

A Lethal Genetic Factor in Garole Lambs - A Case Study

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Abstract: Results pertaining to organ weights of lambs with lethal gene (which led to the death of all such lambs within 96 hours of their birth) have been presented. It was observed that the lambs with the lethal gene had mahogany roan type, steel gray colors. The lambs are normal at birth but succumb to death on the fourth day of their birth. The abomasum, weight of the intestine and spleen of such lambs were significantly smaller and weighed less.

Key words: Garole sheep • Lethal gene

INTRODUCTION

Most of the morphological traits and inherited disorders that occur in sheep have not yet been documented. It also represents a major challenge for sheep breeders and researchers. Some of the morphological traits that have been documented in sheep have proved to be very important in practical sheep husbandry. The spectrum of morphological traits and inherited disorders ranges from those that are definitely due to the action of just one gene or to those that are due to the combined action of many genes and many non genetic factors. Many of these traits are inherited in certain breeds and some within some specific families of the breeds. Many factors are inherited as recessive and some as dominant. Effects of all the genes in a living system is not essential for its survival, contrary some of the mutations may be detrimental for the survivability of the individual, such genes are termed as lethal genes. The effect of these types of mutations may be manifested at any particular time of the life of the individual carrying it. In most of the cases death is usually at different stages of the fetal development from being at an embryonic stage, or even till late stages of fetal development. However, some of the lethal genes manifest themselves after animal is born. This usually leads to death of the individual at early stages.

Case Study: The present case deals with an unusual lethal factor identified in some of the Garole lambs

born at a commercial farm in eastern India, the cases resemble that of lethal roan factor as observed in some of the sheep breeds. Garole is one of the prolific ovine breeds of Indian subcontinent. These sheep are reared for their lean mutton, the animals are otherwise quite hardy and can sustain themselves on coarse vegetation and also are tolerant to some of the economically important ovine diseases such as fleece and foot rot. These animals are often seen grazing in water pools in their native tract. During the lambing season of 2008 it was observed that some of the lambs born had an unusual coat color which was grayish and in some of the cases the coat color was roan to mahogany red in color in total six lambs were born in a total lambing of fifty two lambs, the color was different than those with seen in other lambs Figure 1. There was a whorl of white hairs in the eye region in all these lambs, giving a spectacle like appearance, Figures 2 and 3. These lambs were normal at birth but eventually succumbed to death within three to four days of their birth. The lambs in question initially suckled well and they also defecated and urinated as any normal lamb. However, on the third day or at the most the fourth day of their birth the lambs usually failed to suckle and passed out suddenly as if due to asphyxia. The death usually came within a short span of time and without any conclusive reason. The present study deals with such a case and also deals with the anatomical differences between a normal and lamb which succumbed to death due to the lethal factor.



Fig. 1: Comparison between the coat colors of the lambs left one with lethal coat color and right one is normal black



Fig. 2: The Garole ewe with twins one normal and another with the lethal gene, note the whorl of white hairs near the eyes of the lamb with the lethal gene



Fig. 3: A lamb with lethal factor, note the white whole of hair surrounding the eye.

MATERIALS AND METHODS

Comparative postmortem findings of Garole lambs with lethal factor and normal lamb of the same sex and age. The lambs were dissected and all the organs were compared for any abnormality and the weight of individual organ was also taken, the values of the same were calculated on the basis of percentage with respect to the body weight.

RESULTS

The average weights of the individual organs of the lambs with the lethal gene (N=6) and normal born (N=3) are presented as Table 1. It transpires from the table that the ratio of most of the traits in both the groups is more or less equal. However, it is also seen that there exists significant differences in the amount of blood lost after the lambs were cut open, it can be attributed because

