master project will be connected to an on-going research project.

Prerequisite is at least one of the courses 'Behaviour in Domesticated Animals', 'Animal Behaviour' or something similar. Driver's license is necessary.

Extent of MSc: 45-60 ECTS as appropriate.

Production diseases and general robustness in poultry

Main subject area

Animal science/poultry/disease resilience/disease control/microbiology/immunology.

Department and supervisors

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

Ricarda Engberg, Associate professor

E-mail: Ricarda.Engberg@anis.au.dk

Phone: + 45 87157904

Tina Sørensen Dalgaard, associate professor

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

Phone: +45 87158052

Project start

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

Physical location of project and students work.

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

Possibility to do office work in Aarhus.

Short project description

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

Potential study areas include

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

Additional information

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

Dual-Purpose genotypes in organic egg-production

Main subject area

Animal science/poultry/nutrition/genotypes/environment/welfare/immunology.

Department and supervisor

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

Sanna Steinfeldt, Senior Researcher

E-mail: Sanna.Steenfeldt@anis.au.dk

Phone: +45 87158074

Ricarda Engberg, Associate professor

E-mail: Ricarda.Engberg@anis.au.dk

Phone: + 45 87157904

Project start

The project is running in 2020, so start can be decided in agreement with the supervisor. Projects of 45 and 60 ECTS are preferred..

Physical location of project and students work

Department of Animal Science, AU Foulum, Blichers Allé 20, 8830 Tjele.

Short project description

The study is part of the EU project PPILOW and will look into strategies to avoid killing of day-old male layer chicks to ensure sustainability in free-range and organic poultry production.

The aim of the present experimental study is to evaluate the characteristics of female chickens (layers) from different dual-purpose genotypes (breeds that can be used for egg and meat production) during the rearing phase and during egg production. The experiment will be carried out with four different genotypes on the Organic Platform at AU-Foulum, where the layers have access to outdoor areas with vegetation and trees.

The following measures will be included in the study to characterise the difference and potential of the different genotypes:

- Egg production and egg characteristics and quality
- Interaction between genetic, nutrition and environment
- Foraging behaviour and use of outdoor area
- Immunology and robustness
- Welfare assessments

Additional information

The master student will be involved in an on-going EU-project and will get the possibility to be part of a study with focus on the challenges in organic egg-production. The student will get training in animal experimentation and work together with a team of scientists and experienced technicians. In relation to immunology measures, the student will have the opportunity to conduct specific analyses in the laboratory. An interest in organic production and involvement in experiments on out-door facilities with free-range birds will be an advantage.

Biorefining – optimization of protein

Main subject area

Animal Nutrition/Animal Science.

Department and supervisor

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

Søren Krogh Jensen, Senior Scientist

E-mail: skj@anis.au.dk

Phone: +45 8715 8076

Co-supervisor:

Lene Stødkilde-Jørgensen, Assistant Professor,

E-mail: lsj@anis.au.dk,

Phone: +45 8715 4284

Project start

Any time, depending on project extent.

Physical location of project and students work

Practical work will take place at Department of Animal Science, AU-Foulum, DK-8830 Tjele.

Possibility to do office work in Aarhus.

Short project description

Grass and lucerne have a high content of highly digestible proteins; however, the proteins are bound to the plant fibre matrix, thereby making the unprocessed grass and lucerne a less attractive protein source for animal feed compared to soya proteins. The plant-bound proteins are extracted via a biorefinery process, resulting in a protein concentrate, which can be used in monogastrics feeding. The legume lucerne has demonstrated potential as protein source; however, the protein extraction process requires refinement to increase protein yield and quality from the plant matrix, a refinement that is necessary if the production is to be environmentally and economically sustainable. Therefore, this lab scale project investigates how to optimise protein extraction from the plant fibre matrix using enzymes and different separation conditions. Moreover, the quality of the produced fractions will be investigated using in vitro digestibility techniques. Knowledge obtained in lab-scale will be exploited in an up-scaled process.

Extent and type of project

30-45-60 ECTS as appropriate.

Additional information

The master project will be connected to an ongoing research projects involving various aspects of green protein.

The master's student should be interested in laboratory work in collaboration with scientists and lab technicians, as well as data processing.

Biological activity of milk and plant-based alternatives

Main subject area

Animal Science / Cell biology.

