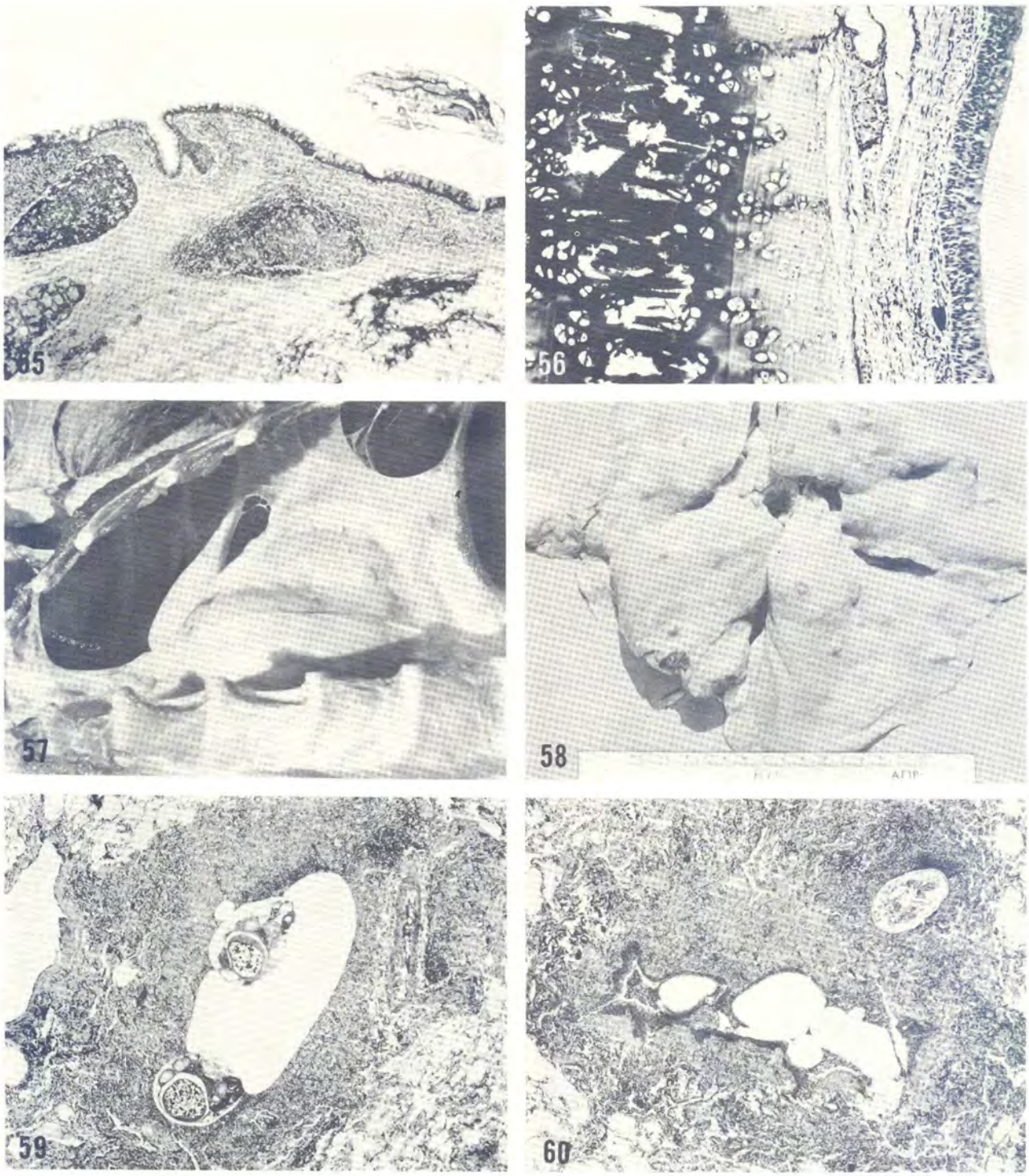


FIG. 55–60. 55. Section of mildly inflammatory mucosa with *P. vocalis* at right. HE×30
56. Tracheal cartilage showing mineralization of inner areas. HE×75
57. Opened thorax of B42 showing severe pleuritis with adhesions to the costal surface
58. Lungs from B14 with several mite lesions
59. Section through a mite lesion showing two mites in central cavity surrounded by inflammatory debris (B43). HE×30
60. Another mite lesion showing metaplastic epithelial lining. Note mite at upper right. HE×30

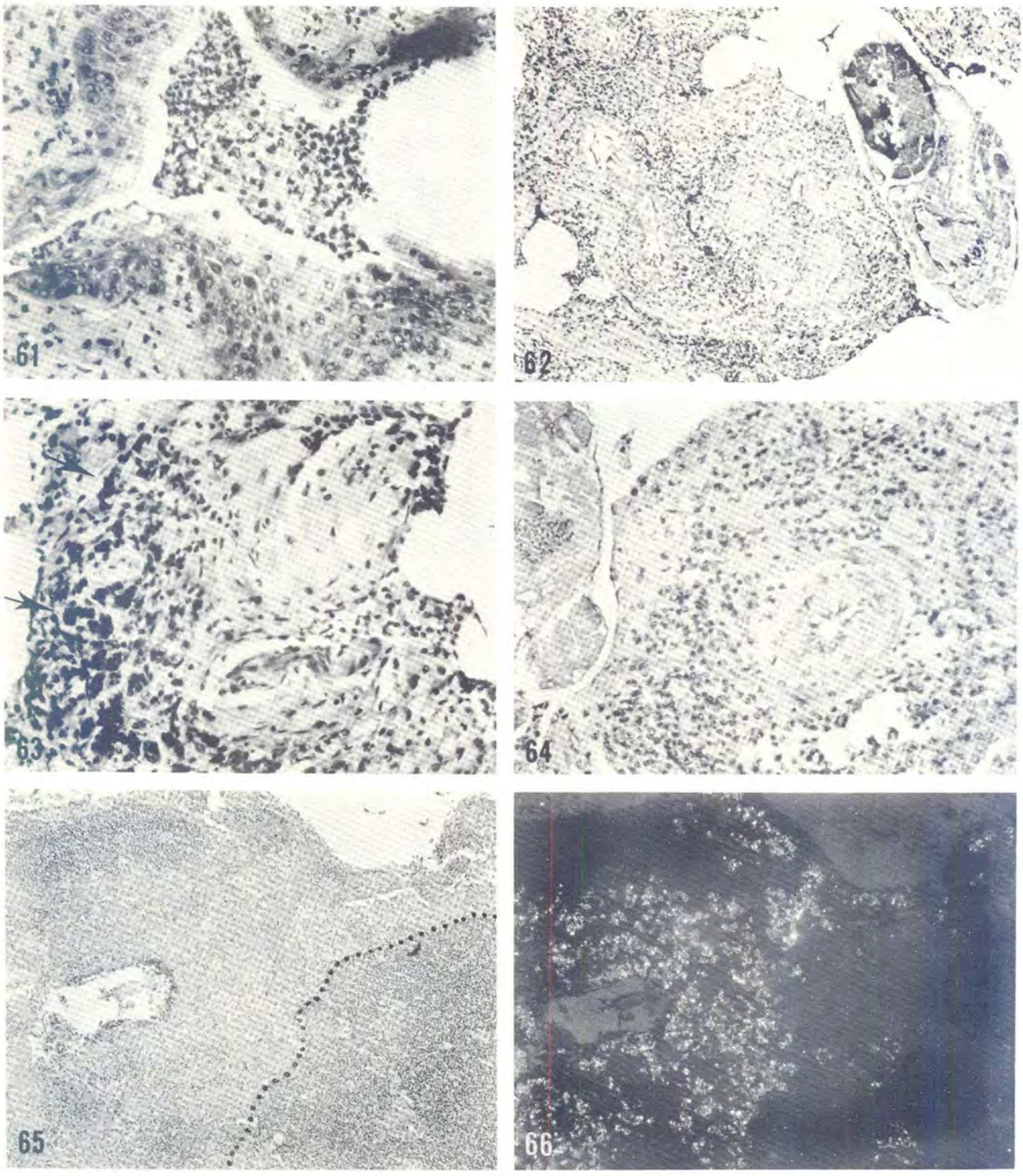
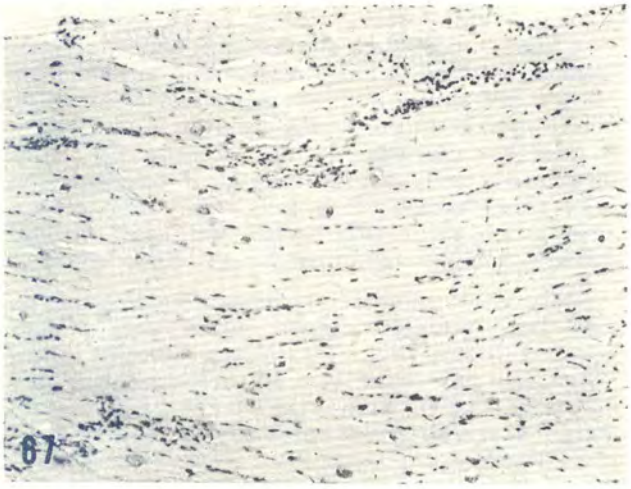
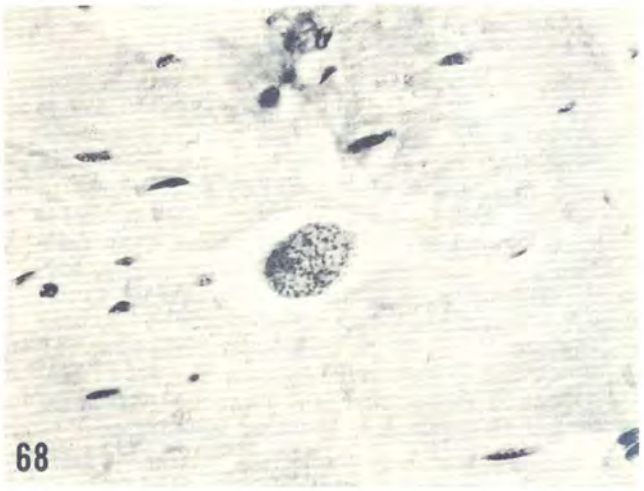
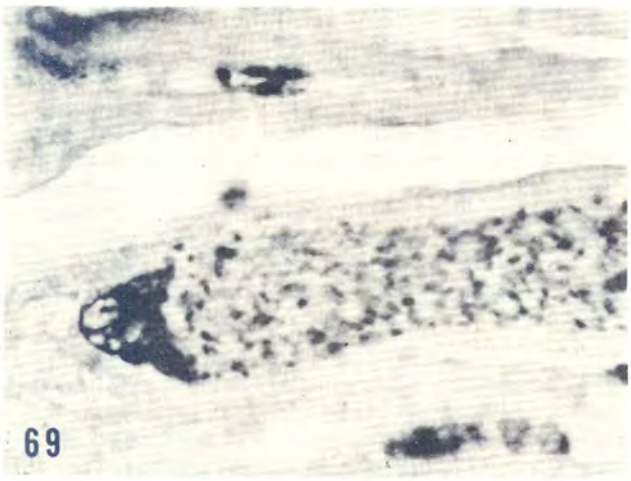
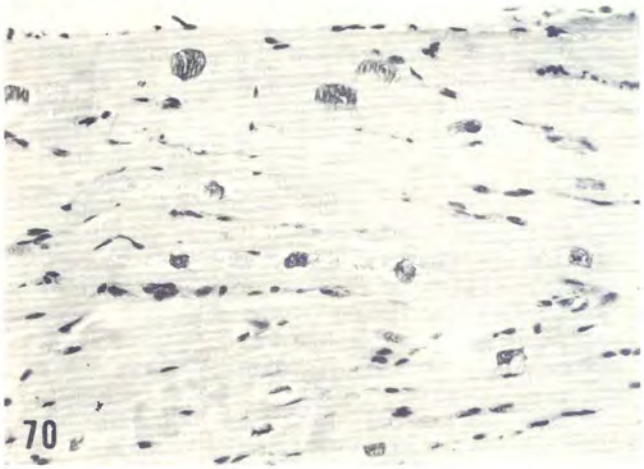


