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HAIR GROWTH AND REPLACEMENT IN THE CAT

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SUMMARY

Observations were made on the histology of the skin from 66 cats of different ages. The extreme thinness of the epidermis of this species is noteworthy. Development of the pelage resembles that of the dog, hair germs being produced at intervals along the epidermis, and these then grow down into the dermis. Sebaceous glands and apocrine glands are produced from the hair germs. Primary hairs are produced first, subsequently the first secondary hairs develop on either side of the primary hairs and these soon produce hair germs from which develop more secondary hairs to compete the compound follicle.

In both housed and unconfined cats the primary and secondary hair bulbs decreased in activity after December, with total inactivity in January. This was maintained during February and March, activity recommencing in April. There followed a period of maximum activity of two to four months duration in unconfined cats. Subsidiary cycles of activity followed until December. It is considered that increasing photoperiod is the stimulus for hair loss and replacement in Spring. Neutered cats showed a comparable cycle to entire animals. Hair replacement did not progress over the body in waves as in rodents, but mosaically as in man.

Variable stages of activity of the hair roots were observed in compound hair follicles. Rates of hair growth of adult cats are comparable to those of man, approximating to 300 microns daily. The rate of primary hair growth was greater than that of secondary hairs. In three housed cats the maximum rate of hair growth occurred in late April with minimal hair growth in February.

INTRODUCTION

Whilst a number of causes have been ascertained for alopecia in dogs and cats, there still remains a variety of syndromes variously ascribed as being hormonal in origin. In dogs several syndromes associated with endocrine imbalance are documented but there is little information available on non-specific alopecia of the cat. Before the pathogenesis of a disease involving a particular system can be ascertained it is necessary to know the normal development of that system. Therefore, the work reported here was undertaken to widen the knowledge available on hair growth and replacement in cats. The first part is concerned with the histology and development of the hair, the second with rates of hair growth and its replacement.

Though hair growth and replacement has been much examined in detail in man this is not so for the cat and dog. Recently, Muller & Kirk (1969) stated

that little is known about hair growth of domestic animals. Several papers have, however, been published on the histology of the skin of the cat and dog. A review of the literature of the histology of the skin of the domestic cat was given by Strickland & Calhoun (1963) together with their own extensive study of the histology of that tissue.

MATERIALS AND METHODS

Skin from 66 normal cats of various ages was studied. Foetal skin from the fifth week of gestation to birth was examined. Skin was also examined from kittens aged one, two and three months, from cats at puberty, and from mature and senile adults. Sections were examined from 23 regions and these were cut in the direction of the hair flow on hairy skin. They were stained with Harris' haematoxylin and eosin, Weigert's and Van Gieson's methods for elastic tissueand Gordon & Sweet's method for staining reticulin; one per cent toluidine blue was used to demonstrate mast cells. To avoid the distortion produced by the processing of tissue for examination by the light microscope, skin was also frozen and cut by hand using the method described by Baker (1966*a*).

To indicate the manner of hair replacement four young adult cats, forming part of a housed colony of ten, were used. These were short-haired, non-pedigree cats, one male, one female, a castrated male and a castrated female. Freedom in a centrally-heated room was permitted, the natural lighting from the large windows which faced west was not supplemented throughout the course of study of one year. The light intensity therefore followed the natural yearly cycle. Hair was plucked once monthly from each animal from the following regions: between the vertebral borders of the scapulae (anterior dorsal thoracic), over the dorsal aspect of the sacrum (dorsal sacral and lateral to the umbilicus. Several hundred hairs were plucked on each occasion and the stage of activity of the hair roots noted. It was not found necessary to clean the hairs or to use a stain for this. The corresponding stages of activity of the hairs of unrestricted cats was found by collecting skin each month for one year from the same three regions of normal adult male and female cats which were destroyed.

A piece of skin 2 cm × 1 cm was removed from each region, and cut by hand in the direction of the hair flow vertical to the skin surface, after first having been placed overnight at a temperature of −20°C. Pieces of skin approximately 500 microns in thickness were cut, placed in glacial acetic acid for a few minutes and then flattened between two glass slides which were then bound tightly together with sellotape. This method showed the stages of the hair follicles in a large number of compound groups.

To determine the rates of growth of hair in the interscapular region this site was clipped in an adult male and two adult female cats, the sites were then shaved. Forty-eight hours later the sites were again shaved and the lengths of the shavings measured using an eye-piece graticule. At least ten primary hairs and at least ten secondary hairs were examined on each occasion. Estimations of rates of hair growth of the male commenced in September and continued monthly for three months, then bi-monthly for a further six months. The hair of

