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SmartCow: an integrated infrastructure for increased research capability and innovation in the European cattle sector



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EXECUTIVE SUMMARY

<p>Background</p>	<p>In the frame of SmartCow project, WU has made access it Research Installation “Carus” through Trans National Access (TNA).</p>
<p>Objectives</p>	<p>This Deliverable aims at describing the TNA provided by WU during the SmartCow project.</p>
<p>Methods</p>	<p>The Deliverable is composed of a table summarising the TNA provided by the Research Installation (RI) and by the reports of activities provided by the TNA users who accessed this RI.</p>

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1 TNA provided

Name of the TNA project	Name of TNA user	Organisation of TNA user	Country of TNA user	Installation from the RI	Start date	End date	Number of units of access provided
Impact of oscillating supply of essential amino acids on whole-body nitrogen partitioning, mammary gland metabolite utilization, and milk nitrogen efficiency in lactating dairy cows	Matthieu Rolland	Ajinomoto Animal Nutrition Europe	France	Barn and respiration chamber	17-08-2020	19-10-2020	68

2 Final reports of the each TNA provided

2.1 TNA 1

The main objective of the project

Objectives Studies with sheep and beef cattle have shown that infrequent supplementation of protein improves nitrogen (N) retention and decreases urinary N losses, presumably by sustained urea recycling to the gut or through ornithine cycle adaptations in relation to labile protein pools in the body. These processes may also help to more efficiently convert protein from human non-edible resources into high quality milk protein. The impact of oscillating amino acid (AA) supply on N dynamics in dairy cattle is unknown. This project aims to evaluate milk yield, N retention and milk N efficiency in response to oscillating supplementation of AA in dairy cattle

Hypotheses We hypothesise that oscillating AA supply is a dietary strategy that will improve milk N efficiency and reduce urinary N losses, through deposition and an efficient re-utilization of N in labile pools. Upon favourable experimental results, this dietary strategy would help the dairy sector to improve utilization of human non-edible resources and reduce N emissions.

The main scientific outcome, innovation/impact of the results

Material and methods Twenty-eight Holstein-Friesian cows (93 ± 27 days in milk (DIM)) were blocked (4 cows/block) by DIM and parity and fed a basal ration (15.5% crude protein (CP); formulated to 95 and 100% of metabolizable protein (MP) and net energy for lactation (NEL) requirements) in tie stalls for 16 d at a fixed amount according to the mean ad libitum intake of each block during a 7-d diet adaptation period. Cows within block were randomly assigned to the basal ration, or 1 of 3 iso-MP rumen-protected (RP) supplements mixed into the basal ration. Supplements were 1) a 384-g mixture of RP His (Ajinomoto Co, Japan), Lys (AjiPro-L; Ajinomoto Health & Nutrition, USA), and Met (Smartamine; Adisseo, France) fed daily (RPAA), 2) a 768-g mixture of RP His, Lys, and Met fed every other day (Osc-RPAA), and 3) a 315-g mixture of RP soybean meal and RP rapeseed meal (MervoBest; Agrifirm, the Netherlands) fed daily (RPSR). The basal ration + supplements were designed to deliver 100% of required MP per 48-h period. The RPAA mixture was formulated to deliver AA in amounts relative to a casein profile. Dry matter intake,



milk yield, and milk composition averaged over the final 4 d of each period was subjected to ANOVA with treatment as a fixed effect and block as a random effect.

Outcome/impact Dry matter intake and milk yield were not affected by treatment ($P > 0.10$). Milk protein content increased with RPAA over all treatments ($P \leq 0.01$). Milk fat yield decreased with RPSR compared with Osc-RPAA ($P = 0.04$). Milk fat content decreased with RPSR compared with RPAA and Osc-RPAA ($P \leq 0.05$). Milk N efficiency was numerically higher with RPAA compared with RPSR (33.6 vs. 32.4%). Findings suggest that supplementing RP His, Lys, and Met in a casein profile can increase the transfer of dietary N into milk N, and that there is no benefit of supplementing RP amino acids in an oscillating pattern.

Visit A planned visit had to be cancelled unfortunately, due to Covid19.

Dissemination of results Presentation by WU of main findings (oral presentation) at 2021 Annual Meeting American Dairy Science Association (with abstract in Journal of Dairy Science). We aim to publish the results in peer-reviewed, open access publication(s) aimed at the dairy production sector at large, with authors from Ajinomoto and WU. Presentation of preliminary results also in SmartCow Workshop WP5/6 (Dec 2020 and Jan 2022). We will also endeavour to disseminate the results as soon as practicable in professional journals in Europe. In all dissemination of results, we will acknowledge the access provided, and specify that the project received research funding from the European Community's Horizon 2020 Programme.

Any suggestions to improve the TNA procedure

Facility manager: Really good procedure in general. To improve, have realistic expectations as to what can be delivered in terms of results only 6 wk after end of trial. User: No additional comment