

SKIN CANCER OF THE ANGORA GOAT IN
SOUTH AFRICA.

BY

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THESIS PRESENTED FOR

D.V.Sc. DEGREE

UNIVERSITY OF SOUTH AFRICA.

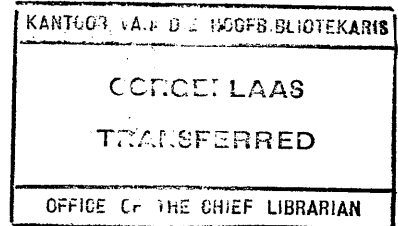
1928.

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(1927/28)

I. INTRODUCTION.

Cancer as a disease of the lower animals, has in the past scarcely received the attention that it deserves. It has been customary to assume that its incidence was negligible as compared to that in man. From evidence accumulated in the last few years, and from the findings presented in this paper, it will be seen that this assumption no longer seems justifiable.

We know, for instance, that neoplasms of the most varied nature occur in the domestic fowl with relative frequency. Apart from artificially produced tumours, many occur in the smaller laboratory animals, notably rats and mice. With regard to the incidence of neoplasms in the larger domestic mammals, on the other hand, and more especially the ruminants, very little is known. It is true to a certain extent, that these animals are usually killed for human consumption, or for economic reasons, long before they reach the age at which tumours usually develop, but one cannot dispute the fact that many do reach a comparatively old age. These are usually animals, e.g. milch cows, wool sheep, mohair goats, etc., which during life yield valuable products. Although tumours have from time to time been recorded from these animals by various workers, the information given, is often very scanty and incomplete. The histological description is either very brief or lacking altogether, so that even the diagnosis is frequently left in doubt. It is largely on account of this paucity of actual detailed histological work in the veterinary literature that one very often experiences real difficulties, when confronted

with any but the commoner and better known types of neoplasms. One is thus forced to fall back onto the fairly comprehensive treatises on human neoplastic disease, and draw comparisons and conclusions as best as one can.

In South Africa experience indicates that tumours in the lower animals are by no means a rarity. In fact, during the course of ordinary routine histological examination in the pathological section of this Institute, no less than 123 were returned as neoplasms in the last two years, out of a total of 1950 specimens examined. It may be of interest to indicate very briefly how these affected the various species of animals.

	<u>Carcinoma</u>	<u>Sarcoma</u>	<u>Others</u>	<u>Total.</u>
Bovine	14	5	15	34
Equine	4	4	14	22
Sheep	4	4	-	8
Goat	16	-	-	16
Dogs	8	1	1	10
Pig	-	-	3	3
Monkey	1	-	-	1
Fowl	-	-	29	29
TOTALS	47	14	62	123

Numbers of melanomata from grey horses encountered at post mortem during this period, are not included in the above figures, as it is not customary to collect them for microscopical examination.

The 16 goat neoplasms are those forming the subject of this paper. The collection of fowl tumours has only recently been started, so that the figure above is hardly representative. Since the material has only been partly studied, they are all for the present grouped together under the heading "others".

It is probable that with the cooperation of the various slaughter houses, and the field veterinarians of this country, much more material could be collected. A number of these tumours were found to be extremely interesting, and are to the best of our knowledge undescribed, thus offering unlimited scope of research work. Indeed, one

cannot help being struck by the wealth of material obtainable at the cost of a little trouble and patience. Material which if subjected to systematic study, would undoubtedly open up possibilities of throwing more light on one of the most baffling problems of human and animal pathology.

The present paper is concerned only with certain skin tumours as observed in Angora goats under South African conditions.

In 1926, our attention was drawn to the annual losses caused amongst Angora goats in this country by the fairly frequent occurrence of skin tumours. At the very outset it became evident that this breed was particularly susceptible to certain forms of malignant skin tumours. These for the greater part affect the perineum of the females, but also to a much lesser extent the ears, base of horns and other portions of the epidermis. The condition presents many interesting features, and, if we exclude the well known adenocarcinoma of the anal glands in the dog, has probably no parallel amongst our domestic animals. As far as could be ascertained, the condition has not yet been recorded. In the first place, the frequency of these tumours in itself forms an interesting observation in view of the belief that animals generally, and ruminants in particular, are only slightly susceptible to malignant growths. The well known fact that dogs are subject to cancer to a greater degree than other animals, is generally attributed to the greater age these are allowed to attain as pets. This, however, is open to objection, as a great many other animals are often allowed to reach a ripe old age, either for sentimental or other reasons, and yet probably show much less tendency towards tumour formation than dogs. Age is obviously not the only predisposing factor. Breed is just as important, and the susceptibility of different species and even varieties of the same species varies greatly. One need only mention,

