

## The Experimental Facility for Cattle (EFC) installations at the Leibniz Institute for Farm Animal Biology (FBN) – 2) RespCham

<p><b>Research topics:</b></p>	<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 '<b>RespCham</b>' feature nutrition and energy metabolism research determining energy and feed efficiency, health and performance traits, and directly address research questions relevant to mitigation of methane emissions from cattle.</p> <p>Selected publications of studies performed in the FBN EFC '<b>RespCham</b>' installation are:</p> <p>Derno M, Schön P, Nürnberg G, Schwarm A, Röntgen M, Hammon HM, Metges CC, Bruckmaier RM, Kuhla B. Short-term feed intake is regulated by macronutrient oxidation in lactating Holstein cows. <i>J Dairy Sci</i> 96 (2), 971-980, 2013. doi: 10.3168/jds.2012-5727.</p> <p>Aguinaga Casañas MA, Derno M, Rangkasenee N, Krattenmacher N, Thaller G, Metges CC, Kuhla B. Methyl-coenzyme M reductase A as an indicator to estimate methane production from dairy cows. <i>J Dairy Sci</i> 98 (6), 4074-83, 2015. doi: 10.3168/jds.2015-9310. PMID: 25841964.</p> <p>Stoldt A-K, Derno M, Das G, Weitzel JM, Wolfram S, Metges CC. Effects of rutin and buckwheat on energy metabolism and methane production in dairy cows. <i>J Dairy Sci</i> 99 (3), 2161-2168, 2016. doi: 10.3168/jds.2015-10143.</p> <p>Lamp O, Reyer H, Otten W, Nürnberg G, Derno M, Wimmers K, Metges CC, Kuhla B. Intravenous lipid infusion affects ruminal methane production in late lactating Holstein cows apart from their reduction in dry matter intake. <i>J Dairy Sci</i>. 2018 Mar 28. pii: S0022-0302(18)30293-5. doi: 10.3168/jds.2017-14101. [Epub ahead of print].</p> <p>Bielak A, Derno M, Tuchscherer A, Hammon HM, Susenbeth A, Kuhla B. Body fat mobilization in early lactation influences methane production of dairy cows. <i>Sci Rep</i>. 2016;6:28135.</p> <p>Engelke SW, Daş G, Derno M, Tuchscherer A, Berg W, Kuhla B, Metges C.C. Milk fatty acids estimated by mid-infrared spectroscopy and milk yield can predict methane emissions in dairy cows. <i>Agron. Sustain. Dev.</i> 2018 38:27.</p>
<p><b>Activities and services currently offered by the infrastructure/installation:</b></p>	<p>The '<b>RespCham</b>' is integrated in the Tiertechnikum of the FBN. The open-circuit indirect calorimetry system consists of 4 respiration chambers for dairy cows. Chambers can be light-cycle and climate controlled in the temperature and relative humidity range from 0°C to 35°C and 50% to 70%, respectively. The airflow through the chambers can be controlled by a bypass which also allows the gas exchange measurement of smaller animals, i.e. calves. Continuous measurements of O<sub>2</sub>, CO<sub>2</sub> and CH<sub>4</sub> concentrations allow to estimate energy expenditure, nutrient oxidation and CH<sub>4</sub> emissions (For further information see:</p>

	<p><a href="http://www.wageningenacademic.com/doi/abs/10.3920/978-90-8686-261-0_6">http://www.wageningenacademic.com/doi/abs/10.3920/978-90-8686-261-0_6</a>).</p> <p>Continuous measurements of NH<sub>3</sub> concentrations complement studies aiming to measure N-balances. Blood can be withdrawn from catheterized animals to measure metabolic and hormonal profiles. Chambers are equipped with a feed bin placed on a scale which is connected to an electronic registration device to measure feed intake as disappearance from the bin. Water intake is registered by water flow meters. Cows can be milked in the chamber. Standing and lying of the animals is registered by a photoelectric switch to assess physical activity. In order to monitor posture changes and the behavior of the animals, each chamber is equipped with an infrared reflector and a camera plugged into a video computer. Cow studies involving stable-isotope labelled nutrient tracers, metabolic challenge test, circadian blood profiling, or quantitative excrements collection can be performed in the chambers and involve a wide range of lab analyses. Studies on energy metabolism can be combined with the investigation of nutrient metabolism usually comprising oral or intravenous (i.v.) stable-isotope labeled tracer application as described for the FBN installation (3) ExpPhysRoom. Tracer protocols are available featuring studies of quantitative glucose or amino acid turnover, nutrient oxidation, first-pass nutrient uptake. 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 housed in the chambers.</p>
<p><b>Description of the access to be provided under SmartCow TNA calls:</b></p>	<p>The unit of access for the '<b>RespCham</b>' is defined as one cow*week, and a total of 64 units of access are offered. The average duration of a project may be 50 days, and the estimated number of projects is 4. Users are supported by experienced staff with total respect of confidentiality. Assistance in obtaining ethical 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. Access includes provision of animals, local feed, housing, veterinary supervision, feeding, assistance with sample collections, milking and daily care. We offer analytical services as described under the FBN installation (3) ExpPhysRoom and provide recommendations on how to analyze samples and evaluate analytical results. 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><b>Animal types, diets, housing and experimental conditions that can be worked on in this infrastructure/installation:</b></p>	<p>Studies can be performed with German Holstein 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><b>Travel and subsistence costs:</b></p>	<p>Travel and subsistence costs of applicants can be reimbursed.</p>

	Applicants should limit their stay spent at the infrastructure to a total of 5 days per project. Reimbursement is provided for a total of 5 days.
<b>Infrastructure/installation ethical rules:</b>	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).