FIG. 61–66. 61. Higher magnification of Fig. 60 showing stratified squamous metaplasia of respiratory epithelium. HE × 200
62. Area of smooth muscle hyperplasia next to mite. HE × 75
63. Smooth muscle hyperplasia and an area of pigment laden macrophages (arrows). HE × 200
64. Mite lesion containing a small artery which shows hypertrophic vasculitis. HE × 150
65. Section of bronchial lymph node showing an area of pigment laden macrophages. Lymphoid tissue is outlined in a lower right hand corner. HE × 75
66. Same field as Fig. 65 as observed under polarized light. Note that much of the pigment is anisotrophic









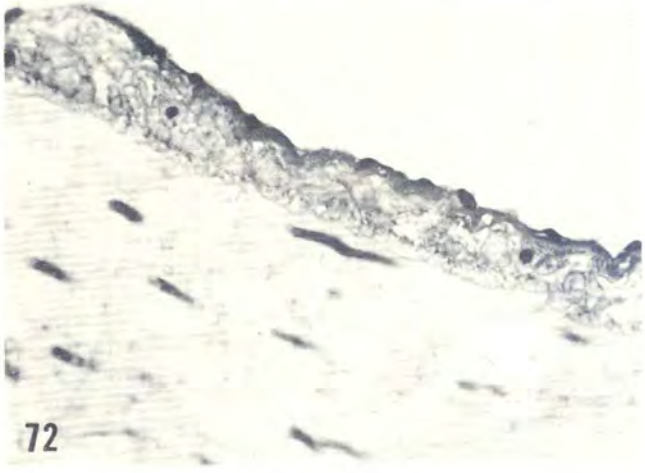


FIG. 67–72. 67. Section of myocardium showing multifocal areas of lymphoid infiltration (B42). HE×75
68. Toxoplasma pseudocyst within the myocardium of B57. HE×500
69. Elongated pseudocyst within a myocardial fibre adjacent to the nucleus. HE×1 200
70. Subendocardial area of the ventricle of B42 showing karyomegaly. Note lipofuscin granules in the centre. HE×200
71. Multifocal areas of myocardial necrosis (capture myopathy) with inflammatory response (B81). HE×75
72. Subintimal thickening of the coronary artery (B16). HE×500

from slight thickening to a condition in which as much as $\frac{1}{3}$ of the width of the vessel wall was composed of the lesion. It never caused any significant narrowing of the vascular lumen, however, and therefore was of little consequence to the well-being of the host.

A portion of ascending aorta was examined from most animals (92). A similar arteriosclerotic change was found which appeared more cellular and fibromuscular than the one in the coronary arteries. In addition the internal elastic membrane appeared to split or fragment to a greater degree, with remnants scattered throughout the lesion. In a few cases there was increased basophilia of the tunica media, suggesting mineralization of the connective tissues in this area. Aortic arteriosclerosis was observed in 40 of the 92 baboons (43,5%), 28 males and 12 females, all adults. Of the 19 that had coronary lesions, 17 also had lesions in the aorta. Of the 5 baboons that could be compared 4 also had renal arteriosclerosis.

It appears that arteriosclerosis in the chacma baboon is a minor disease of adults with little or no sex predilection and that, while other vessels are affected, the aorta shows the highest rate of involvement. This study supports the findings of Van der Watt (1972), who did a detailed analysis of spontaneous vascular disease among the baboons of KNP. He found a definite correlation between mass (age) and presence of the disease, with a high proportion of females over 12 kg and males over 22 kg showing lesions. Three studies of free-ranging East African baboons showed similar results (Strong & McGill, 1965; Howard, Gresham, Hales, Lindgren & Katzberg, 1967; Lindsay & Chaikoff, 1966). A study by Gilbert & Gillman (1960b) on 133 chacma baboons raised in captivity suggested that changes in the coronary vessels were also a reflection of age. They found no lesions in the very young baboons (<1 year) but a high rate in old animals (>10 years). No correlation between age and incidence or severity of lesions could be found for those in between these ages. There may be a difference between "free-living" and captive animals but the morphology of the lesions and incidence suggested that this was minor. Their other conclusion, supported by this study, was that there is no direct relationship between the lesion in the coronary artery and that in the aorta, either in incidence or severity.

Thymus

The thymuses of 15 baboons, mostly very young, were examined. Additionally, thymic tissue was found in the thyroid gland of 10 and in the parathyroid gland of 15 animals of various sizes. The only lesion observed was the presence of microcysts in the thymus twice, thymic tissue in the thyroid 4 times and thymic tissue in the parathyroid once. The microcysts were similar morphologically irrespective of their location. They were usually multiple and mostly lined by flat epithelial cells, but some appeared to have no lining at all (Fig. 73 and 74). The cysts usually contained a homogeneous granular eosinophilic debris, often admixed with remnants of sloughed cells. According to Castleman (1955) the epithelial-lined cysts probably arose from remnants of the branchial cleft while those without a lining represented degenerating Hassall's corpuscles.

Spleen

One hundred were examined macroscopically and microscopically. The mass of the spleen varied considerably, from as low as 0,065% BM up to 0,292% BM (mean of 0,150% BM) (Table 3). There was a decrease in % BM as the animal became larger, but little difference was noted between males and females of the same mass range. This is supported by the studies of East African baboons by Katsberg (1965), who found a marked decline in spleen: body mass ratio from birth through adolescence. With such a large range it is doubtful whether splenic masses would be of any value in estimating the live mass of the animal. A possible explanation for the inconsistency of this figure in our study may lie in the use of the anaesthetic prior to euthanasia. It is well known that certain anaesthetics, particularly barbiturates, cause visceral pooling of blood and engorgement of the spleen.

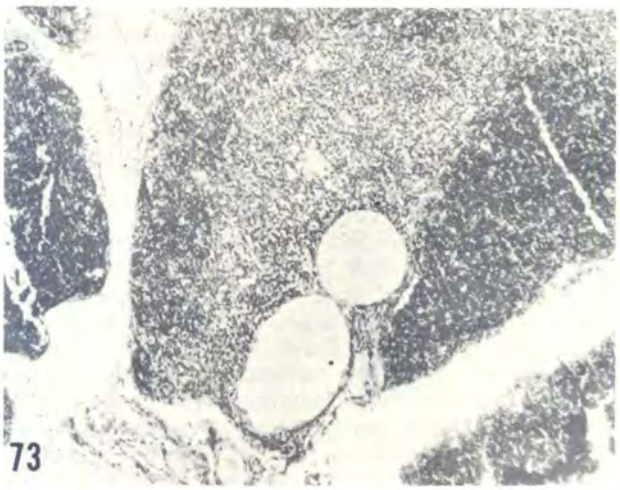
Every spleen showed very large splenic corpuscles with large germinal centres, which were evident macroscopically (Fig. 75). Microscopically, these Malpighian corpuscles were not only large but very numerous (Fig. 76), even in the old baboons, although the germinal centres were not so large in these animals. It is difficult to explain this but it may be related to the continual exposure to antigenic stimulation. It would be interesting to compare these spleens with those of baboons that have been in captivity for long periods, under relatively parasite and disease-free conditions.

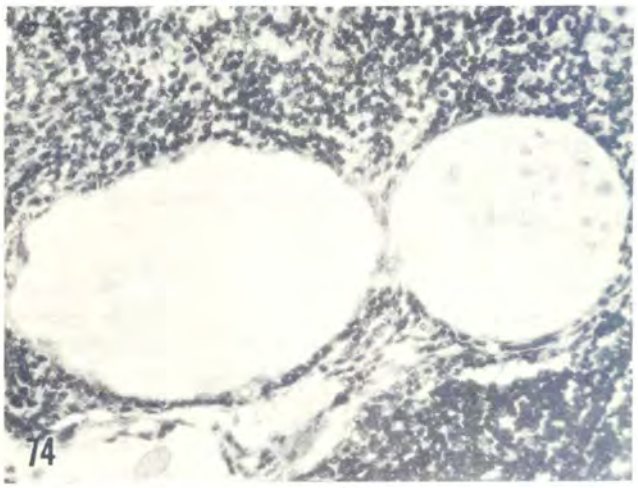
Eight baboons showed areas of mild focal perisplenitis on the visceral surface. These foci were grey, had a rough granular appearance and microscopically consisted of focal fibrous thickenings of the capsule. There was no evidence of leukocytic infiltration. These lesions may have been due to trauma and friction during active running, jumping or climbing movements.

One animal (B67) had an accessory spleen buried in the omentum approximately 3 cm medial to the splenic attachment (Fig. 77). It was spherical, measuring 1 cm in diameter, and conformed in all respects microscopically to normal spleen.

Eight animals had Malpighian corpuscles with hyalinized material in the germinal centres. They consisted of pink, fairly homogeneous material occupying the area normally containing the central artery but which was absent in these cases (Fig. 78). Similar material was also found around and within thickened walls of these central arteries. The material varied in volume but usually occupied half the diameter of the germinal centre. Furthermore, the animals with the splenic lesion did not usually show the change in the lymph nodes. Hyalinization of germinal centres is not fully understood but it has been observed in older people, especially those with long standing hypertension (Anderson, 1966). It has also been postulated that it represents a deposit of immunoglobulins resulting from hyperfunction of the immune system. We could not relate the finding in this study to any other lesions, specific diseases, sex or age.

Miscellaneous lesions of the spleen included 4 cases with granulomas of undetermined origin and 1 with neutrophilia of the sinusoids. This baboon (B41) also showed generalized disease with neutrophilic infiltration of several other organs. There was also 1 spleen (B64) in which the reticulo-endothelial cells contained moderate amounts of brownish black granular anisotropic pigment compatible with schistosome pigment (haematin) (negative with PAS and Prussian blue). This particular baboon had many bilharzia granulomas in the liver and a few adults in the mesenteric veins.





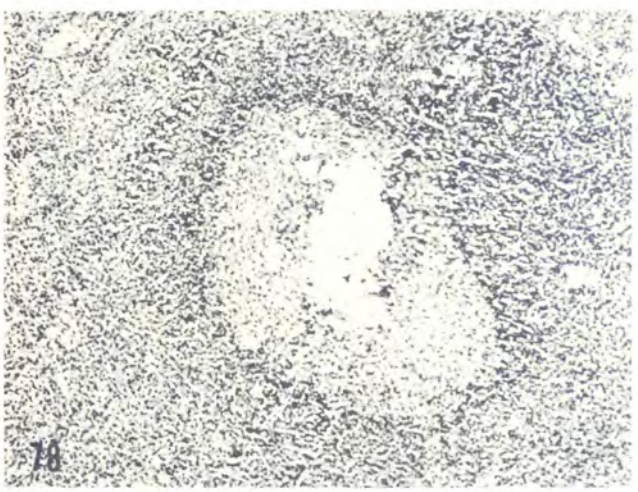


FIG. 73–78. 73. Two microcysts in thymus (B61). HE × 30
74. Higher magnification of Fig. 73. Note that the cyst on right appears to have a thin epithelial lining. HE × 200
75. Spleen from B13 with numerous large germinal follicles
76. Photomicrograph of spleen showing large germinal centres. HE × 30
77. Accesory spleen (arrow) in B67. Normal spleen below
78. Hyalinized plaque replacing germinal centre (B22). HE × 200

Liver

One hundred were examined macroscpically and microscopically. The mean mass of the liver was 2,323% BM with a range of 1,169–4,298% BM (Table 3). There was a slight increase in % BM in females from small to large animals while the reverse was true in males. The adult female mean % BM of the liver was approximately 28% more than the male (2,452%versus 1,851%). While there was a fairly wide range, 83% of all livers were within 1,5 and 2,5% BM.

