

The Experimental Facility for Cattle (EFC) installations at the Leibniz Institute for Farm Animal Biology (FBN) – 3) ExpPhysRoom

Research topics:	<p>The EFC infrastructure at the Leibniz Institute for Farm Animal Biology (FBN) offers services in four installations: (1) Barn, (2) RespCham, (3) ExpPhysRoom, and (4) BehavArena. The research topics possible in the installation ‘ExpPhysRoom’ feature nutrition and metabolism research determining energy and feed efficiency, health and performance traits, and directly addresses research questions relevant to macronutrient metabolism and mitigation of nitrogen emissions from cattle. Selected publications of studies performed in the FBN EFC ‘ExpPhysRoom’ installation are:</p> <p>Duske K, Hammon HM, Langhof A-K, Bellmann O, Losand B, Nürnberg K, Nürnberg G, Sauerwein H, Seyfert M, Metges CC. Metabolism and lactation performance in dairy cows fed a diet containing rumen-protected fat during the last twelve weeks of gestation. <i>J Dairy Sci</i> 92, 1670–1684, 2009.</p> <p>Kaufmann LD, Münger A, Rérat M, Junghans P, Görs S, Metges CC, Dohme-Meier F. Energy expenditure of grazing cows and cows fed grass indoors as determined by the ¹³C bicarbonate dilution technique using an automatic blood sampling system. <i>J Dairy Sci</i> 94, 1989–2000, 2011. DOI:10.3168/jds.2010-3658.</p> <p>Steinhoff-Wagner, J., Görs, S., Junghans, P., Bruckmaier, R. M., Kanitz, E., Metges, C. C., H. M. Hammon. Intestinal glucose absorption but not endogenous glucose production differs between colostrum- and formula-fed neonatal calves. <i>J. Nutr.</i> 141:48-55, 2011.</p> <p>Hötger K, Hammon HM, Weber C, Görs S, Tröscher A, Bruckmaier RM, Metges CC. Supplementation of CLA in dairy cows reduces endogenous glucose production during early lactation. <i>J Dairy Sci</i> 96 (4), 2258-2270, 2013. doi: 10.3168/jds.2012-6127.</p> <p>Gohlke A, Ingelmann CJ, Nürnberg G, Weitzel JM, Hammon HM, Görs S, Starke A, Wolfram S, Metges CC. Influence of 4 wk intraduodenal supplementation of quercetin on performance, glucose metabolism, and mRNA abundance of genes related to glucose metabolism and antioxidative status in dairy cows. <i>J Dairy Sci</i> 96 (11), 6986-7000, 2013. doi: 10.3168/jds.2013-6852.</p> <p>Stoldt A, Derno M, Nürnberg G, Weitzel JM, Otten W, Starke A, Wolfram S, Metges CC. Effects of a 6 wk intraduodenal supplementation with quercetin on energy metabolism and indicators of liver damage in periparturient dairy cows. <i>J Dairy Sci</i> 98, 4509–4520, 2015. http://dx.doi.org/10.3168/jds.2014-9053.</p> <p>Gruse, J., Görs, S., Tuchscherer, A., Otten, W., Weitzel, J. M., Metges, C. C., Wolfram, S., H. M. Hammon. Effects of oral quercetin supplementation on splanchnic glucose metabolism in 1-week-old calves depend on diet after birth. <i>J. Nutr.</i> 145:2486-2495, 2015. DOI</p>
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	<p>10.3945/jn.115.218271. Weber C, Schäff C, Kautzsch U, Börner S, Erdmann S, Görs S, Schweigel-Röntgen M, Sauerwein H, Bruckmaier R, Metges CC, Kuhla B, Hammon HM. Insulin-dependent glucose metabolism in dairy cows with variable fat mobilization around calving. J Dairy Sci 99, 6665-6679, 2016.</p>
<p>Activities and services currently offered by the infrastructure/installation:</p>	<p>The 'ExpPhysRoom' is integrated in the Tiertechnikum of the FBN. The room provides six tied-stall places with feeding troughs for individual measurement of feed intake and water meters for determination of individual water intake in dairy cows. The room allows the alternative performance of long-term infusion studies, i. e. metabolic performance studies with tracers (stable isotope labelled nutrients), or clamp studies to evaluate insulin-dependent glucose metabolism (euglycaemic-hyperinsulinaemic or hyperglycaemic clamp studies) under defined room temperature settings (between 15 to 25°C). Cow studies involving stable-isotope labelled nutrient tracers, metabolic challenge test, circadian blood profiling, or quantitative excrements collection are performed in tie-stalls and involve a wide range of lab analyses. Concerning insulin clamps, plasma glucose concentrations are measured every 5 min and the plasma glucose concentration is kept constant by adjusting the glucose infusion rate. Alternatively, studies investigating nutrient metabolism usually comprise oral or intravenous (i.v.) stable-isotope labeled tracer application. For the i.v. route tracer solutions are infused by syringe pumps and blood is collected by separate permanent vein catheters. After centrifugation of blood, plasma or serum is stored for subsequent lab analyses which are available to investigators performing studies in the 'ExpPhysRoom'. In particular a range of chromatographic and mass spectrometric analysing techniques for tracer protocols are available featuring studies of quantitative glucose or amino acid turnover, nutrient oxidation, first-pass nutrient uptake, biosynthesis and protein synthesis rates, and energy expenditure. We offer opportunities to perform metabolic challenge (feed withdrawal or endocrine stimulation) or diurnal metabolic monitoring studies (response to meal feeding) in jugular vein catheterised cows or cows with gastrointestinal cannulas (rumen, duodenum). These studies include utilisation of a wide range of analytical methods allowing quantification and continuous profiling of metabolites or circulating nutrients (e.g. glucose, non-esterified fatty acids, triglyceride, urea, albumin, enzyme activities etc.).</p>
<p>Description of the access to be provided under SmartCow TNA calls:</p>	<p>The unit of access for the 'ExpPhysRoom' is defined as one cow*week, and a total of 20 units of access are offered. Average duration of a project may be 50 days and the estimated number of projects is 1. Users are supported by experienced staff with total respect of confidentiality. Assistance in obtaining ethic approval (has to be applied for in German language) can be provided. Users can be present and may actively participate in the experiment, according to their preferences and practical competencies.</p>

	<p>Access includes provision of animals, local feed, housing, veterinary supervision, feeding, milking and daily care, and assistance with sample collection. We offer analytical services as described above. Users can be present during lab analysis but do not have direct access to the lab instrumentation. Access does not include shipping of samples.</p>
<p>Animal types, diets, housing and experimental conditions that can be worked on in this infrastructure/installation:</p>	<p>Studies can be performed with German Holstein calves, heifers or cows fed total mixed ration based on grass and maize silage. Specific dietary composition can be provided with the support of the users.</p>
<p>Travel and subsistence costs:</p>	<p>Travel and subsistence costs of applicants can be reimbursed. Applicants should limit their stay spent at the infrastructure to a total of 14 days. Reimbursement is provided for a total of 14 days (e.g. 1 person for a total of 14 days or 2 persons for a total of 7 days).</p>
<p>Infrastructure/installation ethical rules:</p>	<p>Researchers submit their protocols for authorisation to the „Landesamtes für Landwirtschaft, Lebensmittelsicherheit und Fischerei (LALLF), State of Mecklenburg-Vorpommern“. Assistance in obtaining ethic approval can be provided (applications must be in German language).</p>