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Expression of GHR1A, SOCS3, INHBA, and MYC mRNA in liver of periparturient dairy cows

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The partitioning of nutrients to milk in dairy cows is controlled by growth hormone (GH). Blood GH increases in early lactation when the liver becomes refractory to GH. Liver refractoriness is mediated by a loss in growth hormone receptor (GHR) expression and activity. The loss in GHR leads to a decrease in blood IGF-I (negative feedback hormone for GH) and an increase in GH. The laboratory had previously found that GHR1A was decreased at calving. Additional work demonstrated that SOCS3 (a protein that inhibits GHR activity) was increased. Two additional proteins that are involved in cell growth [inhibin beta A (INHBA) and MYC] were also identified as candidate genes. The hypothesis was that SOCS3 mRNA would increase in liver immediately after calving. Furthermore INHBA, a protein that blocks cell growth would be decreased and MYC, a protein that stimulates cell growth would be increased. The objective was to measure the amount of mRNA for GHR1A, SOCS3, INHBA, and MYC during the periparturient period. A liver biopsy was collected from cows (n=58) on each day from 7 days before calving to 7 days after calving. Gene expression was measured by using quantitative RT PCR. The GHR1A mRNA underwent the expected decrease after calving ($P < .001$). The SOCS3 mRNA underwent an opposite change ($P < .001$). The increase in SOCS3 after calving suggests that SOCS3 may cause GH insensitivity in postpartum liver. The amount of INHBA increased as cows approached the day of calving ($P < .001$). Afterwards there was a decrease in INHBA. The increase and decrease in INHBA were parallel to the change in blood estradiol; perhaps suggesting that estradiol controls INHBA expression. The amount of MYC mRNA decreased after calving. The expression of MYC was highly variable in the liver samples that we analyzed.