

varies from dark reddish brown at outer edge, to greyish green brown at centre. The lower part of tumour is covered by a sticky pseudo-membrane or crust with much dirt and pieces of straw adherent. On pulling this crust off, bleeding is fairly profuse. The whole mass is moveable over underlying tissue and appears attached to skin and subcutis. The skin of perineum is not pigmented and shows practically no inflammation. The anus and vulva are patent, defaecation and urination taking place with little difficulty.

22.4.27 Tumour has decreased in size considerably, now measuring only 4 x 3 x 2 c.m. It is attached by a fairly slender stalk which is now easily visible. It is about 1 c.m. above and to the left of anus. The stalk is somewhat flattened and less than 1 c.m. thick. The surface of tumour is covered by a slimy, sticky, stinking material, it is greyish green to brown, due to partial gangrene. Smears made from scrapings of surface of tumour show numerous spirochaetes and a varied bacterial flora, with long threads and fusiform ^{organisms,} shapes. Blood smear is negative. The lower aspect of the tumour presents a ragged cavity, in which numerous fly larvae are lodged. Hair around breech is matted, soiled by stinking, putrid exudate from perineum and tumour.

27.4.27 The whole tumour has disappeared, also all fly larvae. All that remains is a small oval, raised, ragged area, the stump of the tumour stalk. This shows hardly any inflammation and granulates under the scab. The whole perineum is much cleaner than it has been till now. The smeary material having disappeared with tumour.

2.5.27 Small scab present under tail, stump has healed up completely.

This animal has been kept under observation from time to time and is alive today and in perfect condition.

Note that at no time was any interference attempted either

with tumour or afterwards. The fly larvae burrowed right down to the rather slender stalk of tumour from which the hollow shell of the tumour then fell off, thus ridding the animal of both the tumour as well as the maggots as effectively as if a surgical operation had been performed. The small wound thus remaining healed up rapidly under a scab, and no signs of recurrence have been noted during the 18 months elapsed since. The skin of perineum has remained throughout quite clean, soft and pliable. The goat is still being kept under observation.

This confirms the fact already noted histologically that these tumours in their early stages are non-infiltrative ~~trable~~ and very well circumscribed. This applies even more to the stalked variety. This fact undoubtedly explains why it was possible for the fly larvae to eat away the whole of the tumour tissue.

No. 17292.

Angora kapater. Full mouth, very poor condition. This animal died on arrival, and through an oversight only a cursory post mortem examination was made, and the carcass destroyed without collecting material for histological study.

Post mortem findings.

Marked cachexia. Chronic adhesive pleuritis with multiple caseous abscesses (Preisz nocard), caseous lymphadenitis of bronchial and mediastinal lymphatic glands. Acute broncho-pneumonia of both lungs with multiple caseous abscesses. Hydropericardium. Left horn was broken off. Stump and surrounding tissues were covered by thick black, dry scabs, which on removal exposed a cavity leading down to frontal sinus. This contained a mass of gangrenous blackish tissue with slimy, greyish-black, foul smelling, fluid. The edges of cavity around the one-time base of horn, presented a firm, ragged, granular appearance covered by gangrenous material. No metastases in regional

lymphatic glands were recorded. This description agrees so closely to that of 17296, that there can be little doubt that the condition was similar except for the metastases in regional lymphatic glands.

No. 17300.

Angora she-goat. Two-teeth, poor condition and stunted. Arrival 15.6.27.

Over the centre, and about 2 c.m. above the brim of the left supra-orbital process, there is a papilomatous growth about 2 c.m. in diameter. It is sessile and the spike-like projections are hornified. The interstices between these, however, and the base of growth show a small amount of thick greyish purulent matter. The growth is apparently non painful.

23.6.27 There are signs of slight haemorrhage on growth, probably due to traumatic injury. Half the tumour was removed for histological purposes. The wound painted with tincture of iodine.

30.6.27 The wound as well as rest of growth are covered by thick dried exudate scab, which on removal leave granulating wound with purulent discharge. Disinfected and cleaned.

