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大豆异黄酮对高产奶牛泌乳后期乳腺肥大细胞分泌肿瘤坏死因子- α 和表面型免疫球蛋白A水平的影响

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Effects of Dietary Soy Isoflavone Supplementation on the Levels of Tumor Necrosis Factor α and Surface-type IgA Secreted by Mammary Mast Cells in Higher Lactating Dairy Cows during Late Lactation

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摘要 本试验旨在研究大豆异黄酮对高产奶牛泌乳后期乳腺免疫功能的影响。选用12头胎次、体重和产奶量相近的泌乳后期中国荷斯坦奶牛, 随机分为4组, 每组3头。4个组中, D为对照组, 饲喂全混合日粮, A、B和C组在全混合日粮的基础上分别添加10、20和30 mg/kg大豆异黄酮。为进一步探索大豆异黄酮对奶牛乳腺免疫细胞的作用, 分离采自试验组和对照组奶牛的乳腺肥大细胞, 并分别与0 (D1)、0.25 (A1)、0.50 (B1)、0.75 mg/mL (C1) 的大豆异黄酮共育。结果表明: 1) 日粮添加大豆异黄酮后, 试验中后期试验组奶牛血清及乳样中的雌激素(E2)、三碘甲状腺原氨酸(T3)、甲状腺素(T4)含量比对照组有不同程度地提高; 2) 试验组乳样中表面型免疫球蛋白A (sIgA) 含量呈显著上升趋势 ($P < 0.05$), 并于试验后期下降至与对照组相当水平, 乳腺中sIgA含量试验组显著高于对照组 ($P < 0.05$); 3) 试验组血清和乳样中的肿瘤坏死因子- α (TNF- α) 明显下降, 并于试验后期显著低于对照组 ($P < 0.05$), 乳腺中TNF- α 的含量显著低于对照组 ($P < 0.05$); 4) 细胞共育试验表明, 添加一定浓度的大豆异黄酮 (0.50 mg/mL) 能够显著降低奶牛乳腺肥大细胞的TNF- α mRNA表达量 ($P < 0.05$)。由此得出, 本试验条件下, 奶牛全混合日粮中添加不同浓度大豆异黄酮能够提高奶牛的乳腺免疫功能, 且大豆异黄酮添加量为30 mg/kg时, 能够得到较好的免疫效果。

关键词: 大豆异黄酮; 荷斯坦奶牛; 乳腺; 肥大细胞; TNF- α

Abstract: This experiment was conducted to study the effects of dietary soy isoflavone supplementation on the immunological function in the mammary of Chinese Holstein cows during late lactation. Twelve cows with similar parity, body weight and milk production were randomly assigned to four groups with three cows in each group. Cows in the control group (group D) were fed the total mixed ration (TMR) and the cows in the other groups were fed the TMR supplemented with 10 (group A), 20 (group B) and 30 mg/kg (group C) soy isoflavone, respectively. To further evaluate the influence of soy isoflavone on the dairy cows during late lactation, mammary mast cells were isolated from the cows and cultured in the media containing different concentrations of soy isoflavone, which were 0 (group D1), 0.25 (group A1), 0.50 (group B1) and 0.75 mg/mL (group C1). The results showed as follows: 1) the contents of estrogen (E2), 3, 5, 3'-triiodothyronine (T3) and thyroxine (T4) in the serum and milk in the experimental groups were higher in varying degrees than those in the control group in the mid-anaphase after feeding the soy isoflavone. 2) The content of surface-type IgA (sIgA) in the milk from the experimental groups were significantly increased in prophase ($P < 0.05$), and then decreased to the same level as the control group. The sIgA content in the mammary gland of the experimental groups was higher than that in the control group ($P < 0.05$). 3) Tumor necrosis factor α (TNF- α) content in serum and milk in the experimental groups was decreased and significantly lower than that in the control group in the anaphase ($P < 0.05$). TNF- α content in the mammary gland of the experimental groups was significantly lower than that in the control group ($P < 0.05$). 4) In the cell co-culture experiment, 0.50 mg/mL soy isoflavone could inhibit the mRNA expression of TNF- α in mammary mast cell ($P < 0.05$). The results indicate that dietary soy isoflavone supplementation can improve the immunological function of mammary gland of dairy cows, and the optimal supplemental level is 30 mg/kg. [Chinese Journal of Animal Nutrition, 2011, 23 (1) : 112-121]

Keywords: soy isoflavone; Holstein cows; mammary gland; mast cells; TNF- α

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