for example, the well known melanomata in grey horses. The frequency of these tumours under conditions of age, locality, food, work etc., quite similar for grey as well as for other horses, shows clearly that the susceptibility, whatever it may be, is inherent in the grey horse itself. The Angora goat, as will become evident from the observations to follow, presents a remotely similar example. Apart from the fact that these tumours are often melanotic and appear frequently in the region of perineum in both horses and goats, it will be seen that they have nothing in common. In the horse they are melano-sarcomata, whereas those in the goat are of epithelial origin. In comparing the Native and Boer goats of this country with the Angora, under similar conditions of environments and age, often even mixed in the same flock, we find that the former, with very few exceptions, never suffer from cancer, whereas in the latter its frequency is relatively high. This is so striking that many farmers consider the condition contagious, and deal with it accordingly. One must say, however, that except for an occasional valuable stud animal, the losses due to cancer are not considered very great, when compared with the occasional heavy annual mortality, resulting from droughts, poisonous plants, and other agencies common to this country. This probably explains why the condition has not attracted the attention of veterinarians sooner. Mention of the condition from one particularly observant farmer in correspondence with this Institute, led to the discovery that it was fairly general in Angora flocks, in which a very small percentage of cases occur regularly every year.

It was decided to investigate this interesting condition and the results which have been obtained to date, are given in this paper. The main object of this article is the description of the tumours collected. Incidental notes

on the clinical aspects and treatment, gathered partly from the very limited field experience, are added where possible. A few observations and suggestions regarding possible pre-disposing and causative factors are also given. The experimental part of the work is naturally restricted, especially when dealing with large animals as in this case. Such experiments necessarily extend over very long periods of time, a fact which further curtails the scope and variety of experiments which can be undertaken.

From enquiries made amongst Angora farmers themselves, this disease must have existed in the Cape ever since the early days of the Angora goat in this country. The term "cancer", "canker" or its Afrikaans equivalent "kanker" is generally used to designate any tumours with malignant tendencies. Amongst Angora goat farmers, however, it has become a specific term for a malignant disease, which usually affects the perineum, sometimes the ears or other parts of skin of these animals. Frequent metastases, and symptoms of cachexia which accompany these tumours in their ultimate fatal form, certainly justify the term cancer, and also the belief that the disease is incurable in its advanced stage. A great deal of information was collected from many farmers who had had to deal with the condition. Most of it, however, although often interesting, was found to be very conflicting and unreliable, and had to be discarded.

II. THE SOUTH AFRICAN ANGORA GOAT.

Origin.

In order to appreciate certain points raised later in this paper, it is perhaps relevant at this stage, to briefly recapitulate the history of the introduction of this animal into South Africa. This incidentally led to the establishing of one of the most remunerative lines of stock farming in the more or less arid regions of the Cape.

Cronwright Schreiner states that the first importation of one Angora she-goat with 12 males from Asia, took place in 1838. These rams eventually all proved sterile, having evidently been tampered with before their departure from their home country.

Fortunately, the she-goat during the course of the voyage, gave birth to a ram kid, so that this ram with its mother really formed the nucleus of the South African Angora goat industry. Many more and larger consignments were subsequently imported, i.e. in 1856, 1857, 1858 and later. Practically all these earlier imported goats were at first freely crossed with the Native and Boer goat, which are known for their hardiness and prolificacy (twins and even triplets being quite common). This cross, although it undoubtedly meant a serious setback in the quality and quantity of mohair, has had a marked beneficial effect in producing a hardier race, and rapid multiplication at the beginning. Subsequent grading up by selection resulted in the present day relatively high standard animal. One however, often notices reversion to coarse hair, pigmented skin, hair, etc., as a result of the impure original stock.

HABITAT.

The Angora goat population of the Union at present numbers some 1,825,000 animals. Although new blood was several times introduced from Turkey, inbreeding necessarily had to be resorted to in this grading up process, in order to bring the quality of the mohair to that high standard, required for the trade. It is probably on account of this high specialisation for the production of mohair of exceptional quality that the Angora goat like other highly bred animals, presents such refined characters and is rather delicate in constitution.

Angora goats do fairly well in many parts of the Union, but for the production of the best mohair, certain very definite climatic and pastoral conditions are essential, and these are to be found in the colder, dry, semi-arid districts of the Cape. In these regions infectious diseases are practically unknown, but the periodic severe droughts and attendant ills, such as over stocking and plant poisoning, etc. cause at times considerable losses. The goats are usually herded in large flocks by day, and kraaled at night. This practice is being gradually replaced by a more modern and rational system of allowing animals free range day and night in vermin proof camps. As a matter of fact the Angora goat is no worse off as regards hygienic and other conditions, than sheep and Native goats, kept in the same locality.

NORMAL SKIN.

