

A GUIDE FOR SHEEP AND FARM LIFE

THE SHEPHERD

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The Secrets of the Booroola Gene Revealed

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Since its discovery in a flock of Merino sheep in Australia more than half a century ago, scientists have wondered about the origin of the Booroola gene. Some believed that the high prolificacy was the result of a mutation of one or a few closely related genes. Other scientists suspected that the mutant gene was not new but rather was transferred in animals of the Garole breed imported into Australia from the Indian sub-continent in the 18th century (1792-3). The Garole sheep from India is a prolific microsheap found in the hot, humid rice paddies of the southern part of West Bengal. Adult live weight of animals of this breed averages 10-14 kg and under favorable conditions they can produce up to 2.3 lambs per litter.

In the last decades other breeds in various countries have shown high prolificacy



and the way this prolificacy was inherited suggested the presence of major genes similar to that of the Booroola. These breeds include the Cambridge in the UK, Thoka in Iceland, Javanese in Indonesia, Olkuska in Poland, Belclare in Ireland and Lacaune in France. All these breeds showed a kind of inheritance suggesting that the mutant genes are located on an autosomal chromosome. In addition, a new mutant gene labeled "Inverdale" was discovered in a flock of Romney sheep in New Zealand and its inheritance suggests that it is located on the X chromosome.

Recent advances in DNA research enabled scientists to discover that the high prolificacy in Booroola sheep is the result of a mutation in a certain receptor and that of the Inverdale is the result of a mutation in a growth factor gene. These discoveries made it possible to use DNA testing to determine accurately whether the other prolific breeds of sheep carry the same mutations.

Scientists from nine countries pooled their efforts to establish the origin of prolificacy genes in their breeds. Blood samples were collected from Cambridge, Thoka, Javanese, Olkuska, Belclare, Lacaune animals with exceptional prolificacy and DNA profiles were

determined using the most recent technology. The results revealed very interesting discoveries that settled once and for all many important issues.

1. The Booroola mutation is in fact that of the Garole. This confirms that the origin of the Booroola gene is not a new mutation but the result of crossing with Garole sheep in the past.

2. The gene in the prolific Javanese breed is also that of the Garole, and most probably introduced into Indonesia through importation of Merino sheep from Australia in 1860. However there is also the possibility that the Garole was imported directly from India before that date.

3. Most of the Garole animals were homozygous for the Booroola gene. The scientists believe that the homozygous genotype is the original genotype of the Garole breed and any heterozygous animals tested resulted from outcrossing with non-prolific breeds. If this is the case then probably no mutations occurred at all.

4. None of the other prolific breeds investigated carried the Booroola (Garole) gene and since none of them had any possible prior breeding with Booroola, Merino or Garole, scientists believe that they carry mutations of different genes.

5. None of the breeds tested carried the Inverdale mutation. That was expected since the inheritance of prolificacy in these breeds suggested a gene on autosomal chromosome unlike the Inverdale gene believed to be located on the X chromosome.

The advances in the molecular genetics and DNA testing made it possible to achieve that break through. Scientists around the world are working to establish the origin of the other prolific breeds. Stay tuned.



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