The commonest lesion of the liver was a very mild inflammation of the portal tracts. This was found in 21 baboons (15 males and 6 females) which varied from 4,6–32,7 kg BM. The lesion consisted of diffuse infiltrates of mononuclear cells, mainly lymphocytes and plasma cells, in the perivascular and periductal connective tissue spaces of the portal triad (lymphocytic triaditis). It varied from 1 or 2 foci per section to more pronounced cases where most of the tracts were affected. No specific etiology was found, although there was some correlation with similar inflammatory lesions in the heart of 15 cases (71,4%) and kidney of 9 cases (42,9%). This was therefore probably part of a generalized lymphocytic reaction rather than a primary liver disease.

There were 3 parasitic diseases of the liver. The 1st type, of which there was only 1 example (B53), was a cystic lesion 1,5 cm in diameter containing a nematode (5 cm in length), probably a filarid.

The 2nd type of parasitic lesion was due to the ova of *Schistosoma mattheei*. Macroscopically these appeared as multifocal small (1,0 mm diameter) white foci scattered throughout the liver (Fig. 89). Microscopic examination revealed a central ovum surrounded by an eosinophilic granulomatous response (Fig. 79). The majority of the lesions were in or near the portal tracts but there were not enough of them to impair liver function significantly. These schistosomal hepatic lesions were found in 16 baboons (11 males and 5 females), including both young and old individuals from practically all areas of the park. Five of these animals had adult schistosomes in the mesenteric vessels of the small and/or large intestine (Fig. 146 and 147) and 1 (B90) had them in the larger branches of the portal veins (Fig. 80). However, no more than 3 adult pairs were ever found in one host. The baboons were specifically examined for schistosomiasis (=bilharziasis) and this incidence should therefore be fairly accurate.

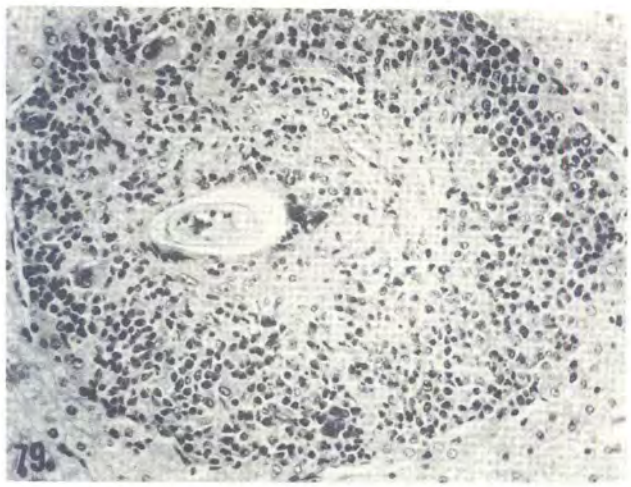
Under certain epidemiological or epizootiological circumstances bilharziasis may be a rather common disease of free-living baboons living in an endemic area, as indicated by numerous references on the subject (Myers & Kuntz, 1965). Several species of schistosomes, including *S. mansoni, S. haematobium* and *S. mattheei,* have been found, *S. mansoni* being the commonest in East Africa (Nelson, Teesdale & Highton, 1962). In contrast, *S. mattheei* was the only species found in this study. This may be related to the fact that in a wild-life reserve such as the KNP human contamination of the streams plays only a minor role. Under these circumstances, species (such as *S. mattheei*) more commonly found in non-human animals would be more likely to infect baboons. This theory is supported by the work of Basson, McCully, Kruger, Van Niekerk, Young & De Vos (1970), who found lesions of bilharziasis in 62% (62 of 100) of African buffaloes from the KNP, the majority caused by *S. mattheei*. Since the baboons use the same watering areas they are exposed to infestation by the same species. It should be stressed that *S. mattheei* can infect man, therefore baboons could play a role in contaminating water supplies, thus perpetuating this insidious disease. Indeed, baboons have been suggested as reservoir hosts for other schistosome species in the endemic areas of the other parts of Africa (Strong, McGill, Miller & Geer, 1959; Nelson *et al.,* 1962; Purvis, Ellison & Husting, 1965; Fenwick, 1969).

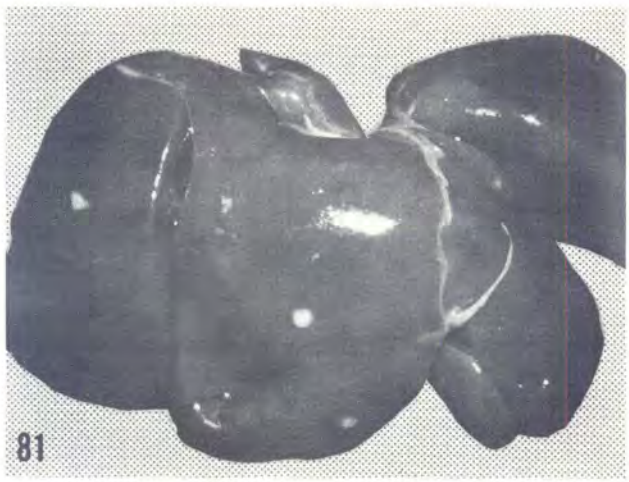
None of the affected animals had a very high level of infestation: 3 adult pairs were the maxmium. This can be interpreted in 2 ways: either their exposure was minimal or the baboon has some inherent or acquired resistance. There is a high incidence of bilharziasis in other indigenous animals, judging from post-mortem examinations, and in the rivers of the KNP, based on cercarial surveys (V. de Vos, unpublished observations); exposure is therefore possible. It is probably minimal, however, because baboons do not usually wade in the water when they drink and seldom (if ever) bathe. The other explanation also appears plausible since it has been clearly shown that various animals, including monkeys, can under some circumstances develop resistance to reinfection (Von Lichtenberg, 1967).

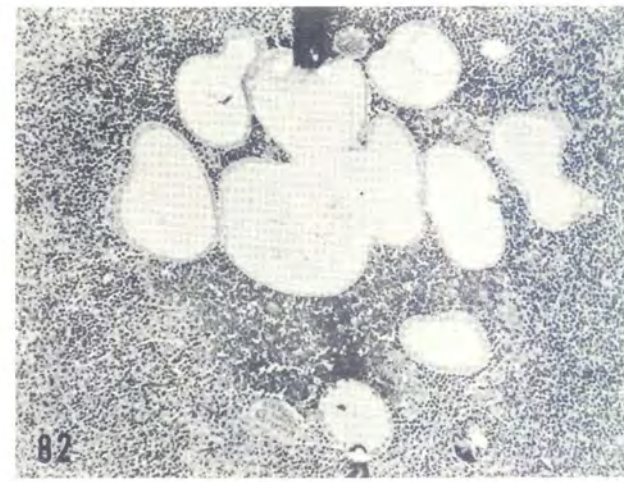
The other parasitic disease observed in the livers was due to hepatocystosis. This was observed in 10 adult baboons (3 males and 7 females), all from the Shingwidzi area. Macroscopically, the lesions were uniformly typical in all cases and appeared as a few randomly scattered small, slightly raised white foci (3–4 mm diameter) on the surface (Fig. 81). They cut easily, had a homogeneous texture and extended into the parenchyma for a distance roughly equal to their surface diameter. Microscopically, depending on their age, they varied morphologically from the classical multilocular cystic form (Fig. 82) to a more solid necrotic lesion surrounded by a dense fibrous capsule. The cystic form (merocyst) contained numerous small merozoites oriented along the inner side of a well-defined but delicate hyaline capsule (Fig. 83). In the older necrotic lesions remnants of this capsule were clearly visible but not the merozoites. Also, excellent examples of pink polygonal Charcot-Leyden-like crystals were observed in a few of the older lesions (Fig. 84). The host response varied mainly from a purulent reaction in the mature lesion to a more granulomatous type in the older type. Eosinophiles were present in all but were more conspicuous in the latter type. The final state was fibrous encapsulation of the lesion and mineralization of the internal structures.

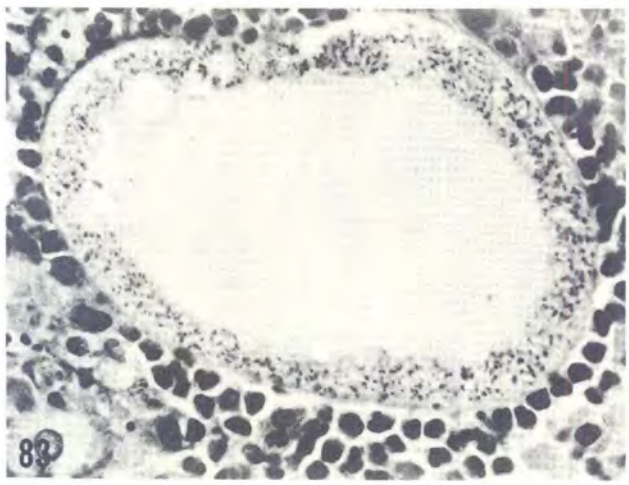
Hepatocystis simiae was thought to be the cause of these lesions on the basis of the size of the merocyst, the convoluted wall and presence of the crystals (Garnham, 1966). Gametocytes were found in peripheral blood smears in 3 cases (Fig. 85) (see *Blood*).

Infection by the protozoan parasite *H. simiae* is a common disease in African primates but evidently it is not a serious pathogen since the host is little affected by its presence, as suggested by Lefrou & Martignoles (1955), Kuntz *et al.* (in press) and this study. The unique aspect in this series of baboons was the restricted geographical localization, a situation which parallels that for *P. cynocephalus* in Kenya. Also of interest was the presence of Charcot-Leyden crystals.









