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Regulation of differentiating intramuscular stromal vascular cells isolated from Hanwoo beef cattle by retinoic acid and calcium

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Marbling or intramuscular fat has been consistently identified as one of the top beef quality problems. Intramuscular adipocytes distribute throughout the perimysial connective tissue of skeletal muscle and are the major site for the deposition of intramuscular fat which is essential for the eating quality of meat. The stromal vascular fraction of the skeletal muscle contains progenitor cells that can be enhanced to differentiate to adipocytes and increase intramuscular fat. Primary cultures of bovine intramuscular stromal vascular cells were used in this study to elucidate the effects of extracellular calcium and retinoic acid concentration on adipocyte differentiation. Cell viability assay revealed that even at different concentrations of calcium and retinoic acid, there was no significant difference on cell viability. Monitoring of the adipocyte differentiation showed that bovine intramuscular stromal vascular cells cultured in low concentration of extracellular calcium and retinoic acid had better degree of fat accumulation. The mRNA and protein expressions of PPARγ, C/EBPα, SREBP-1c and aP2 were analyzed and showed a significant upregulation upon the reduction in the level of extracellular calcium and retinoic acid. The upregulation of these adipogenic related genes means that the decreasing concentration of calcium and retinoic acid is able to stimulate the adipogenic differentiation of bovine intramuscular stromal vascular cells. To further elucidate the effect of calcium, the expression level of calreticulin was measured. Calreticulin which is known to be an inhibitor of PPARγ was down regulated by the decreased level of calcium and retinoic acid in the culture media. The same tendency was observed on retinoic acid receptors RARα and CRABP-II. These receptors are recognized as adipogenic inhibitors and the down regulation of their expression allowed better level of differentiation in bovine intramuscular stromal vascular cells. In conclusion, data show that decreasing the level of extracellular calcium and retinoic acid can significantly promote adipogenesis in intramuscular stromal vascular cells of Hanwoo beef cattle. These findings may provide new insights in enhancing intramuscular adipogenesis and marbling in beef cattle.

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The role of proteins supplementation in protection of young sheep against worm's infection

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Generally, parasites are major constraints on animal productivity throughout the world. Young sheep are most susceptible to worm's infection during their first year of life. The protein supplementation is considered as important because it improves the resistance to worms and prevents the effects of their infection on sheep production. In fact, worms reduce nutrients that sheep would normally use to grow meat and wool. They damage the lining of the intestinal tract and lower absorption of nutrients. Young sheep need protein to build and repair various body structures. In young worm infected sheep, protein is diverted from muscle and wool growth to fight against infection and repairing the damaged intestines. Worms cause decrease in survival, live weight gain, wool and milk production and reproduction performance. Protein used by sheep comes from different sources including the conversion of plant proteins consumed to microbial proteins by rumen microorganisms and by supplementation. Proteins that cannot be broken down by rumen microorganisms are called bypass or protected proteins (cottonseed meal, canola and copra meal). They are given to young sheep as supplementary to increase their resistance to worm infection. Even supplementary feeding is currently considered expensive but is necessary. Protein supplementation is most effective in improving resistance, so young sheep should be given priority access to supplementary feeds rich in bypass protein to increase their production efficiently.

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