

CHAPTER 6

AUTOGENOUS ALOPECIA

Introduction

During the course of the present study a syndrome of partial hairlessness was identified in impala, kudu and steenbok. This syndrome was ascribed to the animals' own grooming efforts, and was thus named "autogenous alopecia". This chapter is comprised of a synthesis of the results of the *post mortem* examination of twelve impala, one kudu and one steenbok in which this condition was diagnosed.

Pathology

Macro-pathology

Integument

General appearance

From a distance the animal appears mottled. In its mildest form this mottling is restricted to the side of the thorax, abdomen and upper hind legs. In the severest cases almost the entire body is affected. This mottled appearance is most apparent in the impala and steenbok which are normally a reddish-brown colour; it is less apparent in the kudu which has a greyish-brown pelage.

On closer inspection it is apparent that the mottling can be ascribed to the exposure of the skin due to the partial or complete lack of hair, the baldness being variable in degree and distribution. The black colour of the skin contrasts strongly with the remaining pelage in the impala and steenbok, and less strongly in the case of the kudu. In severe cases the appearance can best be described as extremely ugly.

Degree of alopecia

The alopecia may be partial or complete. In areas of partial alopecia some of the normal hairs remain, and the skin is visible in proportion to the density of the remaining pelage. The partial alopecia is usually uneven in extent, resulting in considerable variability in the colour and appearance. In areas of complete alopecia the total absence of hair exposes the black colour of the skin. On one impala an area of complete alopecia on the lateral abdomen was interrupted by an area of $\pm 1 \text{ cm}^2$ of relatively normal pelage which contained one engorged adult female tick (*Boophilus decoloratus*). This area lay caudo-dorsally to a protruding cicatrice of approximately the same size which itself was devoid of hair. Occasional areas of partial alopecia are characterised by the presence of many short hairs of approximately the same length, imparting a velvety appearance to these areas.

Distribution of the alopecia

In the mildest cases alopecia is limited to the sides of the body and in these cases is always partial. In severe cases the alopecia, partial or complete in degree, extends over the entire body, with the constant exception of the head and the neck cranial to the spine of the scapula. In the severest

cases the pelage of the neck may be sparse with occasional small bald spots, and there may also be small bare spots on the head. However, even in these cases it is apparent that the pathology is minimal in the head and neck region relative to the rest of the body. Even in the worst cases the tail and metatarsal glands remain well haired, and the lower limbs are less affected than the rest of the body, with the exception of the head and neck area.

Remaining hair

Hair which is present on partially affected areas is usually of normal length and appearance, with the exception of those areas which exhibit evenly short hairs. Remaining long hairs often epilate more easily than would be expected, particularly in the neck region. However, at other times and at other places on the body the hairs appear normally bedded and do not epilate easily. Attempts to obtain an "epilation index" have proved futile because of this variability and also because of the difficulty in exerting a repeatable "epilation force". Nevertheless, the subjective impression is that some of the remaining hairs are more easily epilated than in unaffected animals.

The skin

Completely exposed skin is smooth, clean and supple, and is of an even black colour. No signs of exudation, crusting, thickening, bleeding or fissuring are associated with this syndrome. The skin in partially alopecic areas usually has the same appearance. Occasionally, in the severest cases, exfoliation of the skin is apparent in the partially alopecic areas. The whitish scales are thin and loose, and are easily removed.

Ectoparasites

All affected animals carry large numbers of ticks on those areas where some pelage remains. The abnormally high numbers of adult ticks, particularly of engorged adult female ticks, is particularly conspicuous. In the impala examined in 1986 high levels of louse activity was evident in the long haired areas of the metatarsal glands and the tail. This was characterised by the presence of a large amount of debris, louse exoskeletons, louse eggs and active lice. This exceptionally heavy infestation was not apparent in the animals examined in 1988.