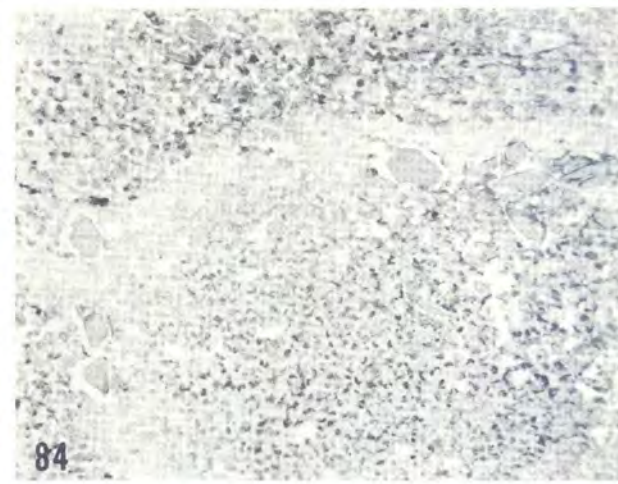
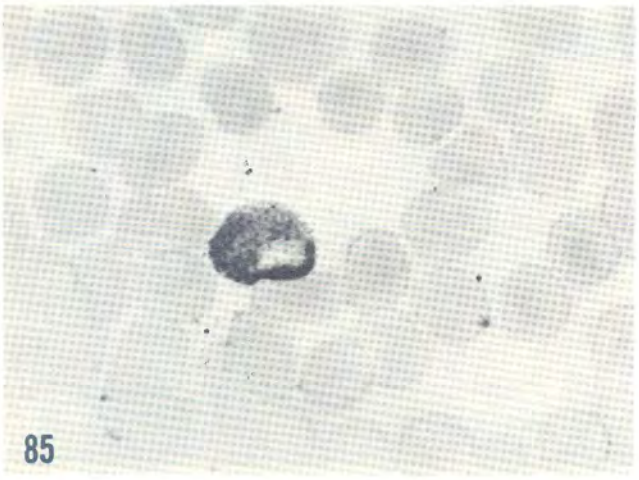
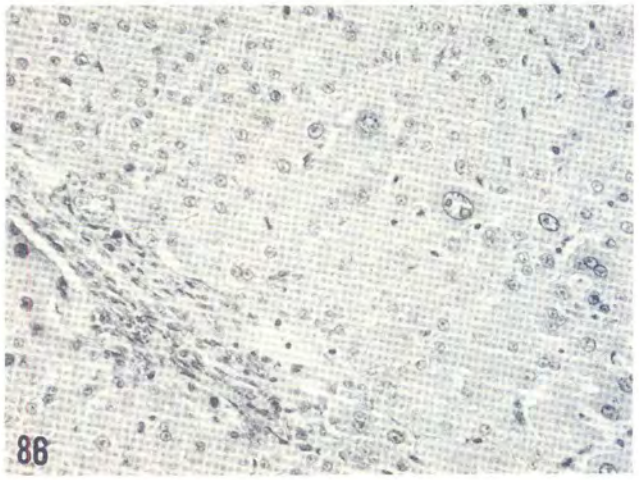
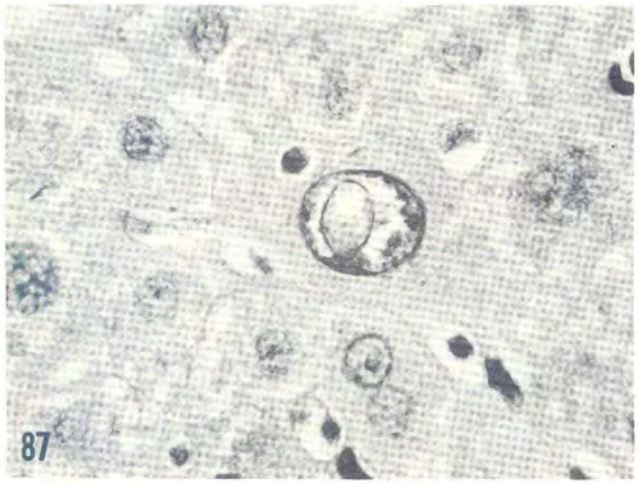
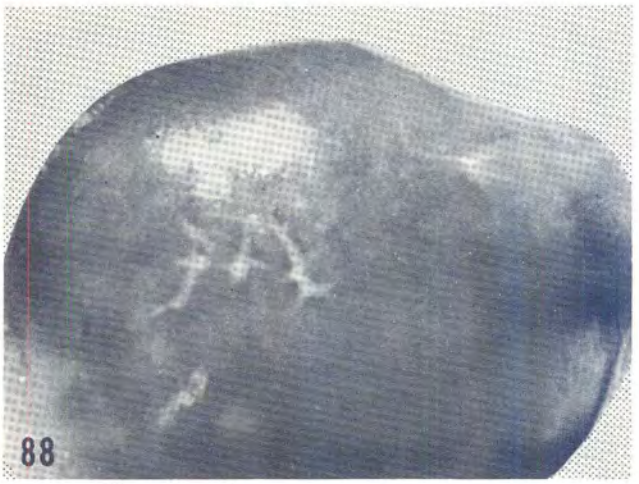


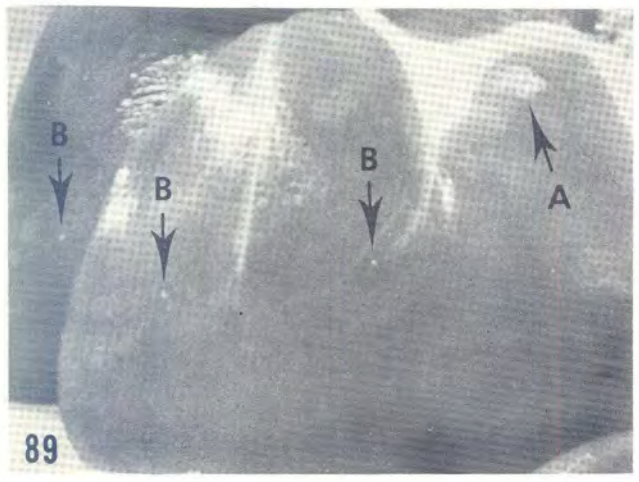
FIG. 79–84. 79. Photomicrograph of hepatic microgranuloma surrounding a schistosome ovum centrally. HE×200
80. Photograph of an opened portion of the portal vein as it enters the liver showing three pairs of adult schistosomes (arrows) on the surface (B90)
81. Liver of B82 with typical *Hepatocystis simiae* lesions
82. Section of *Hepatocystis* lesion from B82 showing convoluted nature of macrocysts charactistic for *H. simiae*. HE×75
83. Higher magnification which shows numerous merozoites oriented along the thin but well defined capsule. HE×500
84. Photomicrograph of an older *Hepatocystis* lesion which contains numerous Charcot-Leyden crystals (B64). HE×200











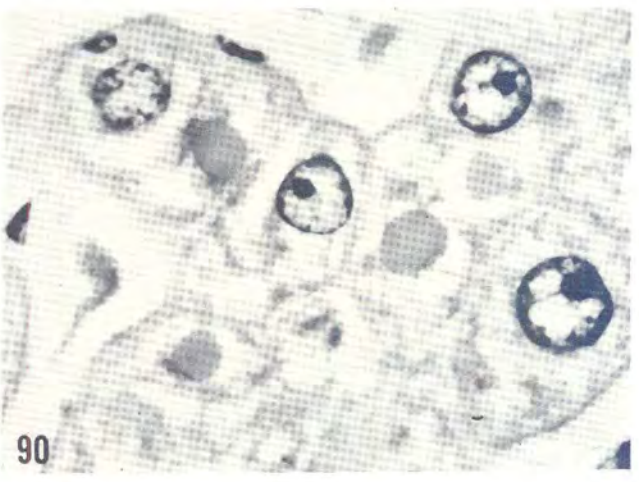


FIG. 85–90. 85. Blood smear from B64 showing erythrocytic stage (gametocyte) of *Hepatocystis simiae*. Pale area is nucleus. Giemsa ×1 200
86. Photomicrograph of the liver of B57 showing mild megalocytosis and karyomegaly of the hepatocytes. There are also several binucleated cells (normal finding). HE×150
87. Higher magnification from a different area of the same case showing intranuclear inclusions. These were interpreted as engulfment of cytoplasm by an invaginating karyolemma. HE×750
88. Diaphragmatic surface of the liver from B84 showing three focal areas of fibrous thickening
89. Liver from B83 showing area of focal fatty change near hilus (arrow A). Pinpoint white foci (arrows B) are granulomas caused by schistosome ova
90. Councilman-like bodies in the hepatocytes of B17. HE×1 200

These crystals are formed from the breakdown products of eosinophile granules and have only been found in primates (El-Hashimi, 1971). They occur in a variety of allergic conditions, particularly in granulomas due to migrating helminths, and this would fit the general situation in this case, i.e. a chronic parasitic lesion. Similar crystals were described by Garnham & Pick (1952) in *Hepatocystis* sp. lesions in baboons from French Guinea. In our study these crystals were in addition observed in lesions caused by *Oesophagostomum* sp. in the large intestine. Eosinophilic crystalloid material has also been observed in springbuck (*Antidorcas marsupialis*) lungs infested with lungworms, in association with numerous globular lymphocytes (Russell-body plasma cell types) (P. A. Basson, unpublished data).

The livers of 5 adults were lighter in colour than normal and had a fine mottled appearance. Microscopically they all showed varying degrees of megalocytosis of the hepatocytes. The nuclei were more vesicular, 2–5 times the normal diameter, and the chromatin was marginated (Fig. 86). A single prominent nucleolus was present in most cases. Many of the largest nuclei had large, rounded, single or multiple eosinophilic inclusions (Fig. 87). Careful examination showed that these were probably invaginations of the karyolemma containing cytoplasm. Several cells contained multiple abnormal nuclei, usually less than 3. The cytoplasm of the above cells was also increased in amount, but to a lesser degree than in those with karyomegaly. There was no evidence of inflammatory infiltrate or bile-duct hyperplasia in any of these cases.

Beside the preceding 5 livers, which showed some pallor, there were 11 more cases in which the liver showed megalocytosis though they were normal in colour macroscopically. These 16 cases were all adult baboons, 10 males and 6 females, varying from 13,2–32,7 kg. They came from various areas of the park and were caught during different seasons of the year (in both wet and dry periods). Of these 16,7 also showed megalocytosis of the renal convoluted tubules (see *Kidney*).

This lesion was probably due to some toxic agent, although its exact nature was not determined. Furthermore, this "toxin" was probably excreted, at least in part, through the kidney, where it caused similar karyomegalic effects. The overall appearance of the lesion was very similar to that produced by mycotoxins and plants containing pyrrolizidine alkaloids (Van der Watt & Purchase, 1970; Purchase, Van der Watt & Tustin, in press). Van der Watt (1972) observed similar hepatic lesions in his series of baboons from the northern Transvaal and KNP and speculated that they may also have been due to mycotoxins. Chacma baboons would have ample opportunity to obtain such toxins in their diet since they eat various fruits that may show evidence of mycotic growth. The plant tubers that form part of their diet at certain times of the year could be contaminated. Several of the pyrrolizidine alkaloid-containing plants (*Senecio* and *Crotalaria* spp.) are present in the park and baboons eat them occasionally; they must therefore also be considered as possible aetiological factors. Other hepatic features of pyrrolizidine poisoning, and some mycotoxicoses, found in domestic animals are fibroplasia and bile-duct proliferation. Even though neither of these lesions was observed in this study, the role of either pyrrolizidine alkaloids or mycotoxins cannot be dismissed since the intensity of these features varies among different animal species (Jubb & Kennedy, 1970). Clarification of this point must await further studies.

Another less important lesion observed in the liver was focal perihepatitis. This appeared as a fibrous plaque on the parietal surface, usually of the right central lobe (Fig. 88), and was found in 8 males, including both young and old ones (3,2–37,3 kg). Microscopically it consisted purely of mature fibrous connective tissue thickening of the capsule. No explanation for its occurrence was found and it was probably of little consequence.

A small focal yellowish area (1–2 cm in diameter) was found in the parenchyma near the hilus (Fig. 89) of 5 animals, 3 males and 2 females. Microscopically it was composed of a poorly circumscribed area of fatty metamorphosis. It resembled similar hilar fatty changes in other animals such as cattle, sheep and antelopes and is probably of little importance.

Councilman-like bodies were observed in the livers of 3 adult males (B16, B17, B21). They appeared as small, rounded, hyaline-like, eosinophilic inclusions within hepatocytes (Fig. 90) that were randomly distributed throughout the liver. No correlation was made with other liver disease or lesions in other organs. Judging from electron-microscopic studies in man (Klion & Schaffner, 1966), these inclusions are hepatocellular in origin, are a non-specific form of cellular damage and are probably the results of irreversible cytoplasmic dehydration.

Gall bladder

One hundred were examined macroscopically, 61 microscopically. Macroscopic lesions of the gall bladder were not observed. Microscopically the major finding in the gall bladder (21 cases, 34,4%) was hypertrophy of the mucosa. The more severe cases had an almost cyst-like appearance with mucin filling these cystic spaces (Fig. 92). The epithelium retained its tall columnar characteristic in all except those cases with marked cyst formation, where it was more cuboidal. This lesion was directly related to age, with normal epithelium in the young (Fig. 91) and progessive cystic change in the older baboons (both sexes). This cystic epithelial hypertrophy was very similar to that described in old dogs (Kovatch, Hildebrandt & Marcus, 1965) but was not as marked as the severe cases in their study, nor did we observe accumulation of mucus in the lumen of the gall bladder as they did. As in dogs, the lesion was of only minor significance and should probably be placed under the heading of geriatric changes or incidental findings.