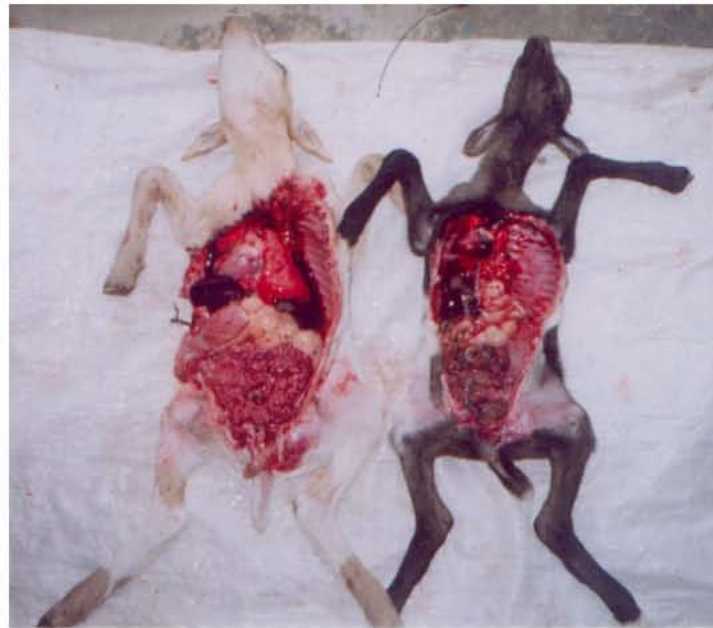


Fig. 4: Position of the organs of both normal (left) and lethal (right) lambs

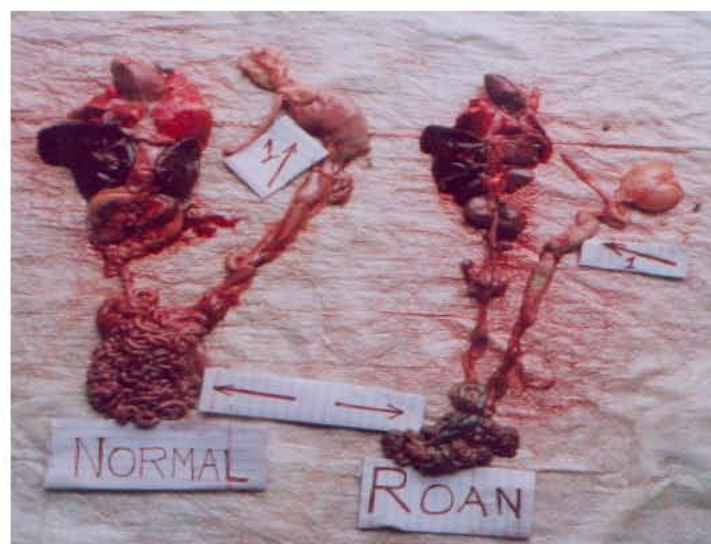


Fig. 5: Comparison between the organs of the normal and the lethal lamb, note the amount of intestines and the abomasum

Table 1: Comparative weights of different organs of Garole lambs (normal vis a vis lethal factor) Values in parenthesis indicate percent values with respect to live weight

Traits	Normal lamb (gms) Mean \pm S.E	Roan lambs(gms) Mean \pm S.E
Weight before autopsy (WBS)	957 \pm 15.7	876 \pm 20.3
Weight after autopsy (WAS)	922 \pm 20.2(.963)*	858 \pm 18.5 (.979)*
Weight of the skin (WS)	152 \pm 18.2 (.1588)*	147.5 \pm 16.5 (.1683)*
Weight of the blood	25 \pm 2.9 (.0261)*	18 \pm 1.5 (.0205)*
Weight of the intestines (WI)	64 \pm 7.2(.066)*	40.0 \pm 5.5(.0456)*
Weight of the empty stomach (WSt)	23 \pm 2.9(.024)*	13 \pm 1.2(.0148)*
Weight of the carcass (eviscerated) (WC)	412 \pm 12.3(.430)*	388 \pm 15. 5(.4429)*
Weight of the liver (WLi)	29 \pm 5.5 (.030)*	21 \pm 2.2(.0239)*
Weight of the lungs (WL)	25.5 \pm 2.7(.0266)*	17 \pm 1.3(.0194)*
Weight of the heart (WH)	13 \pm 1.1 (.013)*	10 \pm 0.5(.011)*
Weight of the spleen (WSP)	2 \pm 0.5 (.0020)*	0.5 \pm 0.055(.00057)*
Weight of the kidney (WK)	12.5 \pm 1.8(.013)*	10 \pm 1.5(.011)*
Weight of the head (WH)	177 \pm 9.9 (.184)	160 \pm 11.5(.182)*
Weight of the genital organs (Wo)	5.5 \pm 1.5 (.005)*	4.0 \pm 1.2(.0045)*
Weight of the empty bladder (WBd)	2.0 \pm 0.6(.0020)*	1.2 \pm 0.05(.00136)*