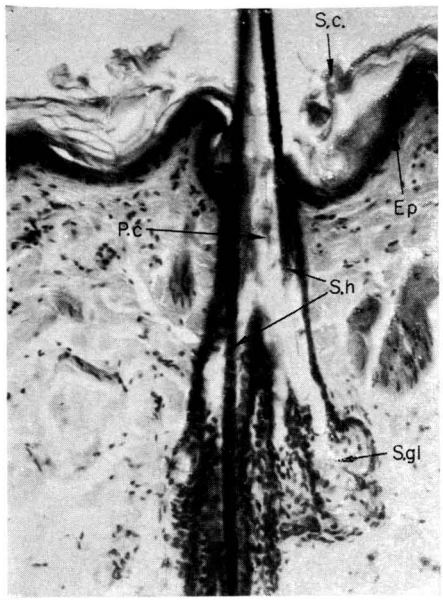

Fig. 1

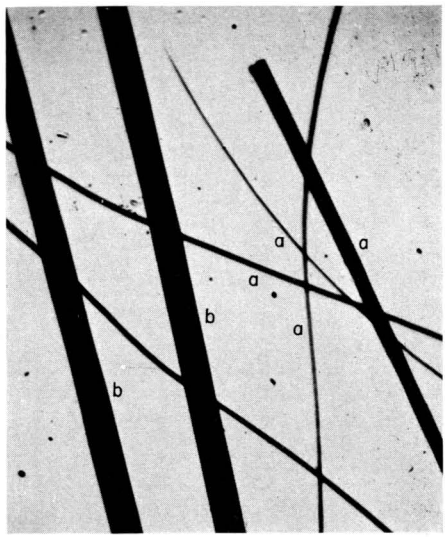

Fig. 2

Fig. 1. A vertical section of a lateral compound follicle of the interscapular region. Haematoxylin and eosin. Original × 55.
Ep = Epidermis; Pc = Pilary canal; Sc = Stratum corneum; Sgl = Sebaceous gland; Sh = Secondary hair.

Fig. 2. The variation in diameter of cat hair is shown. Fine hairs (secondary) form the undercoat (a), stout hairs (primary) form the top coat (b). Original × 55.

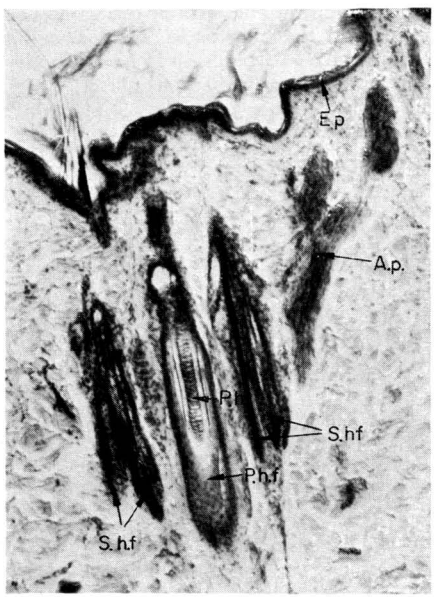

Fig. 3

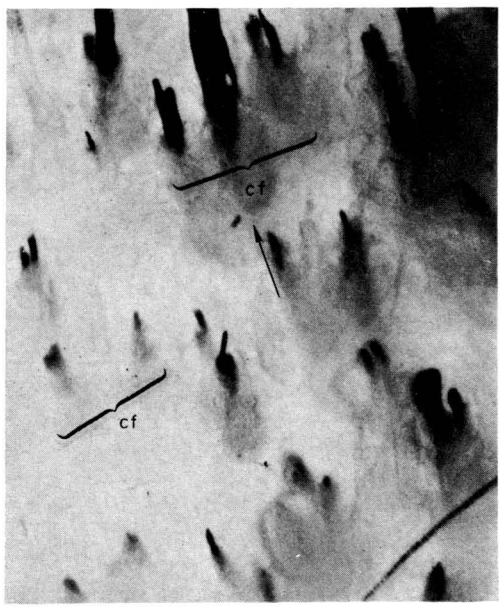

Fig. 4

Fig. 3. Vertical section, interscapular region. A triad of hair follicles is shown. The central primary follicle (Phf) contains a primary hair (Ph) and is bounded on either side by secondary compound follicle (Shf) groups containing secondary hairs. Ap = Arrector pili muscle.

Fig. 4. A vertical view of normal skin which has been shaved (suprascapular region). The follicle group (1) corresponds to the group AB in Fig. 5. Original × 50. Cf = compound follicle groups. The arrows indicate the direction of the hair flow.

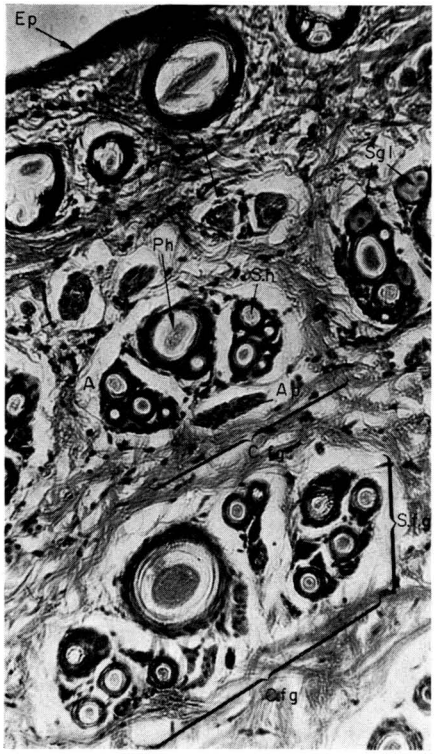

Fig. 5

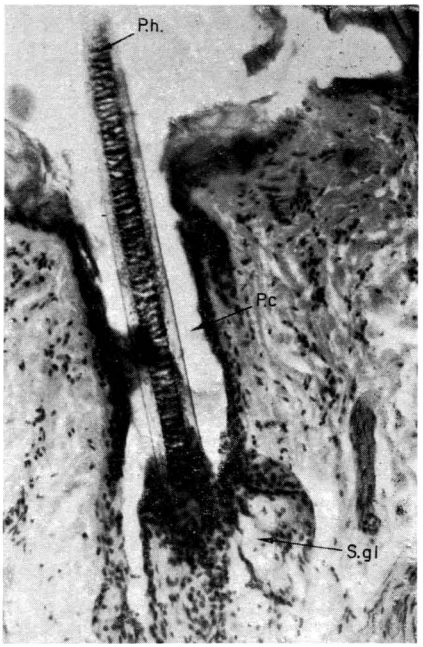

Fig. 6

Fig. 5. An oblique section of normal skin cut at right angles to the hair flow. The arrangement of hair groups is shown, follicles are cut at various levels. The follicles in the upper row are cut through their pilary canals, those in the second row are cut at the level of the sebaceous glands, and in the third, between the sebaceous glands and the hair bulbs. Haematoxylin and eosin. Original × 45. Cfg = compound follicle group; Ep = Epidermis; Ph = Primary hair; Sfg = Secondary follicle group; Sh = Secondary hair; Sgl = Sebaceous gland; Ap = Arrector pili.

