OBSERVATIONS ON SKULLS OF FOUR-HORNED DOMESTIC SHEEP

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(With 1 Table and 1 Plate)

CONTENTS

I—INTRODUCTION

The occurrence of four-horned sheep in domestic breeds is not uncommon. Such abnormal individuals may be produced due to some primary disturbances in the early embryonic development. The causes of such disturbances resulting in structural disharmony may be either genetic or environmental. There are grounds to believe that the four-horned condition in domestic sheep is genetic. Thus, Shortt (1885) describes how a four-horned sheep imported to Madras raised its own distinctive breed of many members in the course of a few generations. Several such breeds are reported to occur in Africa, China and other countries.

The three four-horned skulls of domestic sheep presen tin the Osteological Collections of Zoological Survey of India facilitated certain interesting observations especially with regard to morpho-craniological alterations as related to the excess of horn. This is pertinent especially in the light of earlier reports that the multiplication of horn is associated with lengthening of the wool, rendering the breed commercially more valuable. The structural implications of the abnormality and its effect on the related organisation of the skull are noted and discussed in this paper.

II—OBSERVATIONS

The appearance of a pair of secondary horns has modified the primaries. While the latter retain their predominance in size, they show a tendency in all three cases to deviate from the usual plane of horn curvature. In one specimen, the primary pair has curved towards the facial portion, the remote end then reflecting back again, almost threatening to pierce the left eye. This end of the horn has apparently been cut

in the living state to offset this possibility. In another specimen, the horns on the right side originate and proceed to some distance so closely that it appears to be a case of mere splitting of the primary horn. In the third specimen, both primaries and secondaries are less haphazard in the plane of growth, the primary one symmetrically diverging outwards and forming a half-loop. All the horns are transversally ringed. The secondary horns in all three cases originate from the lateral vertex immediately behind the orbit and below the primaries and their further development is antero-lateral.

A notable change in the cranium is the great expansion of the frontal bone. This is most manifest at the post-horn cranial portion where it has pushed the parietal bones further down. Caught between the supraoccipital and the invading frontal, the parietals have become proportionately much smaller.

It is evident (Table 1) that while all the three abnormal skulls show marked reduction in the parietal length as compared to the normal skull, the one which has the greatest total length but has the heaviest of horns has the shortest parietal length.

TABLE 1.—*Measurements in mm. of abnormal (four-horned) and normal skulls of domestic sheep in the Zoological Survey of India.*

Material	Total length	*Frontal length (*f*)	*Parietal length (*p*)	% Of *p* to *f*.
Abnormal (four horned) skull No. 1.	240	112	16	14·3%
Abnormal (four-horned) skull No. 2.	230	96	22	23%
Abnormal (four-horned) skull No. 3.	? (broken premaxilla)	93	25	26·8%
Normal (two-horned) skull	? (broken premaxilla)	88	32	36·3%

Another noteworthy feature is the extremely poor development of the tympanic bullae. But though the bullae proper are meagrely developed, its styloid processes are well developed. In the absence of complete data on the labels, it is difficult to say whether this represents a true variational character of the race. The frontal sinuses extend into the second pair of horn core also. But the supraorbital foramina are not at all duplicate.

III—CONCLUSIONS

The horn duplication in all three cases shows similarity in the following respects : (i) The primary horns are always the more prominent. (ii) The points of origin of both types of horns are fixed, the secondaries invariably originating immediately behind the orbit and below the primaries. Since the chief brunt of the changes due to the growth of secondaries has to be borne by the frontal bone, a correspondingly greater

*Straight line length along median line.

development of that bone is noticed. The corresponding reduction in the size of the parietals may also thus be perhaps correlated with the weight the frontal bone has to sustain. This is borne out by the fact that in the two skulls of the same size the parietal reduction was more manifest in the one which has the heavier pairs of horns.

IV—REMARKS

A commonly held view is that the four-horned condition is arrived at by the splitting of the first pair, the division taking place in the basic core and not externally (Cornel 1955). In this connection, Dove's experiments are of interest. He could produce a six-horned goat by transplanting split sections of dermis and connective tissue from both horn buds, giving ground to the conclusion that the horn core is the result of a separate centre of ossification originating in the connective tissue and dermis. A mutation occuring in the gene which controls this ossification process can conceivably cause a split development in the horn core, producing outwardly more than one horn. Extension of frontal sinuses into both pairs of horns and their close and fixed origin may be viewed as points favouring this view.

V—SUMMARY

1. Three specimens of four-horned skulls are examined to study the structural implications of the abnormality.

2. The study revealed the following factors :

(*a*) The primary horns are always more prominent and the points of origin of primary as well as the secondary horns are fixed and not varying.

(*b*) Since the additional weight due to duplication of horns is to be borne by the frontal, there is a correspondingly greater development of that bone.

(*c*) Frontal expansion is made at the expense of the parietal bone which is reduced inversely to the weight of the horns.

3. The phenomenon is discussed and a plausible cause suggested.

VI—REFERENCES

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