Effects of Diets Rich in Unsaturated Fatty Acids on Milk Urea Nitrogen (MUN) Levels and Potential for Genetic Selection of MUN

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Milk urea nitrogen (MUN) level is routinely monitored in many dairy herds as an indicator of efficiency of protein utilization, as well as nitrogen excretion to the environment. This study examined the effect of diets rich in unsaturated fatty acids and used to enhance the content of health promoting fatty acids (FA) in milk, on MUN. Twenty six high producing Holstein dairy cows in mid lactation were randomly assigned to one of two treatment (Trt) diets; control (CT) ration (diet CT, consisted of total mixed ration of corn and grass silages) supplemented with 5% safflower (SF) oil on dry matter (DM) basis (diet SF, rich in linoleic acid) or 5% linseed (LS) oil (diet LS, rich in alpha linolenic acid), for a period of 28 days. The Trt period was preceded by a stabilization period of 28 days (pre-Trt) during which all cows were placed on diet CT. After the Trt period, cows were returned to the control ration for another 28 days (post-Trt). Cows were managed following standard procedures and had ad libitum access to feed and water. Milk component yields including fat (%) and MUN (mg/dl) concentrations were measured on a weekly basis. Effects of Trts on milk components were analyzed using a completely randomized design with repeated measures using Statistical Analysis Software (SAS). Results show a similar trend in effects of Trts on fat and MUN concentrations. Both fat and MUN were significantly decreased ($P<0.01$) during the Trt period as compared to pre-Trt and post-Trt periods. Although values of MUN during the Trt period (10.72±0.64, SF diet and 9.19±0.61, LS diet) were significantly lower ($P<0.01$) as compared to pre-Trt (13.55±0.53, SF diet and 13.27±0.51, LS diet) and post-Trt (13.06±0.58, SF diet and 13.06 ±0.55, LS diet) periods, they were still within normal MUN values. Additionally, an ongoing candidate gene association analysis involving 700 cows from 7 herds in Quebec has shown significant associations between the same single-nucleotide polymorphisms (SNPs) in some key genes involved in lipogenesis and MUN as well as health promoting milk FAs.

Implication: Similar effect of diet on milk MUN and fat contents as well as beneficial FA isomers of milk indicates that genes implicated in lipogenesis may also play a role in efficient protein utilization by dairy cows. This indicates the potential to select for efficient dietary protein utilization, reduced nitrogen excretion and beneficial FAs by the same nutrition and genetic strategies.