Fig. 6. Section through a central primary follicle. A single primary hair occupies the follicle. Haematoxylin and eosin. Original × 100. Sgl = Sebaceous gland; Pc = Pilary canal; Ph = Primary hair.

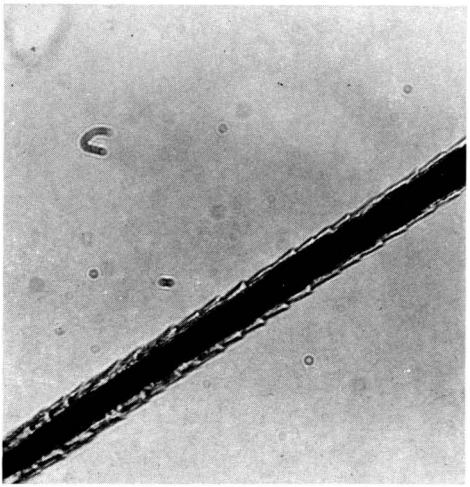

Fig. 7

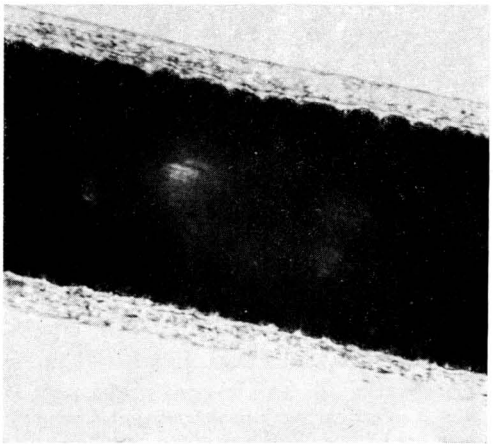

Fig. 8

Fig. 7. A secondary hair shows a narrow hollow medullary cavity and overlapping cuticular scales. Original × 45.

Fig. 8. The primary hair has a much greater diameter and the cuticular scales are not prominently overlapped. Original × 20.

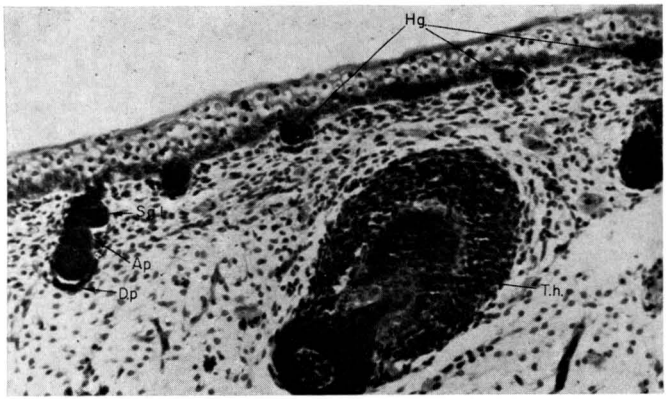

Fig. 9

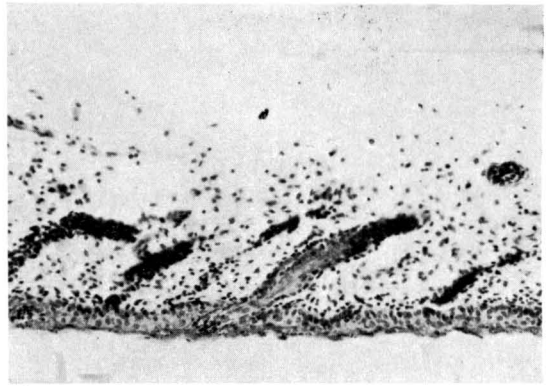

Fig. 10

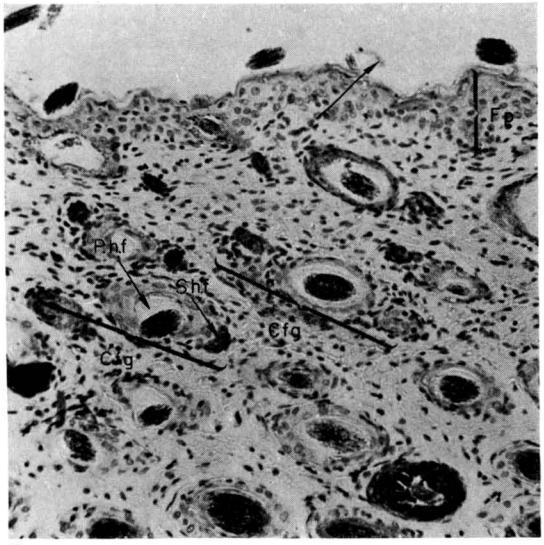

Fig. 11

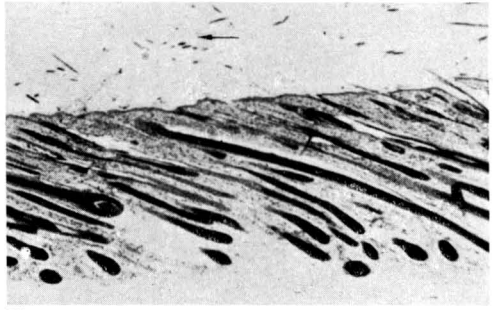

Fig. 12

Fig. 9. Foetus, muzzle, 38 days. A tactile hair is well developed, and hair germs are being formed. Th = Tactile hair; Hh = Hair germs; Sg = Sebaceous gland; Ap = bulge to which arrector muscle will be attached; Dp = Dermal papilla. Haematoxylin and eosin. Original × 55.