9.7.27 Growth decreased in size, tendency to heal up.

22.7.27 Small scab remains, on removal of this, slight bleeding but no trace of tumour.

2.8.27 Healed up completely, leaving only a small scar behind.

20.9.27 Painted with coal tar ^a over circular area including seat ~~over scab~~ of this wart extending to base of left horn,)

This area about 6 c.m. in diameter, was painted at intervals (See ~~dates given under~~ experiment No. 10) after scraping off the previous tar crusts.

30.11.28 This painting has now been continued for

over a year but no change can be noted on the painted area, except the loss of hair and a slight thickening and roughening of skin. This animal was selected for tarring on account of its origin from affected flock and because it showed tendency towards wart formation which may and may not be an indication of predisposition to tumours. The experiment is proceeding.

Part of the papillomatous growth removed surgically from skin above left eye was examined.

Histologically the growth consists of connective tissue, largely infiltrated in patches by round cells, and neutrophiles, and sends out multiple finger-like projections which are covered by a rather thin hornifying layer of epidermis.

Numerous forking slender projections of epidermis dip down into the corium. The basal layer is, however, continuous, and sharply defined. A few chromatophores are present in corium, and a few only of the basal cells contain a little pigment. The horny superficial layer is fairly thick.

Diagnosis.

Papilloma, with slight inflammatory changes at base probably due to injury.

No. 17301.

Angora she-goat. Two-tooth, rather poor condition and stunted. Arrived 15.6.27.

Near inner canthus of left eye a small greyish, papillomatous growth 1 c.m. in diameter, is observed. It is sessile, dry, and horny, shedding scales of epithelium. The perineal skin ^{is} brownish in colour, but shows nothing abnormal.

30.6.27 The dry, brittle horny superficial projections of wart can be easily and painlessly crumbled away by scraping lightly; this leaves a small, hard, raised area, the size of a pea, surrounded by a zone of hairless skin.

This thickened piece of skin gradually returned to normal by a process of scaling off, until later the hair grew again.

8.8.27 Animal is healthy to all outward appearances and is in fair condition.

22.10.27 This goat now selected for tarring experiment. Tar applied alternately and in regular rotation in four different places. Areas about 10 c.m. in diameter were clipped and tarred thus, (1) on the nape of neck, (2) on the sacral region, (3) left thoracic region, (4) right thoracic region. ~~The actual dates of tarring are given under tarring~~ ^{(see} experiment No. 10.) Tarring was discontinued on the 1.3.28.

3.4.28 Hair is growing well over areas now clean from tar. The skin here shows no marked difference from that untarred, except for a slight roughness.

21.6.28 Quite normal in appearance and condition.

30.11.28 ditto.

Nothing further was done to this animal. The skin near canthus of eyes is normal and has shown no further development. The tarring over alternate patches of body for four months was undertaken with the object of noting whether the slow tar absorption through the skin over fairly large areas would favourise the growth of warts in an animal already with this tendency. The results are so far negative.

This wart-like growth at the beginning may be taken as an example of what farmers think give rise to a malignant tumour, following on injury, scratching etc.

On account of the rapid disappearance of the wart no material was available for histological examination.

No. 9983.

Angora she-goat. Aged, condition fair.

30.4.27 Hair very long, at the buttocks tangled and matted together by dark slimy material, smelling strongly of decomposing urine, and consisting mostly of faeces, dirt, secretion etc. On lifting the tail, a fair amount of

greyish sour smelling cheesy material is found partly caked under tail. On scraping this off, a small stalked rounded protuberance, the size of a pea, is found adhering to skin above anus. It is soft, apparently covered by a delicate membrane. Scrapings from the surface of this revealed a mass of bacteria of mixed variety.

11.5.27 Vulva reddened superficially and swollen as if injured mechanically (horning?) The small protuberance mentioned above is partly torn off, hanging on by a shred of tissue, and showing evidences of bleeding. The stump was cleaned, and some material obtained from tumour of Goat 14771 was rubbed well into the lacerated stump

13.5.27 Mass of cheesy matter present under tail. The stump of torn protuberance bleeds easily on manipulation, and is covered by greyish sticky matter, a smear of which showed a rich and varied bacterial flora, with numerous fusiform bacteria and short spiral organisms. Stump re-infected by swabbing from tumour of goat 14771.

16.5.27 There is now a small sessile granulating elevation, the size of a pea, which bleeds easily surrounded and covered by a moist yellowish, gray sticky material. This consists of a mass of bacteria growing in the serous discharge from granulations, together with decomposing pus cells and skin gland secretions.

