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Effects of dietary protein oscillation on intake, production, digestibility and nitrogen metabolism in lactating dairy cows

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Nitrogen efficiency in growing ruminants may be increased with oscillating vs static dietary crude protein (CP). We hypothesized that nitrogen efficiency in dairy cows would be increased by feeding repeated 48-h phases of 13.4% and 17.1% dietary CP (oscillating; OS), compared to a static CP supply (15.3% CP; ST). We conducted urine sampling and total faecal collection on 12 mid-lactation multiparous cows for 8-d, after an 8-d adaptation. Urine excretion was estimated using daily dietary sodium and potassium intake. The experiment was a randomized complete block design with preceding covariate period. Fixed effects of treatment, period (repeated) and associated covariate value, and block as random effect were used for statistical analysis. Nutrient intake, milk composition and yield, and efficiency of feed and nitrogen use for milk synthesis were not treatment affected. Apparent total-tract digestibility (ATTD) of organic matter and gross energy increased, and crude fat and starch ATTD tended to increase with OS, but CP ATTD was not affected. Estimated uric acid excretion tended to increase with OS, but treatment did not affect estimated allantoin or total purine derivatives excretion, or estimated microbial protein synthesis or efficiency. Estimated urinary nitrogen excretion increased and milk nitrogen as proportion of digested nitrogen tended to decrease with OS, but estimated nitrogen balance was unaffected, indicating increased post-absorptive nitrogen losses for OS. Overall, performance and efficiency of dietary nutrient use for milk synthesis were unaffected by treatment, but OS increased ATTD and tended to reduce estimated post-absorptive nitrogen efficiency.