Fig. 10. Foetal skin from dorsum of the body at 40 days. Further orientation of the hair follicle has occurred. Haematoxylin and eosin. Original × 55.

Fig. 11. Foetal skin from dorsum of the body at 45 days. Follicle grouping is obvious, the central primary hairs are developed whilst the laterals are not. Haematoxylin and eosin. Original × 55. Cfg = Compound follicle group; Phf = Primary hair follicle; Shf = Secondary hair follicle; Ep = Epidermis. Arrow = hair flow.

Fig. 12. Skin at birth. The dermis is crowded with primary follicles, secondary follicles are also well developed and are producing further hair follicles. Toluidine blue. Original × 25.

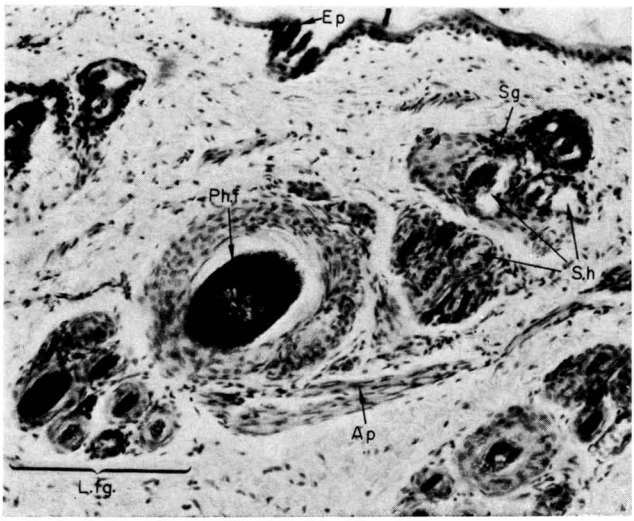

Fig. 13

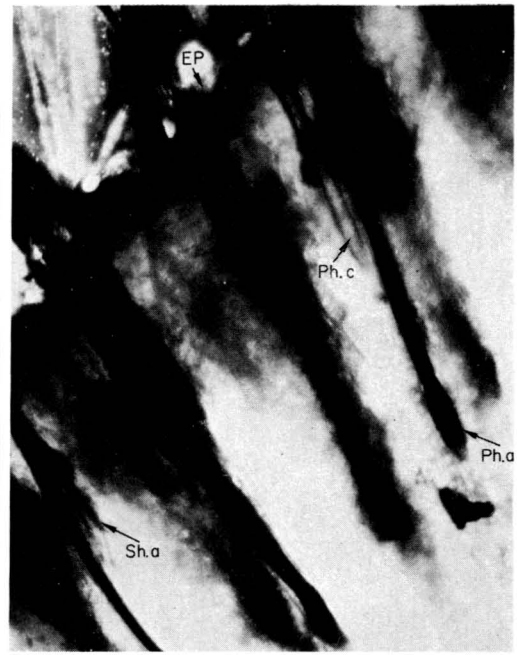

Fig. 14

Fig. 13. Compound follicle, four weeks old. A single primary follicle has produced no follicles whilst the lateral follicles have. Lfg = Lateral follicle group; Ap = Arrector pili; Ph = Primary hair; Sh = Secondary hair; Sg = Sebaceous gland; Ep = Epidermis. Original × 55. Haematoxylin and eosin.

Fig. 14. Thick vertical section interscapular region. Ph.a = Primary hair in anagen phase; Ph.c = Primary hair in catagen phase; Ep = Epidermis. Sh.a = Secondary hair anagen phase. Original × 20.

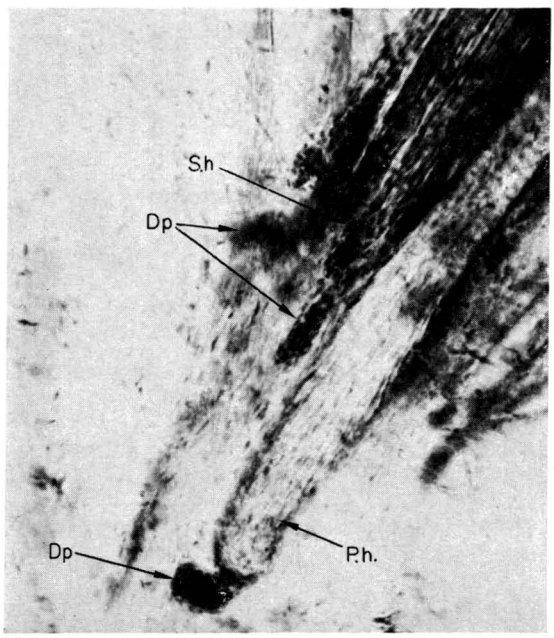

Fig. 15

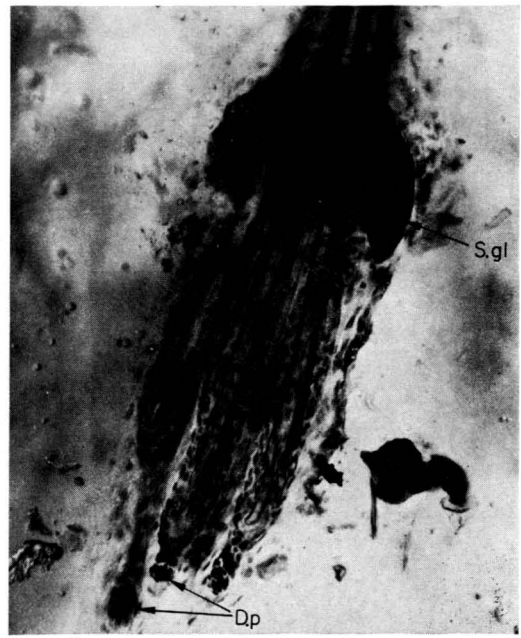

Fig. 16

Fig. 15. Thick vertical section. Primary hair (ph) and secondary hairs (Sh). There is regeneration of the dermal papillae (Dp). Original × 60.