18.5.27 Fairly dry and clean, depression under tail shows cheesy material partially covering a small pink swelling, the size of a split pea. Smear made shows mixed bacterial flora, with fusiforms, racket shapes, and short spiral organisms.

23.5.27 Depression under tail fairly dry, small swelling decreasing in size.

4.6.27 The long, bushy hair around perineal region soiled and impregnated with urine. Swelling has practically disappeared.

13.6.27 Healed up *apparently*.

6.7.27 No change. Injected subcutaneously into perineum above anus swab suspension from goat 14771. Tied an absorbent pad over perineum to keep exudate and urine into continuous moist contact with perineum and thus cause maceration of skin.

11.7.27 Purulent greyish matter discharging from seat of injection. This is kept in contact with skin by above pad.

15.7.27 Stinking, greyish ^{*brown*} ~~brown~~ discharge kept plastered over swollen wound, and granulating bed, by absorbent pad.

22.7.27 Wound has cleaned up and is healing in spite of pad and ^{*decomposing*} ~~dry~~ matter.

2.8.27 Slightly moist exudate covers wound which is healing well.

8.8.27 Matted hair and absorbent pad keep moist conditions, wound has healed up completely. On scraping cheesy matter under tail a small pink protuberance found in the same place as the previous one.

26.8.27 Fairly dry cheesy matter present, protuberance bleeds easily when cleaned of adherent matter.

6.9.27 Moist and sticky ^{*water*} under tail, protuberance appears somewhat swollen.

13.9.27 Same, slight purulo-catarrhal discharge from vulva.

15.9.27 Shorn, condition of animal good. Face and ears have a clear skin, i.e. show no pigmented spots. Recess under tail still carries a small granulomatous protuberance partly covered by caked cheesy matter.

20.9.27 It was decided to apply tar regularly at intervals to skin of perineum. This animal was chosen and included into the experiment because it already had ^{*1a/*} ~~growth~~ of sorts, on the anal skin and that tar application might

hasten the development of that into some definite neoplasm. The whole perineum was ^a painted. ^{(For etc.} the tar used ^{and the dates} ~~on which it was applied are given under Tar experiment No.10)~~
^{see} ^h

29.10.27 Protuberance under tail still present, but shows no change although included in the tar painted area. It becomes surrounded by a putty-like black mass consisting of tar and abovementioned cheesy substance.

14.11.27 Perineal skin shows a blackish brown tinge from tar used. The partly dried crust of tar is scraped or peeled off from skin, before each application.

17.12.27 Skin at edge of perineum is slightly thickened and covered by tar crusts. The skin of perineum itself is still soft and pliable. Protuberance present, but shows no progress.

24.1.28 A small cornu cutaneum about 3 c.m. long, has been growing on inside of right ear for some time. In the recess under tail the small tumour is still present, it is now flattened and papillomatous in nature and about 1 c.m. in diameter.

3.4.28 The pink granulomatous growth under tail has increased in size, it has a flat, expanded papillomatous appearance and about 2 c.m. in diameter, and is generally surrounded by a black sticky mass of tar and detritus. It bleeds easily when scraped even gently.

21.6.28 Still about the same.

30.8.28 Flat, papillomatous growth ^{still ±} ~~has reached~~ 2.5 c.m. in diameter, bleeds on manipulation. Surrounding skin shows no change.

11.9.28 In order to increase toxic effect of tar by increasing absorption, fairly large areas of skin, 15 c.m. in diameter, were clipped free of hair, on both thoracic walls and gluteal regions. These were painted with tar on alternate dates in addition to tarring of perineum.

24.9.28 Animal is losing condition and appears

sickly, listless, shuffling stiff gait, lachrymation of one eye.

28.9.28 Discontinued tar application, animal losing condition and not feeding, miserable appearance.

2.10.28 Died during the night.

Post mortem findings.

Caries of middle incisors with gangrene of gums. Swelling of liver, with greyish, pink reticulated appearance due to prominence of interlobular tissue. Much enlarged and thickened gallbladder filled with fluid yellow bile. Multiple pin's head sized cysts in cortex of kidney. Numerous small hair balls in abomasum, ranging in size from that of a pea to that of a large marble. Small flat papillomatous tumour in recess above anus. Catarrhal enteritis. Tar poisoning.

