

AUintensive (AU2), Aarhus University

Research topics:	<p>The general aim for the intensive unit at Danish Cattle Research Centre/Department of Animal Science is to provide unique facilities that promotes the generation of new knowledge about ruminant animals' physiological and production related responses to nutrition and feeding through studies of the basic qualitative and quantitative digestive, absorptive and metabolic processes. Further, the aim is to identify suitable biomarkers for physiological imbalances and nutrient status in order to develop production effective and sustainable feeding strategies covering the nutrient requirements of the animals in changing physiological stages.</p> <p>Primary focus areas</p> <ul style="list-style-type: none">• Quantification of the metabolism of nutrients at organ and animal level• Physiological regulation of the domestic animals' responses and identification of phenotypic and genotypic biomarkers• Nutrient requirements in relation to the animals' various physiological stages• Nutrition focusing on production with regard for health, welfare and product quality• Improvement of domestic animals' utilisation of resources and their role in the circular bio economics• Feeding solutions with regard to reduction of domestic animals' environmental impact with N, P, heavy metals etc. as well as climate impact through emission of greenhouse gases and ammonia. <p>Website: http://kfc-foulum.dk/sider/english.html</p> <p>Brask M, Lund P, Hellwing ALF, Poulsen M, Weisbjerg MR 2013. Enteric methane production, digestibility and rumen fermentation in dairy cows fed different forages with and without rapeseed fat supplementation. <i>Anim. Feed Sci. Tech.</i> 184:67-69. https://doi.org/10.1016/j.anifeedsci.2013.06.006</p> <p>Johansen, M., Lund, P., Weisbjerg, M.R. 2018. Amino acid profile of metabolisable protein in lactating dairy cows is affected by dry matter concentration in grass-clover silage. <i>Anim. Feed Sci. Technol.</i> 237:166-174. https://doi.org/10.1016/j.anifeedsci.2018.01.002.</p> <p>Kristensen, N. B., Storm, A. C. Larsen, M. 2010. Effect of dietary nitrogen content and intravenous urea infusion on ruminal and portal-drained visceral extraction of arterial urea in lactating Holstein cows. <i>J. Dairy Sci.</i> 93:2670–2683. http://doi:10.3168/jds.2010-3067</p> <p>Larsen, M. & Kristensen, N.B. 2009. Effect of abomasal glucose infusion on splanchnic and whole-body glucose metabolism in periparturient dairy cows. <i>J. Dairy Sci.</i> 92:1071–1083. http://doi.org/10.3168/jds.2008-1453.</p> <p>Larsen, M., Lapierre, H., Kristensen, N.B. 2014. Abomasal protein infusion in postpartum transition dairy cows: Effect on performance and mammary metabolism. <i>J. Dairy Sci.</i> 97:5608–5622. http://dx.doi.org/10.3168/jds.2013-7247.</p> <p>Olijhoek, D. W. Hellwing, A. L. F. Brask, M. Weisbjerg, M. R., Højberg, O. Larsen, M. K. Dijkstra, J. Erlandsen, E. J., Lund, P. 2016. Effect of dietary nitrate level on enteric methane production, hydrogen emission, rumen fermentation, and nutrient digestibility in dairy cows. <i>J. Dairy Sci.</i> 99:6191-6205. http://dx.doi.org/10.3168/jds.2015-10691.</p>
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<p>Activities and services currently offered by the infrastructure/installation:</p>	<p>The installation includes up to 12 rumen and intestinally (duodenum and ileum) fistulated cows, 3 rumen fistulated cows for in situ incubations and collecting rumen liquid for in vitro studies, and up to 10 multi-catheterised and rumen fistulated cows. There are four respiration chambers and facilities for animal surgery.</p> <p>The combined access to rumen and intestinally fistulated animals and animal friendly respiration chambers offers an exceptional possibility to study the interaction between nutrient digestion and metabolism and enteric methane emission when a given methane mitigation strategy is to be evaluated.</p> <p>Measures: Rumen, small intestinal, hindgut and total tract digestibility of multiple nutrients using external markers, feed intake, weight and milk production, diurnal VFA pattern, diurnal NH₃ pattern, rumen microbial community, VFA net absorption, rumen pool size, rumen kinetics including fractional rate of digestion and passage, mean retention time of nutrients and fluids, rumen microbial protein synthesis, multiple blood sampling, possibility to infuse markers and nutrients at different parts of the gastro intestinal tract, total collection of urine, in situ studies of rumen and total tract digestibility, net absorption, net liver and mammary metabolism, postprandial patterns of net absorption and liver metabolism, urinary excretion of <i>e.g.</i> N containing nutrients for balance studies, gas exchange (O₂, H₂, CH₄, CO₂, H₂S) and daily pattern in methane production and dry matter intake.</p> <p>Skilled technicians work together with the barn staff to collect and validate data to secure data quality. Scientists have at least weekly meetings with the barn staff. The users are supported in writing a protocol based on their ideas, experimental objectives and the practical possibilities. The technicians are responsible for the follow up of the protocol during the experiment, and they also support the integration of the collected data into the type of file/database defined together with the user. Special agreement can be made with the animal keepers and the technicians regarding sampling, feeding, management etc.</p>
<p>Description of the access to be provided under SmartCow TNA calls:</p>	<p>The unit of access for each installation is defined as one cow week. One typical access for a project at AU2 consists of 64 units, which is equal to <i>e.g.</i> 4 cows in 4 periods of 4 weeks each. One typical access covers the preparatory work, access to the installation and data recording for a pre-planned period. More specifically, it includes the discussion of research plans and protocols with users, and an introduction to the facilities. The access includes supplying animals, animal housing, preparation, feeding and daily care as well as delivering data.</p>
<p>Animal types, diets, housing and experimental conditions that can be worked on in this infrastructure/installation:</p>	<p>Studies are performed in tie stalls and potentially with both lactating and dry cows. Animals can be fed different diets either ad libitum or restricted, and number of feedings per day is optional. Feed intake is recorded on a daily basis. Possibility for infusion of markers or labelled nutrients. Enteric methane can be measured in 4 respiration chambers.</p> <p>No products (milk, meat) from this barn are used for human consumption making it possible to use feeds, markers, nutrients etc. that cannot be used in a normal production facility.</p> <p>The basic herd is Danish Holstein cows recruited from herd young stock (heifers).</p>

Travel and subsistence costs:	
Infrastructure/installation ethical rules:	<p>According to Danish Law, all experiments involving animals, where the severity of the involved procedures are considered more severe than an injection, are evaluated ethically by the National Authority (https://www.foedevarestyrelsen.dk/Dyr/dyrevelfaerd/Dyreforsogstilsynet/Sider/Ansoegning-og-indberetning.aspx), and licenses issued. All persons – researchers, students, barn staff – who take part in the collection of samples from studies under license must have taken part in a course in Animal Experimentation, corresponding to 2.5 ECTS credits, and accredited by FELASA and the Danish authorities. At the Institute of Animal Science; Aarhus University, the head of the local Animal Welfare Body Mette S. Herskin (email mettes.herskin@anis.au.dk) can be contacted.</p>