Fig. 16. Hair regeneration at a later stage than Fig. 15, the new dermal papillae are proliferating down through the dermis. Original × 65.

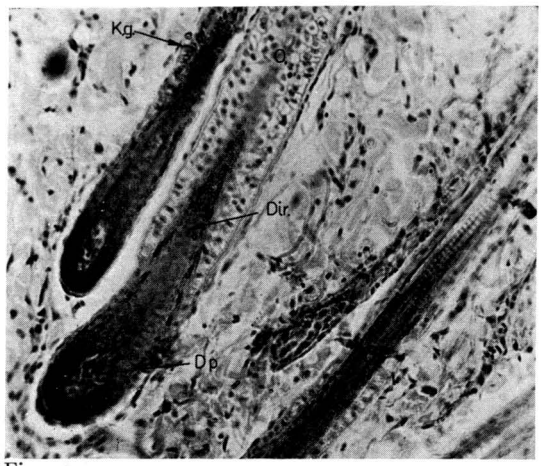

Fig. 17

Fig. 17. The dermal papillae are now actively forming hair, the outer root sheath (o) is formed and the new hair is growing up through it. Dir = Dome of inner root sheath; O = Outer root sheath; Kg = Keratin granules; Dp = Dermal papilla. Haematoxylin and eosin. Original × 65.

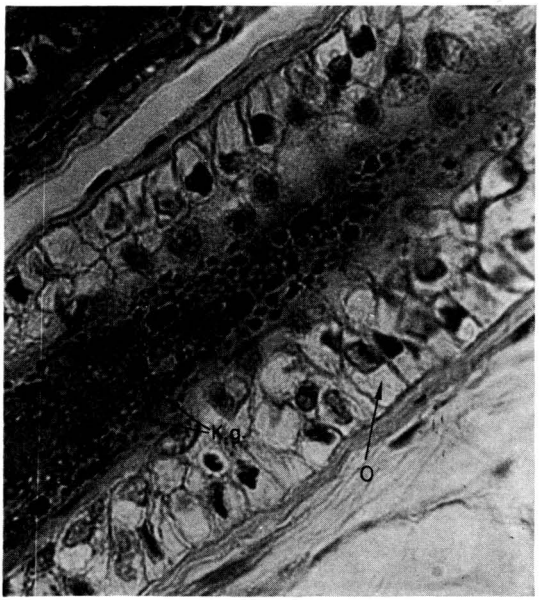

Fig. 18

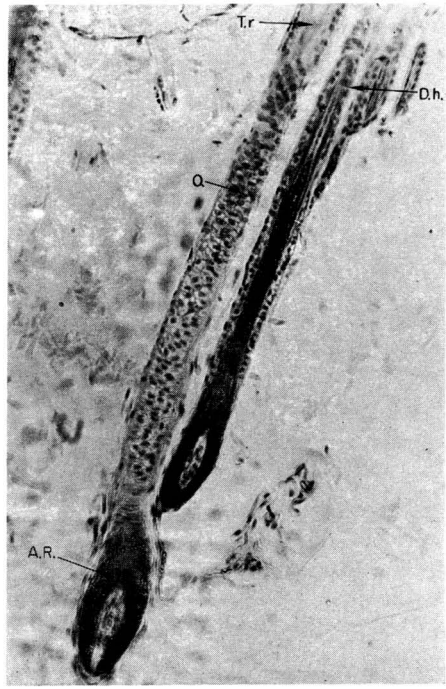

Fig. 19

Fig. 18. Hair regeneration. Higher magnification than in Fig. 17. O = Outer root sheath. Kg = Keratin granules.

Fig. 19. Two developing follicles are illustrated. The follicle on the left has not commenced hair formation, whilst hair formation is well advanced in the right. Dp = Dermal papilla; O = Outer root sheath; Tr = Telogen hair root prior to shedding; Dh = Developing hair. Haematoxylin and eosin. Original × 65.

an adult female (A) was similarly examined from September to December and subsequently until June in adult female (B).

To determine the manner of hair replacement over the entire body surface, two white cats were dyed using *Inecto shampoo. The first male was dyed when eight weeks old, the second male was dyed on three occasions as an adult.

RESULTS

Histology

Examination of sections of representative areas give broad agreement with the findings of other workers. No clear division into four regions occurs in the normal hairy epidermis; this is an important distinction, for to those who have only examined human skin, the normal canine and feline epidermis appears atrophic. The normal hairy surface epidermis of the cat and dog consists of 2–3 cells which are overlain by a compact stratum corneum. The processing of sections and their subsequent staining alters the normal structure of the stratum corneum producing a loose stratified structure (Fig. 1). Both a stratum lucidum and a stratum spinosum are absent. There is, however, a basal layer of germinating cells usually overlain by a single layer of cells undergoing keratinization. In contrast to the hairy epidermis of dogs, melanocytes are absent from the germinal layer except in a few specialized areas of hairy skin; these are the prepuce, scrotum and teats (Strickland & Calhoun, 1963) the circumanal area, the pinnae, and in the umbilical skin of the foetus.

