Cow's lactation during pregnancy alters calf DNA methylation patterns

From paper

SHORT SUMMARY FOR PRACTITIONERS:

In dairy farming, cows on their second or further lactation become pregnant while still lactating from a previous calving. During this overlap, the cow faces considerable metabolic stress, needing energy for both milk production and fetal development, which feed intake alone cannot meet. This study examined whether this maternal stress leaves biological marks on calves, specifically in the form of changes to DNA methylation — a process that regulates how genes are activated or not without altering the DNA sequence itself.

Blood samples were collected from six newborn Holstein-Friesian calves: three born to heifers that had not yet experienced lactation, and three born to cows that were lactating during pregnancy. Over 50,000 individual sites and 2,000 broader regions of the calves'DNA showed measurable differences in methylation between the two groups. The differences were located near genes linked to blood vessel formation, organ development, embryo growth, and cell communication—all processes considered critical during early life and that may potentially influence the animal's productive performance in adulthood.

The practical implication of this work is significant for farm management and breeding. It suggests calves from non-lactating mothers may have a developmental advantage, consistent with earlier evidence that such calves produce more milk and live longer as adults. For farmers, reducing overlap between lactation and early pregnancy (e.g. earlier drying-off or delayed re-insemination) could improve lifetime productivity and health. For breeding programmes, incorporating epigenetic information of this kind into genetic evaluations could, in future, improve the accuracy of selection decisions.

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