Histological findings. *Specimen 8507.*

Congenital fibrosis of liver with extensive proliferation of bile ducts. Cystic kidneys. Tumour above anus presents roughly the shape of a mushroom, i.e. it has a short but transversely elongated stalk about 0.3 c.m. thick, supporting a thin flattened, expanded top about 1.0 x 2.0 c.m. The surrounding skin comprises a rather thin epidermis which is continued up the stalk and on lower aspect of expanded part of tumour. There are numerous sebaceous glands which present a peculiar appearance. They are much lobulated and consist of a greater amount of cellular tissue than normal, so that only a small number of fat containing cells are present in centre. One gets the impression that the basal layer of the gland is thrown into convolutions and that the ^{basal cells} nuclei are greatly proliferated. The sweat glands are few in number and unchanged. There are numerous scattered round cells in the subcutis.

The superficial expanded portion of tumour presents an irregular surface. The epidermis is continuous at the edges with that of skin but becomes **intermittently greatly**

thickened on surface. It sends thick processes dipping down into underlying tissues. These are separated by fissures or cavities usually filled with keratin, forming thus a very irregular surface. The epidermis moreover, is not sharply defined, but blends or becomes continuous at various points with masses of epithelial cells below, which appear to be altered remnants of sebaceous glands. These contain very little fat carrying cytoplasm, but the lobulated arrangement and more or less sharply defined deeper convoluted layer of germinal cells, remind one of sebaceous glands. ^{structure.} Here the proliferation of cellular elements is even greater than under the skin a short distance away. These basal cells from being more or less in single layers in the depths, become loosened and scattered. They are round, flat or spinous in character, and merge into the dipping processes of altered epidermis. In places blood capillaries become fairly frequent and even small haemorrhages are present in the superficial layer. There are suggestions of small foci of horn pearl formation, i.e. swollen squamous cells with disintegrating nuclear substance. Nowhere, however, does not find the uniform loose epithelial cell formation, breaking away from a definite basal membrane as in other tumours of the basal cell type, nor the typical pearl formation seen in cancroids. Although not typical, one might probably call this a type of sebaceous gland adenoma, accompanied by fairly extensive alteration of the epidermis. It is not difficult to imagine a step further in the development of this tumour in which the basal cells of the gland become more and more emancipated and likewise the epidermis tends to cancrioid formation which would ultimately give rise to the mixed form of basal and spinocellular types of carcinoma which have already been described.

Diagnosis.

(Adenoma?) with accompanying acanthosis. Probably an early stage in the combined form of base- and spino-cellular carcinoma.

Specimen 7256G.

Angora she-goat. 6 Tooth. Ventral vulvar commissure and clitoris swollen, red and encoriated, covered with exudate. This whole region was excised, as it was thought this might be the early stage of a tumour. The epidermis at its junction with the vulva mucosa is necrotic over a small area, so that no epidermal cells are left intact. The bed of this ulcer is shallow and the layer of fibrin, exudate and necrotic cell debris rests on a mass of connective tissue very heavily infiltrated with round cells, neutrophiles and other cells. The rest of epidermis and mucosa are fairly thickened but show no abnormality. The former shows the usual skin glands. The whole corium, however, together with the subcutis is extensively infiltrated with neutrophiles, these in parts filling small cavities (abscesses) and greatly marring the rest of structure. There are round cell accumulations and numerous young fibroblasts and vascular tissue. In parts, it seems that epithelial cells can be distinguished, but these may be endothelial cells actively dividing.

Diagnosis.

Ulcerative dermatitis of vulva. Whether or not this is a beginning tumour of the basal cell, or rodent ulcer type, is difficult to say, as no definite indication could be obtained from this material.

No. 14505.

Angora she-goat. Aged, in good condition.

30.4.27 A fresh, bleeding, deep lacerated ^{hr} found involving vulva, was discovered, and probably was due to horning, by another goat.

There was considerable swelling of parts with purulent discharges. On account of constant soiling with urine no healing took place. The animal was kept under observation to see whether such a chronic inflammatory process would give rise to neoplastic growth. Spirochaetes and bacteria were found in the wound on various occasions when smears were made. The wound remained in more or less the same state for months, the inflammatory swelling gradually subsided, leaving a deep slit obliquely across *the* vulva (See figs 42 & 43.)

