

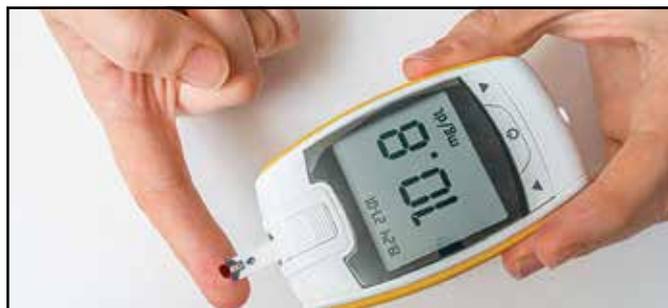
Pregnancy Test Research

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Highly accurate and commercially viable pregnancy and litter size tests for ewes are not yet widely accessible nor affordable for all sheep producers. Currently, the gold standard and only available option for early ewe pregnancy detection is ultrasound. However, that may soon change. Research completed by University of Alberta and Alberta Agriculture and Forestry scientists, with funding from the Alberta Lamb Producers, Ontario Sheep Farmers, Canadian Sheep Breeders Association and Alberta Agriculture and Forestry Strategic Research and Development fund, has discovered and validated promising blood biomarkers. These biomarkers, detected through metabolomics technology, are predictive for both pregnancy and litter size at 50 days into pregnancy. Long story short, these results suggest that drawing a few drops of ewe blood, at least 50 days after breeding, can accurately detect absence or presence of pregnancy and the number of lambs to expect.

Potential Benefits of this New Technology

As a flock manager, you know that fertility is of utmost importance as one open ewe, if undetected, can literally eat up the profits of several pregnant ewes in the flock. This is exactly why the research project was designed – to develop a test to detect at earlier than 60 days into pregnancy not only if an ewe is pregnant or not, but if she is, how many lambs she's carrying. Ultimately, it's the number of ewes bred and confirmed pregnant, the lambing rate and the survival rate of these lambs that are the most important factors in determining sheep productivity and the economic efficiency of a lamb production enterprise. By detecting and culling open ewes, or rebreeding them, and improving the nutrition of ewes that deliver more viable and healthy lambs, we anticipate flock profitability is increased by \$2.5 for every \$1 invested in ewe nutrition as a result of using this tool. In addition, feed costs are reduced by adjusting feed based on pregnancy requirements and preventing blind feeding of all animals with the same ration. Single lambs tend to have large birth weights with more dystocia issues while triplets tend to have poor birthweights with low survivability. Ewes giving birth to triplets have increased risks of pregnancy toxemia



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and hypocalcaemia, which result in high mortality rates in ewes. Knowing the litter size at early stages of pregnancy also offers the opportunity to maintain ewe health and welfare since both over or underfeeding can be avoided. Moreover, epigenetics and nutrigenomics research have proven that adjusting maternal feed based on pregnancy requirements programs the progeny to be healthier and physiologically more sound than the average lamb.



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Ewe nutrition in the last 8 weeks of gestation is critical as it impacts lamb survivability. Typically, 95% of singles, 79% of twins and only 67% of triplet born lambs survive the first week of life. Assuming variation in breed type and a 15% cull rate (Statistics Canada, 2020) 437 000 Canadian ewes are exposed to breeding in a year with 20% of these ewes expected to bear triplets or more lambs in one litter. Thus, 87 400 ewes at a cost of \$961 400 (\$11/ewe/year increased nutrition) will potentially yield 12% more lambs at weaning. Canadian lamb sales increase by \$2.5 million if we can identify those prolific ewes at 50 days gestation and sort them into management groups for feeding.

Research Results

The research team identified and validated 5 blood components that differentiated between ewes that were open and those that were pregnant. At day 50 of pregnancy, we were also able to identify if the pregnant ewe would deliver a single, twins or triplet lambs. If a farmer is interested in precisely knowing how many lambs a pregnant ewe will deliver, we can use 2 specific biomarkers to identify ewes with a single lamb and 6 different specific biomarkers to identify pregnant ewes carrying twins. All other pregnant ewes that do not test positive for these two sets of biomarkers would automatically be categorized as pregnant ewes carrying triplets or more.

These results were identified and validated using a total of six different flocks, 4 in Alberta and 2 in Ontario. Comprehensive statistical analyses are currently being conducted and evaluated to confirm the accuracy of the statistical methods used. These results, though promising, suggest more work needs to continue to bring the tool to commercialization for industry use.

The Next Steps

Once the prototype kit has been confirmed and replicated in field studies (under various management practices, different breeds, different environment conditions, and at different times of the year), the yet-to-be-developed test kit would be modelled after a human pregnancy test. In this case, you

would perform an ear pinch to collect blood. The blood sample would instantly react with the biomarker panel on the hand held, chute-side test to determine if she's pregnant and predict with how many lambs, so she could immediately be sorted into management and/or feeding groups. Anyone could operate the device without needing any technical experience, scientific knowledge or waiting days for results. The cost of this test per animal would remain constant and independent of the location of the farm and the number of animals in the flock. Therefore, producers with any size of a flock can afford this service making this technology widely available. Whether you have five pregnant ewes or 500, and whether you're located in rural areas or closer to the city, you'll still be able to detect pregnancy and litter size in your sheep. The test kit is also expected to offer a similar consistency and accuracy of detection.

We would like to acknowledge the central & southern Alberta and Ontario producers who have been collaborating on these projects, providing access to their animals and facilities. Furthermore, our relationships with various academic institutions including Guelph University, Olds College, Lakeland College and Laval University has made the sheep projects multidimensional. We hope these research efforts will soon make a difference on farm and enhance the growth of our sheep industry.

Stay tuned for more exciting news on prototype development as our research continues! **OSN**



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