Department and supervisor

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

Stig Purup, senior researcher

E-mail: stig.purup@anis.au.dk

Phone: +45 8715 7808 or +45 29345955

Project start

Any time

Physical location of project and students work

Dept. Animal Science, Blichers Allé 20, Building P25, 8830 Tjele, Denmark

Short project description

Food contains compounds that have positive or negative effects on animal and human health. Milk is a good example and is known as the nature's most complete food. Milk contains protein, fat, carbohydrate, vitamins and minerals, but also many compounds with biological effects – called bioactive compounds. These include more than 60 different hormones and growth factors that can affect digestion and function of the gastrointestinal tract, and that are important for development of the newborn and consumers of milk. In recent years, the alternatives to conventional cows' milk have increased with a number of plant-based options: "milks" made from soy, almonds, oats, rice hemp, coconuts and more. Using cell-based models of human or animal tissues, the project will investigate the biological activity of cow's milk or plant-based alternatives, and will elaborate on the healthy or non-healthy effects of these alternatives.

Extent and type of project

45-60 ECTS. This project will be designed and planned in collaboration with the MSc student, and the student will collect and analyze his/her own data. The MSc student is invited as a co-author on an out coming scientific paper. No experience with cell-based assays is required.

Additional information

A number of people is driving from Aarhus to AU-Foulum every day, so transport should be possible without having a car.

Protein quality of seaweed for feed and food

Main subject area

Animal Nutrition/Animal Science.

Department and supervisor

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

Søren Krogh Jensen, Senior Scientist

E-mail: skj@anis.au.dk

Phone: +45 8715 8076

Project start

Any time, depending on project extent.

Physical location of project and students work

Practical work will take place at Department of Animal Science, AU-Foulum, DK-8830 Tjele. Possibility to do office work in Aarhus.

Short project description

Seaweed (macroalgae) is a group of photosynthetic organisms that are rich in nutrients such as protein, essential fatty acids, minerals and vitamins, in addition they often have a high content of functional carbohydrates. Seaweed is widely used worldwide. There is considerable variation in nutrient composition between species. Seaweed protein is considered as a high quality protein due to a high fraction of essential amino acids in relation to, for example, soybean and fish meal, but may be low in yield. In addition, seaweed has bioactive components such as specific carbohydrates and phenolic compounds with antiviral and antioxidant activities. Since seaweed does not occupy agricultural land, there has been an increased focus on the protein fraction in seaweed as an alternative source for feeding the global growing population. Protein constitutes 3-15% of dry matter in brown algae, while red and green algae have protein levels of 10-47% of the dry matter content. The purpose of this project is to identify which seaweed species and biorefining methods that secure high protein yield, taste, functional properties and protein quality, as well as nutritional value (protein digestibility). The focus of the master thesis project is to investigate the influence of different seaweed and processing methods on the protein digestibility and quality of seaweed measured in digestive experiments with rats.

Extent and type of project

30-45-60 ECTS as appropriate.

Additional information

The master project will be connected to an ongoing research projects involving various aspects of green protein.

The master's student should be interested in laboratory work in collaboration with scientists and lab technicians, as well as data processing.

Biobanking as a conservation tool

Main subject area

Animal science/cell biology.

Department and supervisor

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

Stig Purup, senior researcher

E-mail: stig.purup@anis.au.dk

Phone: +45 8715 7808 or +45 29345955

Julie Strand, PhD student;

E-mail: just@regnskoven.dk;

Phone: +45 30248748

Project start

Any time.

Physical location of project and students work

Department of Animal Science, Blichers Alle 20, Building P25, 8830 Tjele, Denmark.

Short project description

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

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

This project will focus on establishing viable cell lines from different species within the class reptiles as well as explore how the results can be used in future conservation strategies. The project will contain 1) theoretical overview of existing research within the class of reptiles; 2) establishment of viable cell cultures for different species within the class, and 3) optimization and further development of techniques.

Extent and type of project

45-60 ECTS. This project has an extensive experimental part (see section 3) and 4)). The project is in collaboration with Randers Regnskov. The MSc student is invited as a co-author on an out coming scientific paper. No experience with cell-based assays is required.

Additional information

A number of people is driving from Aarhus to AU-Foulum every day, so transport should be possible without having a car.

Topics in cooperation with SEGES, Aarhus

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

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

Regarding pigs:

Thomas Sønderby Bruun
HusdyrInnovation
Phone.: +45 8740 5264/+45 2498 3877
E-mail: ths@seges.dk

Regarding ruminants:

Jaap Boes
HusdyrInnovation, Sundhed, velfærd og reproduktion, kvæg
Phone: +45 8740 6655/ +45 2463 1684
E-mail: jbo@seges.dk

Regarding poultry:

Jette Søholm Petersen
Økologi Innovation
Phone: +45 8740 5381/ +45 2171 7715
E-mail: jtp@seges.dk