30.11.28 After 19 months the wound has not yet closed. This slit on the right lip is fairly deep, has smooth sides and opens up into the vulva.

Slight superficial excoriations with attendant swelling can be seen at intervals near the lacerated part. There is also a slight gangrenous tendency in the depth of the slit. There is still the possibility, therefore, that this may ultimately develop into a neoplasm.

The animal is ~~thus~~ being kept under observation.

No. 15690.

Angora she-goat. Aged, in fair condition. This animal was included in experiments Nos. 2, 5 and 10, which gave negative results. It was noticed to have small epidermal protuberances or fringes under the root of the tail as shown in photograph Fig. On these, frequently, faeces, dirt and smegma-like sebaceous secretion tends to accumulate and by the to and fro rubbing action of the tail, forms small balls suspended by a slender stalk. It was thought that this might have some irritating effect. One of these protuberances was excised and examined, but was found to consist of a fold of skin only, i.e. normal epidermis, with the usual skin glands. The covering epidermis showed no abnormal thickening, keratinisation or other changes characteristic of papillomatous or other growths.

VIII SUMMARY OF EXPERIMENTS.Experiment No. 1. Contact.

One she-goat, 11969, was kept in contact with affected animals 14770, 14771 and 14772, for at least six months. During this period she gave birth to one kid. There was ample opportunity for infection, as the box in which the animals were kept continuously at the time was not large, ^t larger on all affected animals and available experimental animals were kept together in a small paddock. Apart from 9983, which already had a small nodule at perineum, no cases developed amongst the incontact goats.

Experiment No. 2. Transmission.

This experiment was carried out by Mr. Bisschop of this Division. Goat 14773 was killed for this purpose and material from the anal tumour used in the various ways indicated below.

She-goat 15689, aged. A small piece of the tumour was implanted into anal sphincter on either side.

She-goat 15690 aged. Triturated tumour tissue was injected subcutaneously and intradermally at perineum.

She-goat 15691 aged. Piece of tumour was rubbed well into the cleaned and scarified skin near anus.

She-goat 15692 aged. The unscarified skin treated in the same way as that of 15691.

The results from these four cases were entirely negative.

Experiment No. 3.

Material obtained by means of swabs from the surface of tumour 14771 was used as follows: Rubbed into intact mucosa of vulva and anus of she-goat 15693.

Rubbed into scarified perineal skin of she-goat 15694.

Rubbed into scarified mucosa of rectum of 15696.

Injected subcutaneously at perineum 15697. Injected suspension mixed with liquid paraffin subcutaneously at perineum 15698.

Results here were likewise entirely negative.

Experiment No. 4.

Suspension of swab material from surface of tumour 14771 was injected subcutaneously near anus of one rabbit and two guineapigs. The rabbit developed a tense bluish swelling on the 6th day. It was killed on the 8th day on account of dull state and very large gangrenous swelling near perineum. The lesions resemble those due to *B. necrophorus*. Cultures and smears confirm this organism as cause of the lesion. The guineapigs only developed small swellings which, however, after some time disappeared. The bacillus of necrosis is thus present on these goat tumours.

Experiment No. 5.

A small piece of the ear tumour was excised from 17299 on the 23.6.27. Ground up suspension of this was injected subcutaneously into the ear of 15690 and the perineum of 15691. Some was rubbed into the scarified ear skin of 14771, suffering at the time from an anal cancer.

Negative results from all three animals.

Experiment No. 6.

The whole ear tumour 17299 was removed surgically on the 30.9.27. Small pieces taken as clean as possible but obviously not aseptic were implanted as follows:

- a. Into the subcutis of the other ear.
- b. Into the subcutis ear of 14505.
- c. Into the subcutis of ear and perineum of 15698.
- d. Into subcutis ear of 15697. This animal had previously received injections of Indian Ink to "blockade" its reticulo-endothelial system.
- e. Into subcutis of ear 15691.

Result: In the case of 15697 an indurated swelling developed at the seat of the transplant. This reached the size of a french bean, but later softened and discharged and thick greyish matter. The small wound then completely healed ^{up.} separately. In all the other cases the implanted material seemed to disintegrate and become discharged.