There were 2 cases of mild diffuse lymphocytic infiltration in the submucosa of the gall bladder. Since the livers of both of these cases also showed portal lymphocytic infiltration it was thought to be part of this process rather than primary gall bladder disease. A few animals also contained well-defined lymphoid nodules in the submucosa. Since they were not associated with the previous cases nor with specific liver disease, these were interpreted as normal anatomical variations (hyperplasia).

Periportal lymph nodes

One hundred were examined macroscopically and 93 microscopically. No macroscopic lesions were found. There were 4 cases showing minimal to mild pigmentation characterized by the presence of greyish-brown aniso- and isotropic granules within medullary macrophages. The pigment was negative

with both PAS and Prussian blue, thus suggesting it was schistosomal (Thompson, 1966). In support of this, one of the affected baboons (B57) did have several bilharzial granulomas in the liver and adults in the mesenteric vessels of the large intestine.

There were also several examples of hyalinization of the germinal centres similar to those described in the spleen. One baboon showed several eosinophiles scattered throughout the medullary sinusoids. This animal also had hepatic bilharziasis and this may have been the cause.

Endocrine glands

Pancreas

One hundred were examined macroscopically and 99 microscopically. The only pancreatic lesion observed was microscopic foci of ectopic tissue in the submucosa of the duodenum of 4 adult males (B64, B76, B83 and B94). It was always well circumscribed, and appeared to be normal pancreatic tissue in all respects (Fig. 93). The tissue did not appear to cause any untoward effect in the duodenum, and the pancreas itself was normal in all cases. According to Barron (1970), ectopic pancreatic tissue has been observed in a domestic cat, dogs, a laboratory rat and a cynomologous monkey. It has also been observed in the spleen of a woolly monkey, *Lagothrix* sp. (Henderson, Webster, Bullock, Lehner & Clarkson, 1970). To our knowledge these are the first cases reported in baboons.

There was also 1 case (B7) with numerous small rounded blue to grey intracytoplasmic inclusions (7–10 μm diameter) in the acinar cells (Fig. 94). Some had a definite pale halo surrounding them, suggesting shrinkage, and they were often near the nucleus, which was in turn indented by the inclusion. There was no inflammatory reaction or other pathologic condition associated with these inclusions; their significance is unknown.

Adrenal

One hundred were examined macroscopically and 96 microscopically. A narrowing of the cortex with a decrease in the cortico-medullary ratio was noticed in a few cases. It was only found in some of the animals showing the capture myopathy stress syndrome (see *Skeletal muscle*).

A fairly frequent macroscopic anomaly was the presence of small firmly attached nodules (<1 mm diameter) on the cortical surface. Their colour and consistency were similar to that of the cortex. They were usually multiple and bilateral and were both within the capsule and outside in the periadrenal adipose tissue. Histologically they resembled the cortical tissue, especially the zona glomerulosa (Fig. 95). The centre of some nodules was similar to the zona fasciculata. Occasionally those in the capsule were connected with the subjacent zona glomerulosa, suggesting that they were evaginations of this zone. Those in the periadrenal fat, however, appeared free of this communication. They were well circumscribed and often surrounded by a thin fibrous capsule. Of the 31 cases (33,4%) (24 males and 7 females), 26 were observed in adults. This suggested that the lesion is more frequent in older baboons and possibly more frequent in males. There were 2 cases (B12 and B85) in juvenile males (4,6 and 3,2 kg respectively).

Nodular hyperplasia of the zona glomerulosa is common in several species of mammals including the chacma baboon (Price, Greeff & Weber, 1971) and man (Anderson, 1966). It has been suggested by Jubb & Kennedy (1970) that they may arise as residues of alternating phases of hyperplasia and involution.

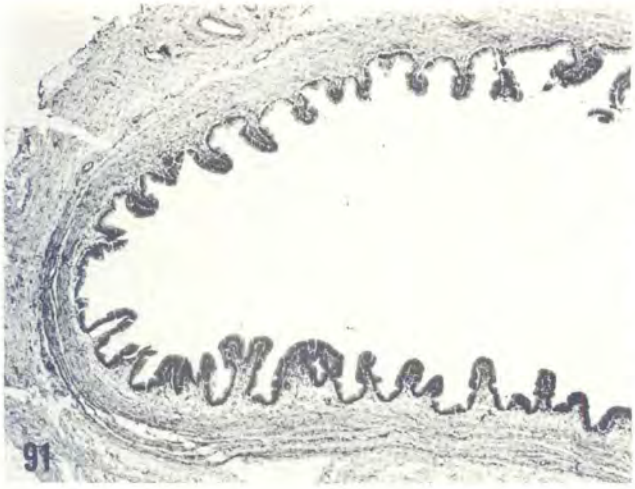
There was 1 case (B72) with focal hyperplasia of the zona reticulata (Fig. 96). This focus was well circumscribed but not encapsulated and was evident only because the cells were lighter in colour and arranged in a sheet-like mass rather than in the normal cord arrangement. The morphology was similar to cortical adenomas of man, but the lesion was far too small to be placed in this category. It was almost identical, however, to that described in the zona fasciculata of 2 woolly monkeys (*Lagothrix* sp.) by Henderson *et al.* (1970). Its significance was not apparent.

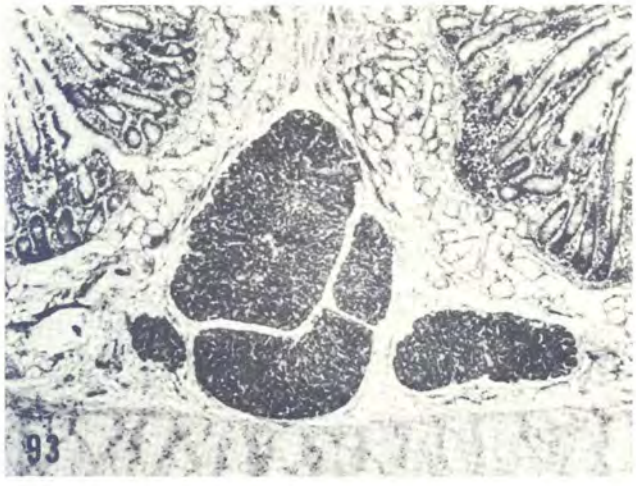
Areas of macroscopic haemorrhage and congestion of the zona fasciculata were found in 1 baboon and microscopically in 11 animals (6 females and 5 males). Except for 1 juvenile male (B63) these animals were all adults. The mild multifocal to diffuse haemorrhages were restricted to the zona fasciculata (Fig. 97), were acute, and leukocytic infiltration was absent. A few of the parenchymal cells within the haemorrhagic areas showed necrosis. Intracytoplasmic eosinophilic globules, similar to those found in the medulla (see below), were found in the zona fasciculata of 2 of the more severe cases. In 3 cases a fatty change was associated with the haemorrhage. It is interesting to note that 6 of the 11 baboons with affected adrenals had been captured at least 3–5 days before necropsy and this prolonged period of stress could have helped to cause these lesions. The same 7 also showed various degrees of capture myopathy. (See *Skeletal muscle* for discussion of this point). Price *et al.* (1971) observed similar adrenal lesions in the majority of 160 captured chacma baboons and thought that they were due to psychological and/or physiological stress, especially enterocolitis.

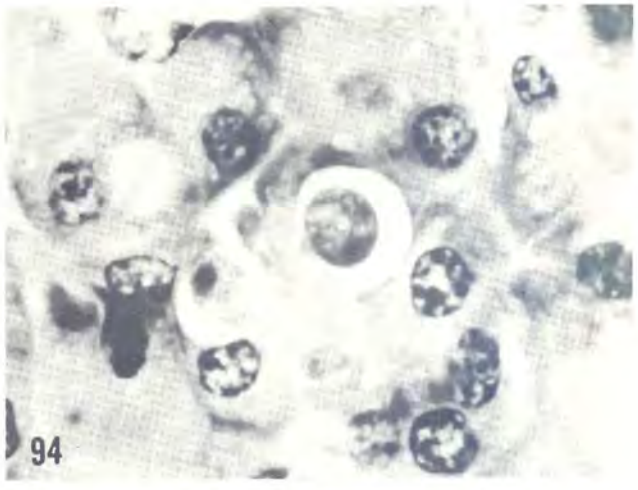
An abnormal degree of fatty metamorphosis of the adrenal cortex was observed in 8 adult baboons, 4 males and 4 females. In 7 cases it was restricted to the zona reticularis as diffuse accumulations immediately adjacent to the medulla (Fig. 98). The remaining case was a single focus in the zona reticularis (Fig. 99). The fat appeared as abnormally large lipid droplets filling and replacing the cytoplasm to a variable degree, and in most cases causing eccentric compression of the nucleus. It should be pointed out that lipids were present to some degree in the zona fasciculata of practically all the baboons but were invariably in a normal microglobular (foamy) state. The abnormal fatty changes were not associated with other lesions except in 3 cases of concomitant haemorrhage. Its importance is not understood and, unlike the haemorrhagic lesion, it cannot be related to a period of confinement after capture since it appeared in both newly-caught animals (less than 6 hours) and those which had been caged for up to 5 days.

There were 3 instances of multifocal infiltration of mononuclear cells, especially lymphocytes, in the cortex, particularly the zona reticularis. All animals were adult males that also had lymphoid aggregates in the myocardium and kidney. For this reason the lymphoid tissue in the adrenal was considered as part of an overall systemic lymphocytosis, possibly the result of some virus condition, although this was not proven.

The zona reticularis of 1 case (B93) was diffusely infiltrated by an isotropic pink homogeneous wax-like material (Fig. 100). Morphologically it resembled amyloid but was negative when specifically stained with gentian violet. It was therefore interpreted as a form of scar tissue, possibly the result of a previous focal necrosis.







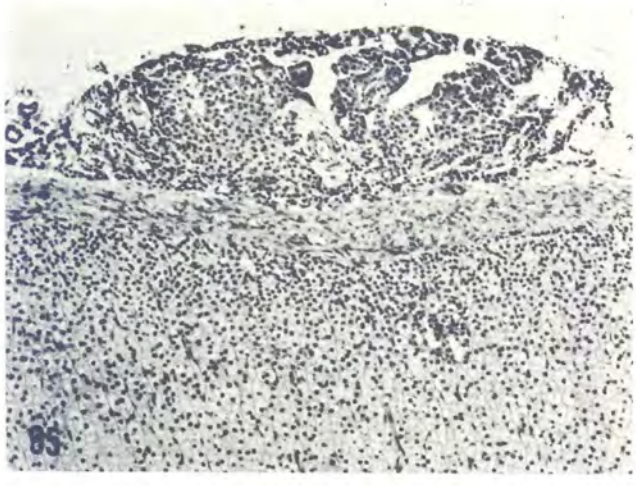


FIG. 91–96. 91. Normal gall bladder mucosa of B24 for comparison to Fig. 92. HE × 30
92. Gall bladder mucosa of B43 showing cystic mucinous hypertrophy. HE × 30
93. Photomicrograph of portion of ectopic pancreas in submucosa of duodenum (B76). HE × 36
94. Intracytoplasmic "inclusion" within pancreatic acinar cells. HE × 1 200
95. Nodular hyperplasia of the adrenal zona glomerulosa (B59). Note that the nodule is outside the capsule. HE × 75
96. Hyperplastic nodule in the adrenal zona reticularis. The medulla is below the dotted line. HE × 30