The follicular folds of the hair follicles reported by Strickland & Calhoun (1963) in the cat were not observed by microscopical examination of unprocessed vertical sections of normal hairy skin cut by hand. It is suggested that these folds are produced by fixing, sectioning and staining skin. The sebaceous glands in the normal hairy skin are simple spindle-shaped alveolar structures arranged about the hairs, discharging into the pilary canals by short ducts at the level of the junction of the first and second quarter of the length of the active hair follicle (Fig. 1). The sebaceous glands of the anterior supracaudal region are very large and are made up of numerous acini, each gland being approximately 1,500 microns in depth and 750 microns in diameter. In the normal hairy skin each sebaceous gland consists of a single acinus approximately 40 microns in length and 15 microns in width.

Two types of sweat gland are found in cat skin, a simple tubular apocrine gland which opens at the same level as the sebaceous ducts in hairy skin, and a much coiled merocrine gland which is unrelated to hair follicles and which discharges directly to the surface of the foot pads.

The dermis contains ground substance, fibres, cells, blood and lymph vessels, nerves and hair follicles. The dermal fibres are collagenous, reticular and elastic, collagenous fibres being the most numerous.Elastic fibres are scattered throughout the dermis and are not numerous, reticular fibres are condensed about the basement membrane of the epidermis and the follicles. In the normal adult skin,

* Inecto, London.

mast cells, histiocytes and fibroblasts are comparatively few in number. In foetal skin this cellular population of the dermis is far more numerous. The mast cell of the cat resembles that of the dog and is found associated with dermal blood vessels, two or three are found in each high power field (1/12 objective × 10 eye piece).

There is considerable variation in the thickness of hair (Fig. 2). Here it is proposed to use the terminology of Carter (1965) when classifying hair. Thus, in the cat and dog there are primary and secondary hairs. The primary hair (guard) forms the top coat whilst the secondary (lanugo) hair makes up the under coat. Both types are medullated and the term lanugo used to describe secondary hair of cats is incorrect, for lanugo hair is not medullated. Secondary hairs are far more numerous than primary hairs except in certain specialized areas.

Hairs are arranged in groups of two to five with groups of two to three being commoner on the dorsum of the body: the groups are arranged at right angles to the flow of hair (Fig. 3). As reported by Strickland & Calhoun (1963) hair groups are arranged about a large primary hair on the dorsum of the body (Fig. 4, 5), but this arrangement is not characteristic elsewhere.

Thick sections cut in the direction of the hair flow and others cut at right angles to it, show that although nearly all primary hairs do not share a pilary canal (Fig. 6) the lateral groups do share common pilary canals (Fig. 1). On the dorsal aspect of the body there is often one stouter hair in each lateral group.

Secondary hairs (Fig. 7) have a much narrower medullary cavity than primary hairs (Fig. 8) and the overlapping scales which make up the hair cuticle are more obvious. Secondary hairs considerably outnumber primary hairs in all undifferentiated hairy regions. The ratio, however, varies, approximately ten secondary hairs to one primary along the dorsum of the back, with a ratio of 24 to 1 in the umbilical region.

Development of the skin

Development of the hair is well established in the foetus of 38 days. The epidermis is several cells thick and the dermis is very cellular (Fig. 9). A stratum corneum is absent. The epidermis consists of approximately five layers of cells, the outer ones having a clear cytoplasm whilst the basal cells are smaller with more deeply staining cytoplasm. At intervals there are seen to be aggregations of cells (hair germs) projecting into the dermis from the epidermis. These are produced at an obtuse angle and will form the primary follicles. Sebaceous glands are formed as buds from the upper third of the developing follicle; just beneath the gland precursor is another bulge. This will later be the site for the attachment of the arrector pili muscle. A crescent of cells beneath the advancing column will form the dermal papilla. At the fortieth day of gestation, orientation of the cells of the hair follicles becomes more obvious (Fig. 10). Five days later the dermal papilla is enclosed by the hair bulb and hair formation is well advanced (Fig. 11). Development of the primary follicle precedes that of the lateral follicles which are also formed as outgrowth from the epidermis. Usually the primary follicle does not form hair buds.

At the fifty-sixth day of gestation the primary follicles contain well-developed hairs but the secondary follicles do not.

At birth the dermis appears to be packed with well developed primary follicles, in the anagen stage. Development of the secondary follicles is also well advanced. The epidermis is now quite thin (Fig. 12).

Post natal development of cat skin is similar to that of the dog (Baker, 1966*b*). On the first day of life there is an arrangement of triads of simple follicles. The triad contains a large central primary follicle bounded laterally by two smaller follicles which are producing further secondary follicles. Subsequently, the compound follicle is formed from buds which are produced from the secondary follicle just below the sebaceous gland. Thus a number of hairs are formed which share a common pilary canal in their upper third. Further budding continues for some weeks after birth (Fig. 13).

Development and replacement of hair

Rook (1970) describes the cyclic stages of mammalian hair grow thas anagen (the period of active growth), catagen (the short period of active regression) and telogen (the period of rest). Scalp hair of man is in anagen for 2–5 years, catagen for 10–14 days and telogen for 3–4 months.

It was observed by the author that the hair follicles making up a group may be in various stages of activity. For example, the primary hairs might be in anagen whilst the secondary hairs were in telogen. Sometimes a number of secondary follicles were observed in anagen whilst the remainder of the group were in telogen, alternatively all the members of a compound follicle group might be at the same stage of activity.

