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生长激素和胰岛素样生长因子 I 对奶牛乳蛋白合成关键激酶及调节因子 mRNA 表达量的影响

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Growth Hormone and Insulin-Like Growth Factor I : Effects on mRNA Expression Levels of Key Kinases and Regulatory Factors Regulating Milk Protein Synthesis

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摘要 本试验旨在探讨生长激素(GH)和胰岛素样生长因子 I (IGF- I)对体外培养的奶牛乳腺上皮细胞内调控乳蛋白合成的关键激酶及调节因子 mRNA 表达量的影响。试验对纯化后的荷斯坦奶牛乳腺上皮细胞进行 4 种处理, 对照组采用无血清生长培养基, 试验组在对照组的基础上分别添加 GH(100 ng/mL)、IGF- I (100 ng/mL) 和 GH(100 ng/mL)+IGF- I (100 ng/mL)。培养 24 h 后, 采用实时定量 PCR (RT-qPCR) 法测定 κ -酪蛋白基因以及调控乳蛋白合成的关键激酶及调节因子的 mRNA 表达量, 并测定生长激素受体(GHR)和胰岛素样生长因子 I 受体(IGF- I R) mRNA 表达量。结果表明: 体外培养的奶牛乳腺上皮细胞可以表达 GHR 和 IGF- I R mRNA, 各试验组均能显著提高 κ -酪蛋白(CSN3) mRNA 表达量 ($P < 0.05$), 但未发现 GH 和 IGF- I 复合存在累积效应; 与对照组相比, GH 组有提高 E74-样转录因子 5 (ELF5) mRNA 表达量的趋势 ($P < 0.10$), 而 IGF- I 组显著提高了哺乳动物雷帕霉素靶蛋白(mTOR)和核糖体蛋白 S6 激酶 1 (rpS6K1) mRNA 表达量 ($P < 0.05$), GH+IGF- I 组未呈现加强作用。结果提示, GH 和 IGF- I 可能单独通过影响调控乳蛋白合成的关键激酶及调节因子 mRNA 表达来调节 κ -酪蛋白的合成。

关键词: 生长激素 胰岛素样生长因子 I 乳腺上皮细胞 乳蛋白 mRNA 表达量

Abstract: This experiment was conducted to investigate the effects of growth hormone (GH) and insulin-like growth factor I (IGF- I) on mRNA expression levels of key kinases and regulatory factors regulating milk protein synthesis in cultured bovine mammary epithelial cells *in vitro*. Four treatments were employed to culture the purified mammary epithelial cells of a Holstein dairy cow and growth medium without serum was used in a control group, and based on the control group, mediums supplemented with GH (100 ng/mL), IGF- I (100 ng/mL) and GH (100 ng/mL) + IGF- I (100 ng/mL) were used in experimental groups. After cultured for 24 h, the mRNA expression levels of CSN3, key kinases and regulatory factors regulating milk protein synthesis, GHR and IGF- I R were determined by real-time quantitative PCR (RT-qPCR). The results showed as follows: there were mRNA expressions of GHR and IGF- I R in mammary epithelial cells cultured *in vitro*, and CSN3 mRNA expression level was significantly enhanced in all experimental groups ($P < 0.05$), however, no cumulative effect was found; compared with the control group, the mRNA expression level of E74-like transcription factor 5 (ELF5) tended to be increased in GH group ($P < 0.10$), mRNA expression levels of mammalian target of rapamycin (mTOR) and ribosomal protein S6 kinase 1 (rpS6K1) were significantly increased in IGF- I group ($P < 0.05$), but on augmented effect was found in GH+IGF- I group. All results indicate that GH and IGF- I may modulate κ -casein synthesis independently through affecting mRNA expressions of key kinases and regulatory factors that regulating milk protein synthesis.

Keywords: growth hormone, insulin-like growth factor I, mammary epithelial cell, milk protein, mRNA expression level

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