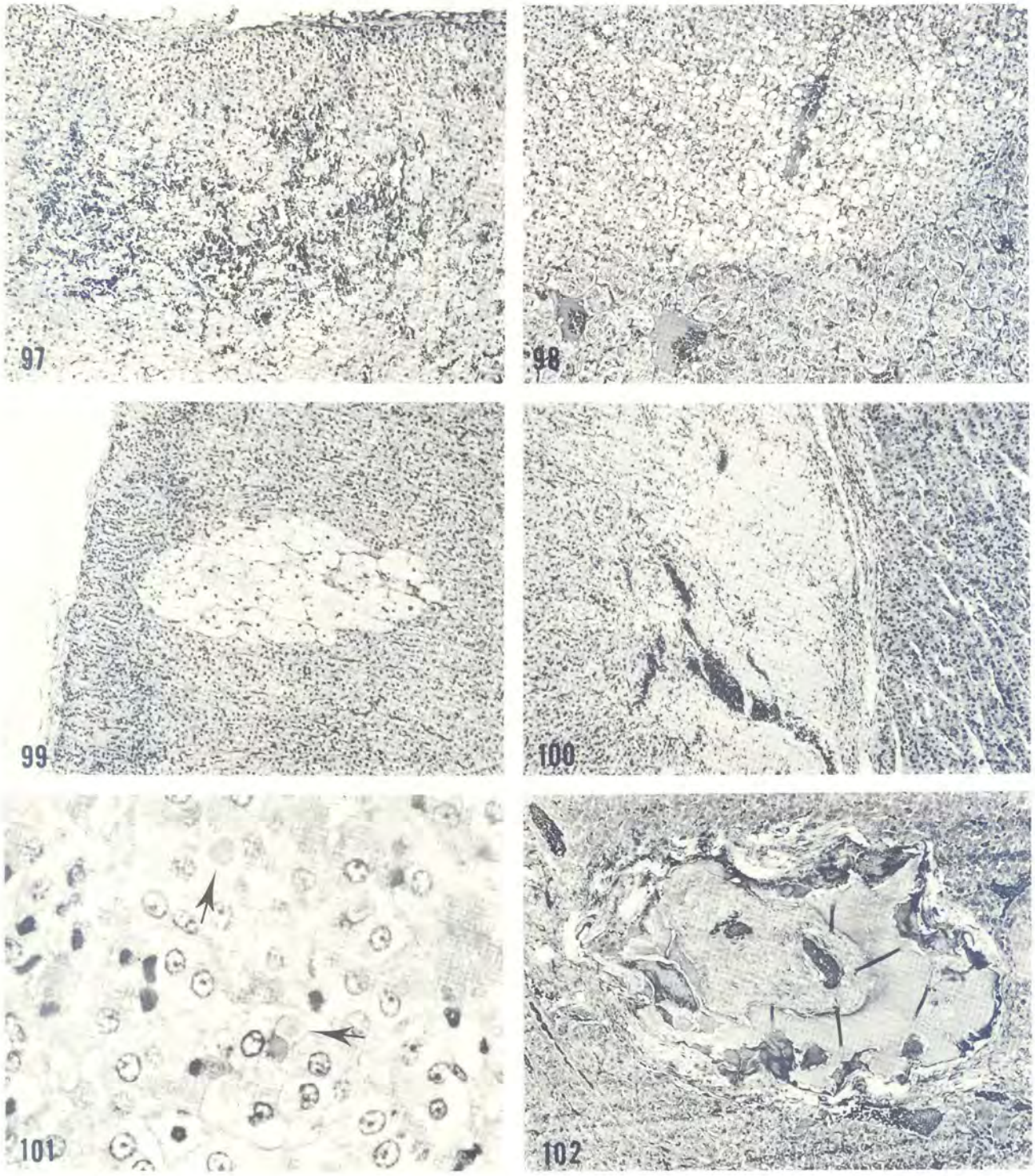


FIG. 97–102. 97. Area of diffuse haemorrhage in the zone fasciculata of B41. HE×75
98. Focus of fatty metamorphosis in cortex near the corticomedullary junction. HE×75
99. Focal area of fatty metamorphosis in zona fasciculata (B75). HE×75
100. Hyalinized scar in cortex near junction with medulla (left) (B93). HE×75
101. Intracytoplasmic hyaline globules (arrows) in adrenal medulla of B81. HE×500
102. Focus of calcification at cortico-medullary junction in B64 (decalcified tissue). HE×75

The adrenal medulla showed 3 distinct types of lesions: viz., lymphoid foci, intracytoplasmic hyaline globules and focal mineralization.

Lymphoid foci were observed in 7 adults (5 males and 2 females). There were from 1–4 foci, all fairly well circumscribed, per section. Their morphology was similar to those of the lymphoid aggregates in the adrenal cortex and their presence was associated with similar changes in the heart (all 7 cases) and kidney (5 cases), which again suggests that this was a part of a systemic lymphoid change rather than a primary lesion.

The intracytoplasmic hyaline globules varied in size from 3–21 μm in diameter and were isotropic, bright pink, spherical, well-defined and at times surrounded by a halo (Fig. 101). Confusion with erythrocytes was excluded on the basis of size, location, colour (with HE) and histochemical properties, the globules being PAS-positive and acid-fast. All cases were found in adults (4 females and 1 male). The globules were identical to those described by Basson, Adelaar, Naude & Minne (1970) in cattle and Dekker & Oehrle (1971) in man. After electron microscopic studies the latter authors concluded that the globules were lysosomal in nature, probably products of lipid peroxidation and related to lipofuscin pigments. They could show no correlation with age, sex, or associated diseases in their series of 3 cases. Other workers, however, have shown a correlation with infections (Hart & Cyrus, 1968), wasting disease (Moslener, 1954), malignancies (Bonciu, Ionesco & Belis, according to Dekker & Oehrle, 1971), neurological disease (Hart & Cyrus, 1968) and plant poisons (Basson *et al.*, 1970); one author (Büchner, 1959) even feels that they may be normally present. In this study there were more females than males affected but the small number of cases does not justify any attempt to correlate them with sex.

All cases were associated with adrenal cortical lesions, either haemorrhages or fatty metamorphosis or both. Interestingly, all these animals also showed capture myopathy, and while not specific for this disease, since they were found in 5 of 28 cases only, they may be related to the stress which apparently predisposes to capture myopathy (Basson *et al.*, 1971) and either accompanies or is produced by many diseases.

There was 1 case (B64) of mineralization in the adrenal medulla (Fig. 102). This well-circumscribed focus was visible macroscopically and measured approximately 2 mm in diameter. No evidence of ossification or a pre-existing stimulus such as a parasite was found. It was suspected to be dystrophic calcification, possibly similar to that found at the cortico-medullary junction in monkeys (Ross, Gainer & Innes, 1955).

Thyroid

One hundred were examined macroscopically and 90 microscopically. The commonest change was the presence of normal-looking colloid between the follicles (extra-follicular) (Fig. 103), usually in the hilar area. It was found in 29 baboons (17 males and 12 females) which varied in mass from 6,4 to 32,7 kg. The only abnormality associated with it was the presence of several large eosinophilic parafollicular cells [as defined by Bloom & Fawcett (1968)] in a few instances (Fig. 104). It should be stressed, however, that there was no lymphocytic infiltrate in the area. Neither an explanation nor any significance could be attached to this finding. One possibility that arose during the course of this study was that it might be due to traumatic squeezing during removal of the gland. With this in mind the thyroids from the last group of 17 baboons were handled differently from those in the previous animals. Instead of simply removing the glands *in toto* and/or bisecting one of them, only 1 gland was removed thus. The second (opposite side) was left attached to the trachea and surrounding muscle and fixed *in situ*. After fixation, blocks were cut from both glands and HE sections prepared as in the previous 83 cases. The specific sections were then compared for the presence and extent of extra-follicular colloid. In this group of 17 baboons, 6 had very mild extra-follicular colloid. In 5 instances it was found only in the gland removed at necropsy and in 1 it occurred in a gland that was attached to the trachea. It was never found bilaterally. This suggested that the extra-follicular colloid was probably an artifact of post-mortem handling, but the experiment was too limited in its scope and numbers to justify any definitive conclusions. Another argument in favour of the artifact theory is that an inflammatory reaction was absent; if colloid becomes extra-follicular it should stimulate an intense cellular response. However, in some cases parafollicular cells were found, though these were absent in both normal areas of the same thyroid and in unaffected thyroids, which suggested it was a real lesion. At this point, therefore, the pathogenesis and significance of this change are obscure. Jubb & Kennedy (1970) show an example of extra-follicular colloid in a bovine that had colloid goitre but no evidence of goitre was seen in any of the baboons in this study.

There were 6 examples (4 males and 2 females) with lymphocytic infiltration of the thyroid. This invariably consisted of a few small lymphocytic foci interposed between follicles, mainly in the hilar area or near the capsule (Fig. 105). The adjacent follicles were normal. Two cases had concomitant extra-follicular colloid, but not in the immediate vicinity of the lymphocytes.

According to Jubb & Kennedy (1970) thyroiditis is uncommon in animals; it is mainly found in old dogs but even here is only seen occasionally. According to a study in old laboratory dogs by Tucker (1962), lymphocytic thyroiditis was accompanied by atrophic changes of the follicular epithelium, and Mawdesley-Thomas & Jolly (1967) suggested that it is an auto-immune disease in this animal species. Although an auto-immune cause cannot be ruled out in these cases, it seems highly unlikely because associated follicular changes are lacking. The possibility that this is part of a generalized lymphoid proliferation or response can probably also be eliminated because lymphocytic infiltrates of the heart were present in only 2 and in the kidney in only 1 of these 6 cases. It appears, therefore, that this is an example of primary lymphocytic thyroiditis of unknown cause.

Interfollicular (clear cell) hyperplasia was observed in 3 adult females (B43, B45 & B65). These cells were conspicuous because they were in small proliferative clumps (Fig. 106) rather than single rare cells, which were seen routinely. According to Meissner & Warren (1969) these cells are believed to produce thyrocalcitonin. If so, the hyperplastic state in these 3 animals may be related to pregnancy or lactation, both of which have a stimulatory action on calcium metabolism. One of these baboons (B65) was in an early phase of pregnancy and the other 2 were lactating.