Dentition

In all cases exhibiting alopecia there is some degree of attrition of the incisor-canine complex. There is a strong correlation between the degree of attrition and the severity of the alopecia in animals collected at the same time of the year. The attrition of the teeth is in the vertical plane, affecting the most lateral elements first and progressing to affect the central element - I_1 . Horizontal feeding-related attrition is also evident on I_1 if it is not totally worn by the vertical mode of attrition. Attrition is first evident on the tips of the teeth. Later attrition is also evident in the neck region of the teeth in the form of a groove parallel to the plane of the gingiva on the caudal aspect of the teeth.

Malocclusion

In the mildest cases moderately advanced vertical attrition of the lateral elements is evident, to the extent that the crowns of these teeth are reduced to approximately half of their original height. The stumps of the teeth are smoothly polished in the vertical plane. In the most advanced cases

all of the anterior dental elements are completely worn to below the gumline. In no case were teeth found to be lost; attrition is simply so advanced that nothing remains of the crown. The remaining stumps are smoothly polished and oval to round in shape, and in the fresh specimen the surfaces of all these stumps are below the surface of the surrounding gingiva. In intermediate cases the elements are progressively worn, commencing with the most lateral element - the incisiform canine. Due to the presence of the two apparent points of attrition described above, the remaining teeth of some of the intermediate cases exhibit unusual shapes. The neck-region attrition is evidenced by deep grooves in the neck region of the teeth - in the most advanced cases of this mode of attrition only a small section of the neck remains to connect the root to the remaining crown. pale discoloration and is abnormally friable. In addition, the carcass of these animals has a strange, Other findings

Dist. Condition

Animals exhibiting autogenous alopecia are in poor condition. In general they are in poorer condition than normal animals, as evidenced by a low Kidney Fat Index and by serous atrophy of fat in late winter. The difference may become obscured at the end of a long winter when all animals may be in extremely poor condition.

Haemopoiesis the hair shaft is broken off below the surface of the epidermis. (In normal animals collected at the same time of the year) A variable degree of haemopoiesis is evident on inspection of the bone marrow. Some animals display a considerable degree of such haemopoietic response while this is less evident or even absent in other animals.

Internal parasites

A subjective assessment of all the cases examined suggests that affected animals carry a greater burden of tape worm cysts in the musculature and in the internal organs, as well as cestodes (*Stilezia sp.*) in the bile duct and liver. Again this feature is highly variable and is difficult to quantify, but is most noticeable in animals that are in extremely poor condition.

Pale musculature

In some of the most advanced cases in extremely poor condition the striated musculature of the entire body displays a pale discolouration and is abnormally friable. In addition, the carcass of these animals has a strange, rancid smell which is evident immediately after slaughter.

Histo-pathology - skin

Aetiological diagnosis

Histological examination confirms that there is no marked inflammatory process evident in the epidermis of affected animals. There is also no evidence of any mite activity in the skin.

Almost all hair follicles are in the telogen (inactive) phase. Occasional deep follicles are in the anagen phase. Follicles are generally devoid of hair, or the hair shaft is broken off below the surface of the epidermis. (In normal animals collected at the same time of the year (September) most follicles were also in the telogen phase, but the hairs were retained in the follicles). Hair follicles are otherwise normal.

Sub-epidermal blood vessels exhibit thickening of the walls and a moderate to severe perivascular round-cell and eosinophil infiltration. (This is, however, also evident in clinically normal animals).

Pathological anatomical diagnosis

1. A high external parasite infestation associated with variable alopecia of the entire body, with the exception of the head and neck region which is relatively unaffected.
2. Partial or complete absence of anterior dental elements associated with a vertical plane of attrition.
3. Poor body condition and variable degrees of anaemia and internal parasitism.

Aetiological diagnosis

The vertical attrition of the anterior dental elements is due to the prolonged use of these teeth for grooming purposes. Two sources of abrasion operate during the grooming activity. One is active on the tips of the teeth which are rubbed against the surface of the skin during grooming. The other is active on the neck region of the teeth due to the hairs being pulled between the teeth. Individual variation determines which abrasive action is responsible for the final total attrition of the individual teeth. Continued use of the remaining stumps results, through the rubbing mode of abrasion, in attrition of the remaining stumps to below the level of the surface of the gingiva.

