Early Prognostic Markers to Predict Fertilization Success and Risk of Embryonic Mortality in Dairy Cattle

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Abstract

This investigation aims to examine maternal serum levels of various angiogenic factors and proteins in dairy cattle for (1) the early prediction of unsuccessful fertilization and (2) the early recognition of potential pregnancy failures (early EM) after successful insemination. Serum samples were taken from the same calf at three different time intervals: 30 days before artificial insemination (B-AI), on the day of artificial insemination (AI), and 30 days after artificial insemination (A-AI).

After the assessment of pregnancy, the cows were divided into two main categories according to their pregnancy status.The results revealed a marked decrease in leucyl/cystinyl aminopeptidase (LNPEP) levels following B-AI, along with significant reductions in Secreted Frizzled-Related Protein 3 (SFRP-3) and Vascular Endothelial Growth Factor (VEGF) concentrations on the day of artificial insemination (AI). In contrast, prolactin (PRL) levels showed an increase. This information is prognostically significant as it serves as an early indicator of the likelihood of potential pregnancy failure.A significant decrease in LNPEP, SFRP3, and VEGF levels, along with an increase in PRL levels, was observed in A-AI. The serum concentrations of Insulin-Like Growth Factor 2 (IGF-2), Tissue inhibitors of metalloproteinases (TIMP-1), angiopoietin (ANG), Endoglin (ENG), Fibroblast growth factor (FGF), Inhibine-A (INH-A), and Transforming growth factors-β1 (TGF-β1) did not show any significant differences between the groups with unsuccessful and successful pregnancies.

This study is the first to demonstrate that maternal serum concentrations of LNPEP, SFRP3, VEGF, and PRL are crucial in determining pregnancy success. These factors may also serve as predictors for the likelihood of unsuccessful pregnancies following artificial insemination (AI) in dairy cattle and indicate the potential success of the insemination process after B-AI. Further research in this area will facilitate the development of more applicable, useful, and specific markers.