In the domestic cat after a period of active growth, mitosis of cells in the hair bulb ceases and the hair moves up towards the epidermis, the hair bulb disappears and the hair root becomes fusiform. There is atrophy of follicle cells beneath the hair root. The base of the hair follicle is now in telogen and lies in the middle third of the dermis (Fig. 14). This is in marked contrast to the anagen phase when the hair bulb is positioned at the junction between the dermis and subcutaneous tissue. The sebaceous glands remain apparently unaffected by these changes. After a period of inactivity which may last several months the commencement of the period of activity (anagen) is shown by the development of a group of cells just beneath the club root. These stain deeply in contrast to the cells of the quiescent follicle above them (Fig. 15, 16). Subsequently differentiation becomes apparent with active pigmentation by the melanocytes and formation of the dome-shaped inner root sheath (Fig. 17, 18). Hair formation then proceeds, the new hair growing up through the previously formed hair sheath to lie parallel to the hair of the previous cycle which is subsequently dislodged (Fig. 19). Mitotic activity proceeds and the column advances down through the dermis to lie at the junction of the dermis and subcutaneous tissue. The primary hair bulbs or papillae are placed somewhat deeper.

The melanocytes of the follicle in anagen may or may not produce pigment throughout the periods of growth. In black hair, pigment production obviously remains active throughout the period. In the tabby cat bands of pigmentation

are seen, indicating alternating activity and quiescence of the melanocytes. As the melanocytes are passed from the follicle in catagen to the resting hair papilla beneath the follicle, hair colour will not change from one cycle to another.

In dyed cats hair growth was observed to occur uniformly throughout the pelage in the juvenile and adult. Hair is therefore replaced mosaically.

Examination of large numbers of hand-cut sections from three representative regions in unconfined male cats throughout one year showed a period of inactivity of the primary and secondary hairs during February and March. This was followed by a period of maximum activity of two to four months duration. Subsequently there were subsidiary cycle(s) of activity until December when the hairs began to enter a resting phase.

Cyclic activity of secondary hairs of unconfined females was marked, but was less apparent in primary hairs. Female secondary hairs were inactive from January to June, when activity commenced, with a subsidiary cycle of relative inactivity in September. This was followed by a period of maximum activity until the end of December.

In the colony of ten housed cats, maximum moulting coincided with the period of maximum activity of the hair roots of free range cats in June. The confined cats showed periods of hair follicle activity from December to May; this was general for males and females and for castrated cats. In May all cats in the housed colony of ten began moulting. Peak activity occured later but activity fluctuated widely for the remaining part of the year.

Mean daily rates of hair growth in microns were as follows for a male and a female cat during the period September to June:–

	Primary hair	*Secondary hair*
Male	313·6	241·4
Female A	321·7	280·2
Female B	270·8	239·7

The maximum rates of hair growth occurred in April with minimal activity in February.

DISCUSSION

The hair roots of both housed and unconfined cats showed minimum activity from December to May followed by a rapid return to activity which was then maintained for several months. It may be inferred that the increasing photoperiod is the stimulus for hair loss and replacement in spring as has been determined in certain species of mammals (Keogh, 1967). Neutered animals showed a comparable cycle. Castration therefore apparently does not affect the normal annual hair cycle.

Follicles of the same compound follicle often showed different stages of activity,

probably the mechanism controlling activity is intrinsic in a particular follicle though this can be affected by other factors. This is indicated by the symmetrical alopecia (usually considered to be symptomatic of endocrine imbalance) observed in cats. Although this type of alopecia is uncommon, it is by no means rare. Muller & Kirk (1969) consider that hormonal alopecia is rare and that regrowth follows thyroid and sex hormone therapy. However, they give no substantive evidence to support this claim. No endocrine estimations have been undertaken in affected cats to determine imbalance(s) if any. In the author's opinion thyroid hormone imbalance is not associated with so-called "feline endocrine alopecia". The associated signs of disease of the thyroid glands are not seen in this condition. There is, however, some evidence to indicate an association with sex hormone imbalance. Feline endocrine alopecia is more common in castrated males and spayed females and is never seen in the prepubertal animal. Muller & Kirk (1969) report that both thyroid hormone and sex hormones should be given, testosterone being given to the male and stilboestrol to the female. Therapy is by oral administration until a response is obtained.

In rats, hypophysectomy accelerates the initiating of anagen in resting follicles whilst adrenocorticotrophic hormone retards it, if the adrenal glands are intact. In this species oestrogen delays the onset of anagen in resting follicles. Oestrogen would appear to have a similar effect in the male dog, for Sertoli cell tumours in dogs, with accompanying high levels of circulating oestrogen, are usually associated with symmetrical alopecia. In man and dogs diffuse alopecia is seen in hypothyroidism.

The rate of hair growth in man is said to vary from 0·1 mm to 0·4 mm daily. Saitoh, Uzuka, Sakamoto & Kabori (1967), using a capillary tube method, reported rates of daily growth as follows: vertex and chest, 0·4 mm; temple, 0·39 mm; beard, 0·27 mm. They found that shaving did not change the growth rate. Barman Astore & Pecoraro (1965) found that the rate of growth of hair in man is little affected by sex or age. Comben (1951) measured the rate of hair growth in a single adult male greyhound over a period of two months, and reported a rate of 0·04 mm to 0·18 mm daily in the supraspinous region of the shoulder. Rates of hair growth in the cat were comparable to those in man in the work reported here, with insignificant differences between male and female. Maximum growth was observed at the time of increasing numbers of hairs in anagen in the late spring.

Secondary hairs are slightly shorter than primary hairs in the interscapular region of short haired cats. The mean length for primary hairs of eight male and female adult cats in this region was 2·22 cm and 2·02 cm for secondary hairs, a difference of 2 mm. It is therefore possible that the period of active growth is approximately the same in primary and secondary hairs because of the slower growth rate of the latter.