Experiment No. 7.

One of the markedly enlarged supramammary lymphatic glands of 17298, was removed surgically on the 2.3.28. It was hoped in this way to obtain practically aseptic, metastatic tumour tissue for transplantation purposes. This material, however, proved to be already septic, so that no intrajugular injections could be made. The ground up tumour tissue was injected subcutaneously into the following animals:

Female 18783	received	4 c.c.	into	the	thigh
" 18784	"	4 "	"	"	"
" 18785	"	2 "	"	"	right ear.
" 18786	"	2 "	"	"	"

All four cases behaved in the same way, i.e. a small firm swelling developed at the site of the injection and reached the size of a hazel nut in about 10 days. This gradually became soft and later burst discharging a small amount of thick, greyish matter. The small wound then healed up completely. No material for section was taken at any time in the fear of disturbing any growth taking place. Results are thus negative.

Experiment No. 8.

Infection of existing chronic wound of vulva 14505 with swab material taken from surface of tumours, 14771 and 17293. Although this material contained large numbers of spirochaetes and bacteria, which developed to a certain extent in the wound, no progress was noted. The wound

remained in the same state, i.e. refusing to heal up. It seems doubtful whether micro-organisms have any direct influence on the production of these tumours, unless such influence becomes manifest only after very long periods of time.

Experiment No. 9.

Large doses of Potassium iodide daily, either alone or in combination with arsenic were tried on 14771 and 17293. There was a slight reduction in the size of the tumour. This of course, may be due to spontaneous regression, which has occasionally been noted in such tumours. Since no encouraging results were obtained, the use of this drug was discontinued.

Experiment No. 10. Tar application.

The extensive work done on the artificial production of skin cancer and the comparative ease with which this is brought about by the application of coal tar, led to the following experiment. It was reasonable to think that the Angora Goat being so susceptible to spontaneous skin cancer, might readily respond to the action of coal tar. Eight goats were selected, some originated from affected flocks, others from totally different sources. These were painted with tar, every 3 or 4 days, i.e. (twice a week). Six young rabbits were selected and used as controls, i.e. their ears were painted on the inner surface, with the same tar on the same dates. The tar used was an ordinary grade of imported coal tar, manufacture unknown. The routine procedure of application consisted of clipping the hair where present, over area to be treated. Before each application the partly dried crusts, etc. from the previous treatment were carefully removed by peeling or scraping off. In the goats whose ears were painted, shields had to be fastened to the horns, to protect the eye from contact with the

tarred ear.

Particulars of the animals treated are as follows:

17295 She-goat, full mouth. From affected flock, skin shows pigmented patches. Painted the whole of perineal skin from 20.9.28 to 7.11.27. The animal then suddenly lost condition and had a severe diarrhoea. It died on the 15.11.27 and showed a marked ^einteritis, evidently due to some intercurrent infection. The skin in those parts painted with tar showed no change whatever.

16704. She-goat, aged. Non pigmented skin. Available animal. Perineum painted since 20.9.27 and still proceeding now after 15 months. No changes can be noted in the treated skin.

11969. She-goat, aged. Pigmented skin. Tarred the inner surface of right ear from 7. 11. 27 to 11. 9. 28
From this date tarred outer and inner surfaces alternately
Skin shows a very slight thickening.

15689. She-goat, full mouth. Non pigmented skin tarred perineum since 20.9.27 and still proceeding now after 15 months. Four areas roughly 15 c.m. in diameter were clipped on the thoracic walls and gluteal regions. These were tarred in rotation one on each date. The animal lost condition rapidly after a month of this. Tarring of the body was, therefore, discontinued. Only the perineum is painted now. The skin of perineum show hardly any change. There is a slight thickening but no enlargement of follicles.

15690. She-goat, 6 tooth. Pigmented patches on skin. Tarred upper surface of ear since 20.9.27. In this area was included a chronic swelling and ragged wound due to an ear tag having torn off. Tarring is proceeding and since 11. 9. 28 ^{ears on both} both _^surfaces are tarred alternately. A small piece of skin in tarred area was removed and examined macroscopically. Apart from signs of chronic inflammation no change could be detected. The horny layer was not