¹N=6 * values calculated on live weight basis

the animals with the unusual lethal factors were dead before the postmortem examination and that of the healthy animal was slaughtered, hence the discrepancy. The values pertaining to the weight of the intestinal tract too is significant, the results can be collated with the photograph (Figure 4 and Figure 5). The weight of the intestines of the lambs with Lethal factor is significantly lower than that of the one which is normal. Similarly the weight of the abomasum of the two groups also vary significantly, the weights of the organ of the one with lethal factor is lesser than that of the one which is normal. The weights of the liver, lungs too differed between groups; the lambs with lethal factor had lower weights for both the organs in comparison to the one which is normal. The weight of the spleen for the lambs with lethal factor is quite lower than of the normal lamb. The weights of the other organs did not vary significantly between the two groups.

DISCUSSION

The present case is similar to the lethal gray / roan factor as observed many breeds of sheep. It has been observed that the lethal roan factor exists in several ovine breeds in Asia and south east Europe, [1] breed, The dominant allele at the locus of the lethal roan causes an admixture of white hairs into the birth coat of the lambs, [2] All the lambs which showed the lethal factor

expired within ninety six hours of their birth. The lamb with homozygote gene for lethal grey are paler than the heterozygotes with a variable expressibility; the same may be true here as the color of the ewe (Figure 2) also indicates the presence of the factor but in a lesser extent, it is possible that the ewe is heterozygote for the trait. It has been observed that the lambs of grey Karakul sheep which carry the lethal roan factor are usually potbellied, became anemic and have problem with rumen, abomasum and intestines; however the trait manifests itself in the breed between 32 and 888 days with an average age of 174 days, [3]. The presence of abnormally small spleen in the present case suggests that the animal with lethal factor would have problem with blood volume and erythrocyte. Count, thereby leading to anemia, the findings are in consonance with the observations of [3, 1] ascribed that the lambs with lethal roan factor have abnormalities of gastrointestinal innervations and die soon after birth, the present findings also indicate similar findings as all the affected lambs indicated asphyxia prior to succumbing to death. The present findings pertaining to gastrointestinal abnormality in lambs with lethal grey factor is supported by the findings of [4-7].

Most of the reports pertaining to lethal roan factor are in Karakul breed of sheep. There is presently no information pertaining the comparative weight of the different organs vis a vis normal lambs of the same age, in Karakul and other ovine breeds manifesting the syndrome. In the present findings there is presence of

milk in the rumen of the affected lamb Figure 5, the findings are in consonance with the results obtained by [7]. The gene seems to affect the size and efficacy of the other organs too especially the spleen. However, the most important findings indicate that there is discrepancy in the length of the intestines, Figure 5, the same may be hampering in the absorption of nutrients and cause gastrointestinal upset resulting. However, detailed literatures on the exact cause of death of the lambs with lethal roan factors are scanty. The presence of the lethal factor in Garole breed of sheep has not been reported so far by any of the researchers. There are chances that the gene may have been inherited by the animals of Garole breed from other ovine breeds during their course of migration especially the ovine breeds from Tibet and Mangolia which have shown the presence of the same gene responsible for prolificacy in Garole sheep. The migration hypothesis finds similarity with [6] for the wide distribution of the factor in ovine breeds all over the world.

CONCLUSION

The importance of the report lies in the fact that Garole breed of sheep is being used by many breeders for improving the prolificacy of different ovine breeds in India and in different countries of the world. There are chances that the lethal factor may also be transmitted to the flocks of different breeds of sheep and hence screening of Garole flock prior to their induction in breeding schemes is strictly recommended. Comparative study between organs of the lambs which are normal and the ones with the lethal factor have been studied; it has been observed that the lambs with lethal factor have abnormally low weight of the abomasum, spleen and the intestines in comparison to that of the normal. The weight of the liver and lungs too are comparatively less in the lethal lambs vis a vis normal lambs.

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