Continued use of the partially or totally worn teeth for grooming purposes is no longer effective in removing parasites from the pelage, resulting in a high external parasite burden. The irritation caused by the persistent presence of the parasites coupled with the high parasite numbers results in continued grooming efforts. The persistent grooming efforts result in the epilation or fracture of the hairs, leading to partial and eventual complete alopecia. (Development of patches of alopecia following excessive grooming activity has previously been recorded in mice which are unable to effectively remove parasites due to limb disabilities (Bell, Jellison & Owen 1962, Bell & Clifford 1964), and in moose which experience heavy tick burdens in winter (Glines & Samuel 1984).) The loss of hair may be facilitated by the fact that the hair follicles are in telogen phase in winter. The poor condition of affected animals may exaggerate the looseness of the telogen hairs, further facilitating their epilation. Only those parts of the body which can be reached by the mouth are affected by this process - hence the normal appearance of the pelage cranial to the spine of the scapula.

Tests for possible nutritional causes of alopecia were undertaken on impala exhibiting this syndrome in the Kruger National Park, RSA, by Dr N. Fairall (Fairall *in litt*) during the 1960's. No indication of an alternative cause for the alopecia was identified by these tests, and in fact the cause of the syndrome had remained unidentified until the present study.

The areas of even-length short hairs is suggestive of new, synchronized hair growth. The existence of these hairs may reflect the fact that new, actively growing hairs are not epilated easily or, alternatively, that parasitic irritation has been reduced resulting in a cessation of the repeated grooming efforts that are responsible for the epilation.

Once the pelage is removed, exposed parasites are likely to be removed even by the worn teeth, resulting in the restriction of ticks and lice to those areas which retain some pelage and thus offer some protection. The long haired parts - the tail and the metatarsal glands - remain well covered and retain large numbers of parasites. Exposure of the skin to sunlight is likely to result in UV irritation despite the black colouration, possibly explaining the mild cases of exfoliation recorded.

The ability to remove parasites - and thus the source of irritation - is likely to be correlated to the percentage of dentition remaining. For this reason alopecia is worst in those animals with no teeth, and is less severe in those with only mild to moderate degrees of attrition.

The poor condition is a reflection of the effect of the annual winter dry season on the level of nutrition. The relatively poorer condition of affected animals is likely to be due to: 1. A compromised ability to ingest herbage due to the relative or total absence of the anterior teeth; 2. An increased expenditure of available energy on ineffective grooming efforts; and 3. The general stress syndrome precipitated by the parasite irritation, loss of condition, and associated derangements in physiology.

Haemopoietic response indicates a responsive anaemia, and is likely to be related to the high but individually variable degrees of external and internal parasitism.

High levels of internal parasitism may reflect compromised immunocompetence due to poor condition and the correlated adrenal hypertrophy (Chapter 4, present study). Alternatively, or in addition, affected animals

may somehow be exposed to a greater infestation risk via unidentified processes.

EVOLUTIONARY ASPECTS

The pale friable musculature of severely affected animals is likely to be a reflection of the advanced state of cachexia as well as the anaemic condition of these animals

INTRODUCTION

The thickening of the sub-epidermal blood vessel walls and the associated round-cell and eosinophil infiltration are suggestive of a chronic exposure to ectoparasite allergens. As of various investigations into the community of species co-existing in the northeastern Tuli Block of Botswana. The results have been discussed within the constraints of the particular fields of investigation, and Collier's Razor has determined that only limited conclusions could be drawn from the results obtained.

What the thesis has thus achieved is a description of a particular pattern, or a particular group of patterns, within a specific temporal and spatial framework. After all, every study refers only to a minute sample of the real world. However, the patterns we see are merely a reflection of the disparate and innumerable processes that underly the functioning of every living system. To ignore these processes and to describe only the patterns is to deny the fundamental reality of the biological world. Yet to speculate about processes that have not been specifically studied and identified would be to ignore the constraints of scientific discipline. Yet again, as a Doctorate in Philosophy, this investigation requires a thorough consideration of the philosophical implications of its findings in a manner not permitted by the precise world of published scientific literature.