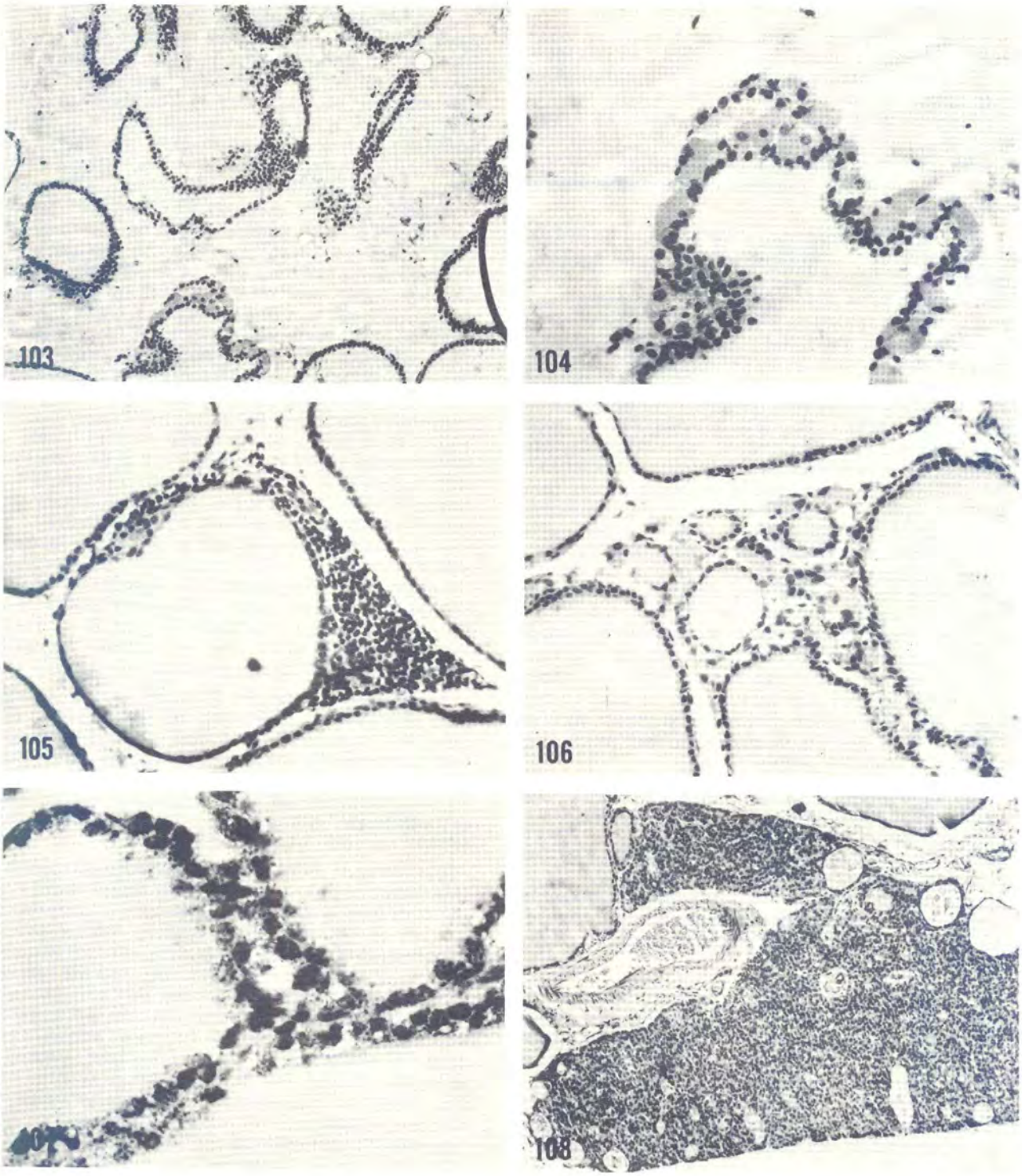


FIG. 103–108. 103. Area of interfollicular colloid in thyroid (B19). HE × 75
104. Several oxyphilic cells along follicular wall. Outside this is interfollicular colloid (B19). HE × 200
105. Area of lymphocytic infiltration in thyroid (B64). HE × 75
106. Focal area of hyperplasia of interfollicular (light) cells (B45). HE × 200
107. Follicular lining cells containing lipofuscin pigment granules (B57). HE × 500
108. Several microcysts in parathyroid of B4. HE × 75

A counter argument may be that more females should have shown the lesion because most adult females were in 1 of these 2 physiological states, free-living baboons being very prolific.

The cytoplasm of the follicular lining cells of 1 old, somewhat debilitated male (B57) contained large amounts of a fine yellow-brown isotropic granular pigment (Fig. 107) that was positive with PAS and the 24-hour ORO technique. It was therefore considered to be lipofuscin. This pigment occurs in many animals such as dogs, calves, seals, deer, various laboratory animals, gorillas and man (Thompson, 1966). It has been associated with old age, at least in the liver (Cohrs, 1967), and this was thought to be the case in this baboon.

Embedded remnants of thymic tissue occurred in the thyroid of 10 animals which varied in mass from 3,4 to 30,5 kg and resembled normal thymus except in some of the larger (older) baboons, where cystic changes were observed (see *Thymus* for discussion). It is not surprising that it was found in this area when its embryological origin is considered (Bloom & Fawcett, 1968).

Parathyroid

Fifty-four were examined microscopically. Of these, 16 (29,3%) (11 males and 5 females), whose masses varied from 1,8–30,5 kg, contained from 1 to several small microcysts (Fig. 108). They were lined by low cuboidal epithelium and contained a variety of mildly eosinophilic material of granular and/or homogeneous nature, often admixed with cellular epithelial debris (Fig. 109). According to Castleman (1952) microcysts are found frequently in the normal parathyroid of man and are generally the result of degeneration. They are evidently also frequent in baboons, but their degenerative nature could not be determined. It is doubtful whether degenerative changes would occur in animals as small as 1,8 kg (B100).

As in the thyroid, thymic tissue was found embedded in the parathyroid. It was observed in 15 animals (27,8%) (12 males and 3 females) which varied in mass from 4,1–28,6 kg. In some cases it almost obscured the parathyroid but did not appear to cause pressure necrosis or other untoward effects (Fig. 110). It was unusual in that where it involved the parathyroid it nearly always appeared to be restricted to this gland and did not involve the adjacent thyroid. There were 3 animals, however, in which thymic tissue was found in both the thyroid and parathyroid of the same side. Even here, though, the aberrant tissues appeared to be independent of each other. The thymic tissue was normal except for occasional microcysts (see *Thymus* for discussion). Again, as with the thyroid, the importance of this finding was strictly academic and can be explained by embryological development of these closely associated tissues.

Pituitary Gland

One hundred were examined macroscopically and 69 microscopically. The pituitary was cut so as to show both the adeno- and neurohypophysis.

The commonest change was the presence of microcysts in the adenohypophysis of 18 baboons (26,1%; 12 males and 6 females). These were all sexually mature animals varying in mass from 10,9–37,3 kg. The cysts were single or multiple and were usually found anywhere in the periphery of the gland (Fig. 111). Their lining varied from tall ciliated columnar to low cuboidal, sometimes even squamous, epithelium (Fig. 112). In fact, all types could be found lining the same cyst. They usually contained mucinous-like material, but at times it was more granular in nature with remnants of sloughed cells scattered throughout. These cysts appeared to exert only very mild pressure effects on the surrounding parenchyma and were never large enough to produce pressure on the neurohypophysis.

The respiratory-like lining epithelium indicated that they were remnants of the Rathke's pouch. According to Jubb & Kennedy (1970) these cysts are very common in dogs, especially brachiocephalic breeds, but are rare in other animals. In man they are also quite common but are usually quite small and of no clinical importance (Anderson, 1966). The same is probably true with regard to this group of baboons, although clinical examinations were not made prior to autopsy.

A few scattered megalocytic basophiles were found in the adenohypophysis in 4 adults (2 males and 2 females). They were approximately 50–70 μm in diameter and contained unusually large nuclei (Fig. 113). They were not associated with megalocytosis in other organs (liver or kidney), and their significance is unknown.

An unusual change involving the chromophobes was found in 1 adult male (B32). Many of these cells showed enlarged clear foamy cytoplasm (Fig. 114). Since it was found in only 1 animal it was regarded as being abnormal though again its significance is unknown.

Digestive System

Teeth and gums

Although a detailed examination of this area was not attempted, a few general impressions were obtained. Firstly, very few lesions were found in the teeth of the young baboons. In very old animals, especially males (B27, B49, B62, B72 and B88), there was evidence of tooth wear, particularly of the incisors, which were worn to the gums in one case. The other major finding was occasional broken superior canines. Also associated with the aging lesions was gingival hyperplasia, which was most pronounced in the area of the superior canines; there this tissue grew down and covered approximately half the tooth. This lesion was also prominent on the labial surface of the incisors, where it extended between the teeth almost to the occlusal surface. Microscopically, it consisted of dense fibroplasia covered by slightly hyperplastic epithelium. Very little inflammatory response was seen, though gingivitis is a common finding in old baboons (Dan'ko, 1966). Bramblett (1967) thought that broken teeth may limit the life span of baboons. This may be true, but it is doubtful if it plays a major role in the mortality of baboons in the KNP since some of the old males had canine teeth that were broken off at the gum line and severe wearing of the remaining teeth and yet were in a good state of health. As far as defense in intra-troop battles is concerned, Saayman (1971) pointed out that the old baboons with worn dentition will group together to ward off attacks from the younger males with more formidable canines.

One adult male (B49) had a large abscess (3 cm in diameter) beneath the skin in the right maxillary region about 2 cm below and in front of the eye.

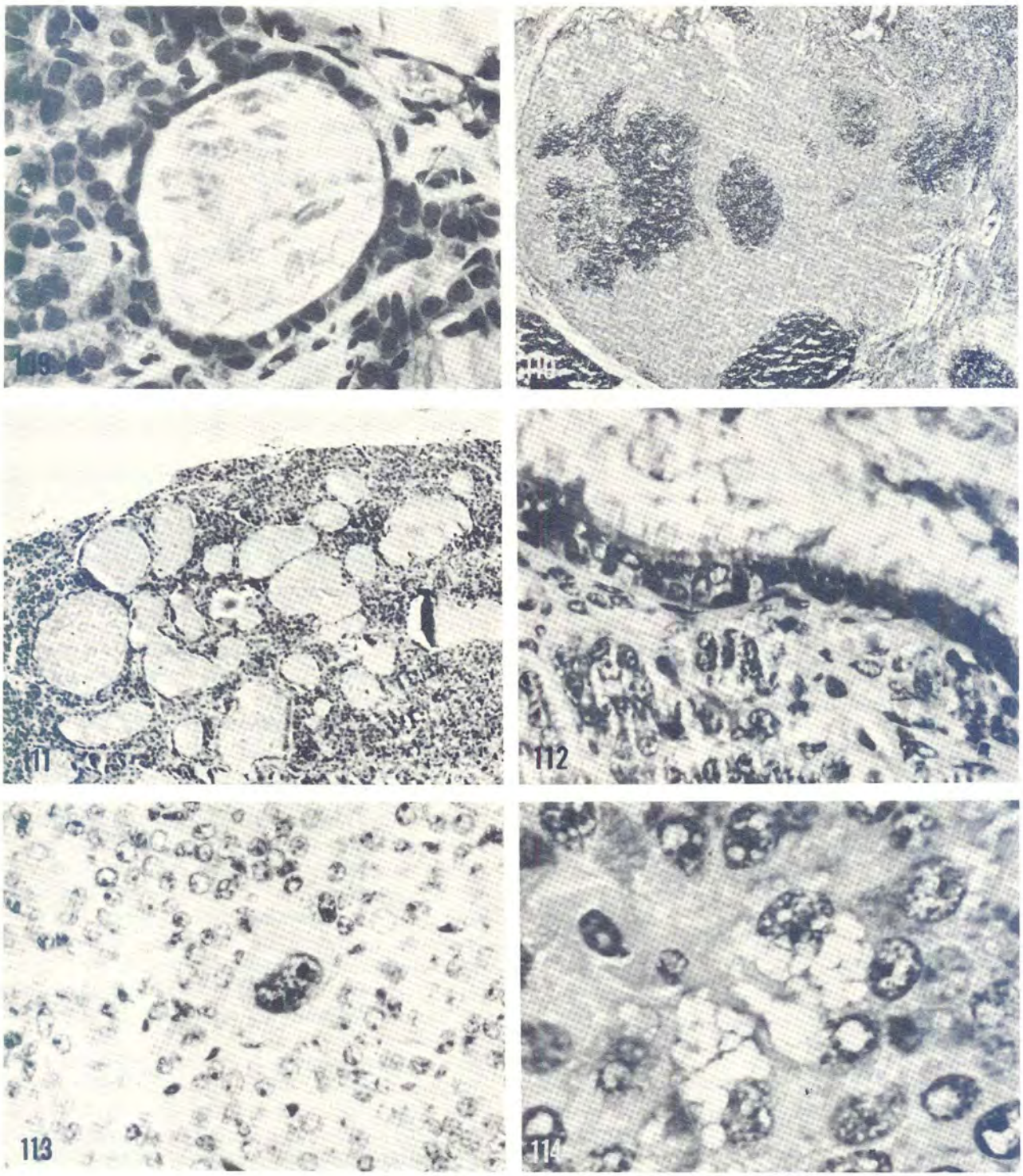


FIG. 109–114. 109. Higher magnification of microcyst showing contents. HE×500
110. Parathyroid of B19 containing several areas of thymic tissue (dark areas). HE×75
111. Numerous microcysts of adenohypophysis of B36. HE×75
112. Lining of a microcyst showing ciliated epithelium (B69). HE×500
113. Megalocytosis of abasophile in adenohypophysis (B45). HE×200
114. Two foam cells in adenohypophysis of B32. HE×1 200

Closer examination revealed that the abscess had invaded the adjacent nasal fossa through a large defect (1,5 cm in diameter) in the maxilla. It had also eroded through the medial septum, involving the left fossa to a lesser degree. Further examination revealed that one of the upper molar teeth on the right side was cracked and it was surmised that the abscess might have been related to this fracture. A similar case (B88) also showed abscessation related to a broken tooth, but it was not as severe as B49. Cracked or broken teeth would permit the entrance of bacteria and provide an excellent environment for their growth, resulting in possible abscessation. It is surprising that more abscesses were not observed in the old animals, considering that most had broken teeth.