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Croissance du poil et repousse chez le chat

(**Baker**)

Résumé. Des observations furent pratiquées sur l'histologie de la peau de 66 chats d'âges différents. L'extrême minceur de l'épiderme de ces espèces est remarquable. Le développement du pelage ressemble à celui du cien, les follicules pileux naissant à intervalles le long de l'épiderme, et ceux-ci s'enfoncent ensuite dans les derme. Les glandes sébacées et apocrines naissent à partir des follicules pileux. Les poils primaires naissent en premier, ensuite les poils secondaires se développent sur l'un ou l'autre côté des poils primaires et ceux-ci produisent bientôt des follicules pileux à partir desquels se développent plus de poils secondaires pour compléter le follicule composé.

Chez les deux races de chats domestiques et sauvages, les bulbes pileux primaires et secondaires diminuaient d'activité après Décembre, avec une totale inactivité en Janvier. Cet état se maintenait jusqu'en Février ou Mars, l'activité reprenant en Avril. Suivait une période d'activité maximum durant de deux à quatre mois chez les chats sauvages. Des cycles ralentis d'activité succédaient jusqu'en Décembre. Il est considéré que l'augmentation de la photopériode est le stimulus de la perte des poils ainsi que celui de sa remise en place au Printemps. Les chats castrés montraient un cycle comparable à celui des animaux normaux. La repousse du poil ne progressait pas en vagues le long du corps comme chez les rongeurs, mais en mosaique comme chez l'homme.

Des stades d'activité des racines des poils furent observés au niveau des follicules pileux composés, des taux de croissance du poil atteignant 300 microns par jour. Le taux de croissance des poils primaires était supérieur à celui des poils secondaires. Chez trois chats domestiques le taux maximum de croissance du poil se situait fin Avril avec une croissance minimale en Février.

Haarwuchs und Haarnachwuchs bei Katzen

(**Baker**)

Zusammenfassung. Die Haut von 66 Katzen verschiedenen Alters wurde histologisch untersucht. Bemerkenswert ist, wie dünn die Epidermis bei dieser Tierart ist. Die Entwicklung der Körperbedeckung ähnelt der beim Hund beobachteten; Haarkeime sind in Zwischenräumen entlang der Epidermis angelegt und wachsen dann in die Dermis. Talgdrüsen und apokrine Drüsen werden von den Haarkeinen produziert. Zuerst werden Primärhaare produziert; zu beiden Seiten der Primärhaare entwickeln sich dann Sekundärhaare und diese produzieren alsbald Haarkeime, von denen sich weitere Sekundärhaare entwickeln, die den Gesamtfollikel komplett machen.

Sowohl bei im Haus gehaltenen Katzen wie bei frei lebenden ist die Aktivität der Haarwurzeln des primären und des sekundären Haars nach dem Dezember herabgesetzt und hört

im Januar völlig auf. So bleibt es im Februar und März und im April beginnt sie wieder. Zwei bis vier Monate lang folgt dann eine Periode höchster Aktivität bei frei lebenden Katzen. Solche zyklische Aktivität setzt sich bis zum Dezember fort. Man nimmt an, dass stärkerer Lichteinfall im Frühling der Stimulus für Haarausfall und nachwuchs ist. Der Zyklus verläuft bei kastrierten Katzen ähnlich wie bei normalen. Haarnachwuchs erstreckt sich nicht wellenförmig über den Körper wie bei Nagetieren, sondern erfolgt mosaikförmig wie beim Menschen.

Verschieden Aktivitätsstadien der Haarwurzeln wurden in kompletten Haarfollikeln beobachtet. Das tägliche Wachstum betrug 300 micron. Die Primärhaare wuchsen schneller als die Sekundärhaare. Bei drei im Haus gehaltenen Katzen erfolgte das Maximumwachstum des Haares Ende April, während es im Februar sein Minimum erreichte.

Crecimiento y reemplazo del pelo en el gato

(**Baker**)

Resumen. Se observó la histología de la piel de 66 gatos de distintas edades. La extremada delgadez de la epidermis de esta especie es notable. El desarrollo del pelaje se parece al del perro, produciéndose gérmenes de pelo a intervalos en la epidermis, y creciendo entonces en la dermis. Se producen glándulas sebáceas y apocrinas de los gérmenes de pelo. Los pelos primarios se producen primero, y subsiguientemente los primeros pelos secundarios se desarrollan a cada lado del pelo primario, y pronto producen gérmenes de los que se desarrollan más pelos secundarios para completar el folículo compuesto.

En tanto los gatos domésticos como en los en libertad, los bulbos pilosos primarios y secundarios disminuyeron en actividad después de diciembre, con inactividad total en enero. Esta continuó en febrero y marzo, empezando su actividad de nuevo en abril. Vino entonces un período de actividad máxima que duró de dos a cuatro meses en los gatos en libertad. Ciclos de actividad secundarios continuaron hasta diciembre. Se considera que el fotoperíodo en aumento es el estímulo para la pérdida de pelo y su reemplazo en la primavera. Los gatos capados mostraron un ciclo comparable al de los animales completos. El reemplazo del pelo no avanzó sobre el cuerpo en olas, como en los roedores, sino en mosaico, como en el hombre.

Se observaron etapas variables de actividad de la raíces del pelo en folículos pilosos compuestos. La razón de crecimiento de pelo fue de hasta 300 micrones diarios. La razón de crecimiento de pelo primario fue superior a la de pelo secundario. En tres gatos domésticos, la razón máxima del crecimiento de pelo ocurrió a finales de abril, con un mínimo crecimiento en febrero.