

ABSTRACT

Development of intramuscular fat in Wagyu beef cattle depends on adipogenic or antiadipogenic substances present in serum

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In blood, there are many kinds of adipogenic or antiadipogenic factors such as hormones and vitamins. In this study, adipogenic activity in sera of fattened beef cattle was evaluated using cultured mouse 3T3-L1 preadipocytes. After the preadipocytes were grown to reach confluence, serum of fattened beef cattle was added into the culture medium (10%, vol/vol) for 3 days, and thereafter cellular sn-glycerol-3-phosphate dehydrogenase (GPDH) activity was determined as an index of adipocyte differentiation. Sera were collected from 19 beef cattle (Wagyu and Wagyu × Holstein cross cattle) from three different farms at slaughter. Cellular GPDH activity was significantly different among the farms, and was affected by sex difference (i.e. sera from fattened heifers induced higher GPDH activity than those from steers). There was a positive correlation between GPDH activity and beef marbling performance ($T = 0.62$, $P < 0.02$), suggesting that serum factor(s) play a role in development of intramuscular fat deposition. Adipogenic activity was negatively correlated with serum retinol concentration ($r = -0.73$, $P < 0.001$). Neither serum cholesterol, triacylglycerol nor non-esterified fatty acid was related to adipogenic activity.

Furthermore, serum retinol concentration was negatively correlated with beef marbling performance. These data imply that retinol level in blood during the fattening period may influence intramuscular fat deposition of beef cattle through its antiadipogenic action on preadipocytes present in muscle tissues.