The better bred Angora goat has as a rule a clear, pinkish white skin of fine pliable texture. The long, uniform, wavy, silky locks of pure white mohair cover the whole body with the exception of the face, ears and distal extremities of the limbs. The latter parts are covered by coarse, short, stubby hair. Very often, however, blackish pigmented patches are present on the skin, especially that of face, ears and perineum, rarely on the body. These vary in size from that of a pin's head to half a crown or larger, and in number from a few scattered patches to great numbers often tending to confluence. The hair over these is as a rule white. Occasionally one sees goats with completely pigmented skin; the hairy coat then has a bluish grey colour. This distribution of pigment in the skin is important as it probably has a bearing on the origin of the pigmented tumours to be mentioned later.

The skin is usually dry and often covered with fine epithelial scabs resembling dandruff. Oily skins are sometimes met with, but such animals are culled, as their mohair is considered coarse. The skin of the face and ears is rather thicker, and very often pigmented, in fact the skin around the eyes is nearly always so. The ears often show laceration and snicks, the result of ear marking. The perineal skin is soft and of a pinkish grey to very light brown colour. It is well supplied with sweat and sebaceous glands, but only sparsely covered with fine hair. The recess below the tail usually contains a variable quantity of greyish, cheesy, sour-smelling matter resembling smegma. This may be in the form of a soft, pultaceous mass, it may be caked or even dry and crumbly, but always fairly firmly adherent to the underlying skin. Little balls of this substance matted together with dirt and formed by the to and fro rubbing of the tail, can often be seen hanging from small excrescences of the epidermis in this region. The skin in this recess, once cleaned is very thin and hairless, white in colour, and pitted by the openings of countless sebaceous glands.

HISTOLOGY OF THE SKIN.

For the purpose of obtaining an idea of the histology of the skin of those parts especially subject to cancer, an apparently healthy, mature she-goat 14433 was killed, and material for examination collected from the non-pigmented perineal skin. Sections were prepared from 13 different pieces, representing regularly spaced layers on either side of a median line from the depth of the tail recess down to the region of the clitoris. The skin just under the tail, i.e. in the depth of the recess

shows numerous very large sebaceous glands, nearly touching each other. They show branched sacculations, which communicate with the surface by wide funnel-shaped opening in the epidermis. Hair follicles are practically absent in this region, but the sweat glands are well developed. The epidermis is fairly thin and covered by very little keratinised substance. In the sections taken, at the level of the anus, the epidermal layer becomes fairly thick, and in many places, especially along some of the follicles, evidence of hornifying centres can be seen. Still further down the hair follicles become more numerous. Sebaceous and sweat glands remain well developed and numerous, although not quite so close together, nor so large as above. In the region between the anus and the vulva, situated well below the level of the sweat glands, and lying on the bundles of muscle fibres, are sparse, but well developed glands, which appear to have a special function. Their lumen contains an eosinophilic, homogenous material resembling colloid. In appearance they resemble the sweat glands to some extent, but show many more convolutions. Some of the tubules often show branching sacculations. The lining epithelium consists of a single layer of low cubical epithelium often having a peculiar, vacuolate appearance due to the presence of many refractory globules in the cytoplasm. The opening of these glands was not traced. They are probably modified skin glands, of the nature of the so-called apocrine sweat gland. Pigment is absent, or very scarce in the basal layer of the epidermis, but may be seen in chromatophores lying just under the basal membrane. These are few in number, and fairly well spaced out, but more are seen in between the sebaceous glands and around the hair follicles. Throughout this region, round cells in clusters, or in diffuse arrangement are seen in the corium, sometimes associated with the interpapillary

processes of epidermis. These round cell accumulations are more evident under the squamous epithelium lining the vulva. Here they seem actually to invade the epithelium in places and are often mixed with neutrophiles. The chromatophores are generally absent from this region. Towards the periphery of the perineum, there is a gradual decrease in the number and size of the skin glands, as the hair follicles become more numerous.

Specimens of skin from other goats, some with pigmented perineum and ears, were also examined. The histological picture is similar to the above in all essentials, except that the distribution of pigment is different. The pigmented patches or maculae mentioned above, contain a good deal of melanin. The granules are most abundant in the germinal layer, but pervade also the whole malpighian layer.

The other parts of skin may contain smaller but variable amounts of melanin, which is either uniformly spread along the basal layer, or concentrated to form denser patches. The arrangement of the skin glands is the same. They are large and closer together, often unassociated with hair follicles near the anus and under the tail, whereas they gradually become smaller towards the periphery of the perineum. Here and there near the anus and vulva, superficial erosions with infiltration of neutrophiles and round cells under and into the epidermis are seen. Sometimes a layer of inflammatory exudate and fibrin covers the excoriation. The skin of the ear from two specimens examined, presents nothing unusual. The epidermis is thrown into coarse serrations superficially, except on the inner surface of ear where it is relatively smooth. The interpapillary projections are small and shallow, but at the edge of the ear may reach considerable depth and thickness (acanthosis). The basal layer of the epidermis and