Mary had a lot of lambs: Researchers identify way to accelerate sheep breeding

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Former Cornell postdoctoral researcher Raluca Mateescu co-authored a study with Cornell Animal Science Professor Mike Thonney and professor emeritus Doug Hogue that identifies a way to prompt ewes to breed out-of-season, more frequently and at younger ages.

(PhysOrg.com) -- Mary had a little lamb, but only once a year. However, Cornell Sheep Program researchers have discovered an unusual form of a gene that prompts ewes to breed out of season as well as conceive at younger ages and more frequently.

They conducted a simple genetic test to identify the presence of the unusual form of the gene, the so-called M allele that other researchers had suspected might be correlated with out-of-season fertility, in their test flock and then validated the gene's relationship with aseasonal breeding by observing that trait in the flock.

The finding, published in the August issue of the *Journal of Animal Science* (Vol. 87, No. 8), may be a boon for the sheep industry worldwide, especially when combined with the Sheep Program's STAR system - a method to manage ewes to lamb five times in three years rather than once a year.

"The primary biological limit for sheep production worldwide is the seasonality of breeding, but the market for high-quality lamb is a 52-week thing," said Doug Hogue, professor emeritus of animal science in the College of Agriculture and Life Sciences. His Cornell colleague Mike Thonney and former Cornell postdoctoral researcher Raluca Mateescu, now at Oklahoma State University co-authored the paper with Andrea Lunsford, a graduate student at OSU.

Although the presence of the M allele has been definitively correlated with the ability to breed out of season, the researchers caution that it may only be a marker for the gene actually responsible for the trait.

"Breeding out of season is a complex trait," Mateescu said, "so there are a lot of genes controlling it." Mateescu observed the phenotype - the physical expression of the gene - in the researchers' flock during a postdoctoral fellowship at Cornell.

"In this case, we're talking about a receptor gene for melatonin," Thonney explained. Melatonin is a naturally produced hormone commonly found in many animals. The change in the DNA sequence of the M allele does not change the amino acid sequence of the protein. This means that it may be an accurate indicator for the phenotype of breeding out of season, though it's uncertain whether the gene actually impacts how the sheep's body reacts to melatonin. And there may be a risk of losing the association over generations, the researchers said, as recombination could occur between the marker and the functional gene.

Thus, the researchers stress that it will be very important to validate the gene's ability to indicate for aseasonal breeding each time the allele is bred into a new sheep population.

"I think it's very exciting … we only have one gene, but it's definitely a tool that farmers can use," said Mateescu, who is now focusing on placing markers across the sheep's entire genome to more accurately determine which gene or genes directly affect the trait of aseasonal reproduction.

The allele is particularly useful for management under the STAR system, developed by Hogue and Cornell sheep farm manager Brian Magee in the early 1980s, which uses nutrition and conventional breeding techniques to reduce the time between heats. "If a ewe doesn't get pregnant when she is supposed to, instead of a year, it's only 73 days [using the STAR system] until she has another opportunity," Thonney said.

While the STAR system requires better nutrition and more farm labor to manage the lambing, each lambing event involves fewer ewes than traditional yearly lambing.

The researchers hope that the discovery of the M allele may help the STAR system adapt to consistently high levels of production without any additional risk to flock health.

Source: Cornell University (news : web)

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