Tongue

One hundred were examined macroscopically and 97 microscopically. The commonest lesion was sarcosporidiosis, which occurred in 14 adult animals (8 males and 6 females). (See *Skeletal muscle* for discussion).

There were 7 examples (5 males and 2 females) of lymphocytic glossitis, characterized by a diffuse mild infiltration of lymphocytes just beneath the epithelium (Fig. 115). Six out of these 7 baboons also had lymphocytic foci in the myocardium and 4 out of 6 (where the information was available) had a lymphocytic nephritis. It was therefore felt that the lymphocytic glossitis was merely a manifestation of a systemic lymphoid response to some unknown insult, possibly a virus.

Small foreign-body granulomas were observed in the tongue of 2 adult female baboons (B82 and B97). They consisted of a central core of plant material surrounded by foreign-body giant cells, macrophages and a significant number of eosinophiles. This incidence is very low, but it must be remembered that one section of tongue actually represents a very small area of the organ. Considering the varied nature of a baboon's diet it is not surprising that lesions of this type were found.

A very interesting and unusual lesion was found in 1 animal (B57). This old male had 2 large bilateral cysts (15mm in diameter) on the dorsal surface of the posterior 3rd of the tongue in the area of the circumvallate papillae (Fig. 116 and 117). On cut section they contained a clear slightly watery fluid. Microscopically they were lined by stratified squamous epithelium similar to that of the ducts of Ebner's glands (Fig. 118 and 119), and it was therefore concluded that these cysts were dilatations of these structures. The lower-lying glands of Ebner were relatively unaffected. The ducts of these glands open into a moat-like depression surrounding the circumvallate papillae. It is suggested that the pathogenesis of this lesion was plugging of the moat or duct by an unknown material with subsequent dilatation. Although a similar lesion (ranula) is found in salivary ducts of other animals (Jubb & Kennedy, 1970) and man (Anderson, 1966), no report was found of this lesion involving Ebner's glands.

The same baboon (B57) also had a large oval erosion (2 × 1 cm) on the dorsal surface of the tongue approximately 2 cm anterior to the cystic ducts (Fig. 116). Microscopically, there was no inflammatory response or inclusion body associated with the lesion nor could any aetiologic agent be identified. There did not appear to be any correlation with the cystic Ebner's glands. Its pathological importance, therefore, cannot be ascertained. This baboon was in poor condition compared to the others in this study so this lesion may have been part of an overall debilitated state or possibly even related to a vitamin deficiency.

Tonsils and pharynx

One hundred were examined macroscopically and 88 microscopically; of the latter 83 contained tonsillar tissue and the remaining 5 were pharyngeal tissues from near the tonsil.

Macroscopic lesions of the tonsil were uncommon, though most animals showed varying degrees of lymphoid hyperplasia and tonsilitis. In a few instances small pieces of plant material that had elicited a mild foreign body-type reaction were found deep in the crypts.

There was also 1 example (B32) of adipose tissue within the lymphoid tissue near the junction of the subjacent connective tissues (Fig. 120). This fatty tissue was of no pathological consequence but was interesting because it is not normally found in this area.

The most interesting lesion of the tonsil observed in this study was a small keratinaceous cyst in B36. This structure was lined by stratified squamous epithelium with a central core of laminated keratinaceous debris (Fig. 121). It possibly resulted from either the blockage of one of the crypts or, more probably, from the entrapment of a piece of epithelium within the lymphoid tissues. Again, this lesion was considered to be of academic interest only.

The mucous glands near the tonsils or in other areas of the posterior pharynx were examined in 88 cases. Twenty-five (28,5%) had varying degrees of lymphocytic infiltration in the interstitial tissues, which was mainly concentrated circumferentially around the ducts of the glands (Fig. 122). The duct in 1 case (B40) showed squamous metaplasia. Of the 25 affected animals, 14 had lymphocytic infiltrates in the heart, 8 in the kidney and 14 (of the 23 available tissues) in either the submandibular or parotid salivary gland or both. Because of the relatively low correlation it was postulated that this probably represented a local lesion, which extended along the excretory ducts of the glands.

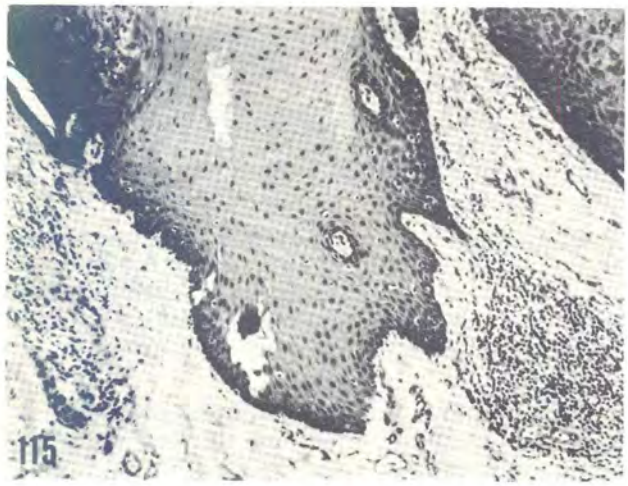
Sections of microfilariae were observed within the pharyngeal mucous glands of 1 baboon (B19) (Fig. 123 and 124). They were within the lumen of the glands without any accompanying inflammatory reaction, but foci of a lymphocytic infiltrate were present elsewhere in these glands. For a discussion of the parasite and its possible relationship to *Tetrapetalonema* the reader is referred to the section on *Skin*.

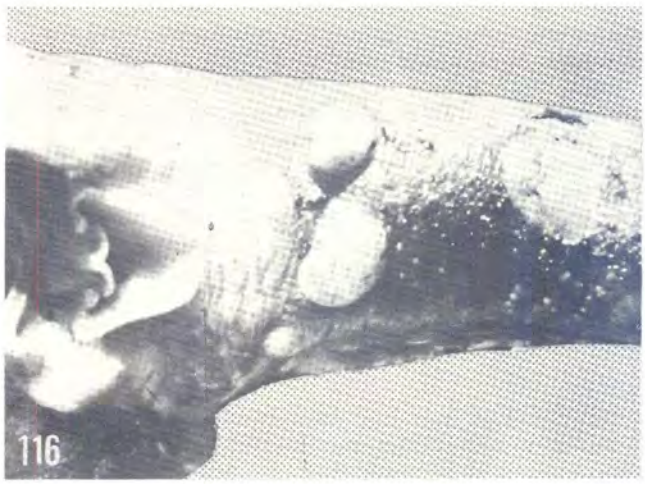
The only other lesion of the pharyngeal mucous glands was a small foreign-body granuloma, probably of phytogenous nature (B17).

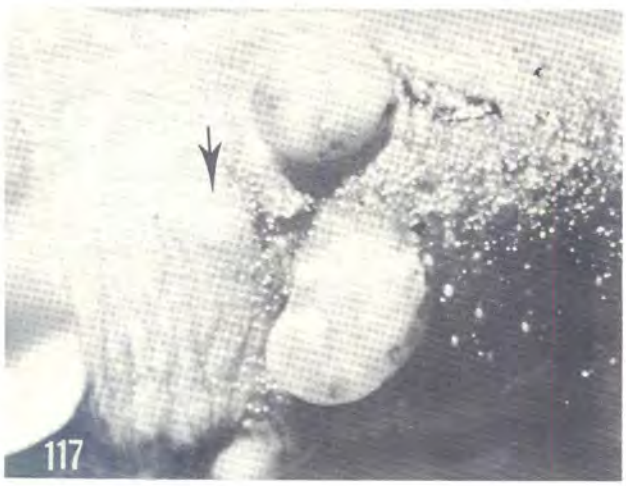
Sarcosporidia were found in the striated muscle of the pharynx in 11 cases. They were identical to those of the skeletal muscles in other areas (see *Skeletal muscle*).

Salivary glands

One hundred were examined macroscopically. The mandibular salivary gland was examined microscopically in 91 animals and the parotid in 72 animals. One or the other was viewed microscopically in 94 cases.







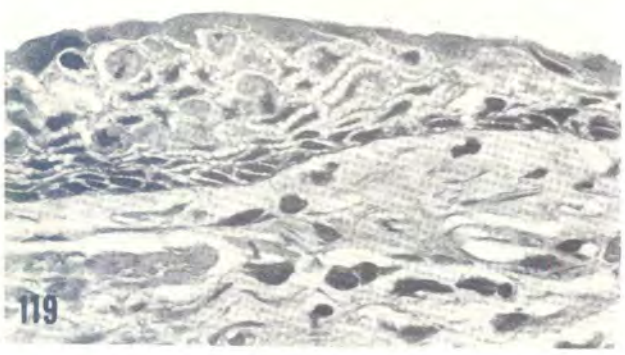


FIG. 115–120. 115. Lymphocytic glossitis in B67. Note that the lymphocytic foci are restricted to the subepithelial connective tissues. HE×75
116. Tongue of B57 showing two large cysts (Ebner's gland ranula) on the posterior dorsal surface. A circular erosion is seen about 2 cm anterior to the cysts
117. Closer view of cysts in Fig. 116. Note normal circumvallate papillae (arrow). ×1,5
118. Photomicrograph of cyst showing that it involves the ducts and not the glandular tissue beneath. HE×12
119. Stratified squamous lining of cyst. HE×500
120. Section of tonsil from B32 showing adipose tissue within the lymphoid tissue. HE×30

Mild focal disseminated interstitial lymphocytic sialoadenitis was by far the commonest lesion, being observed in 40 baboons (44,9%), 25 males and 15 females, varying in mass from 1,8–32,7 kg. This lesion was found exclusively in the mandibular gland of 20 baboons, exclusively in the parotid of 14 baboons and in both glands in an additional 6 animals. It consisted of a focal infiltration of lymphocytes, a few plasma cells and an occasional histiocyte usually near and often surrounding the ducts (Fig. 125). The lesion resembled the one described in the submucosal glands of the posterior pharynx very closely. No specific etiological agent was observed. There was a poor correlation between this lesion and lymphocytic lesions in other organs, the heart being involved in 20 and the kidney in only 12 of these 40 cases. This suggested that it was a primary sialoadenitis, and this was supported by the fact that it was found in both the mandibular and parotid glands in only 6 instances. According to Jubb & Kennedy (1970) inflammation of the salivary glands in animals is uncommon and is usually the result of a pathogenic agent entering via one of the excretory ducts. The distribution of the lesions around the ducts in this series tends to support this theory.

Cytomegalic inclusions were found in the mandibular salivary glands in 6 of the 91 animals examined (6,6%). 4 females and 2 males, varying in mass from 4,1–17,3 kg. The inclusions were the typical large purple "owl-eye" intranuclear type and invariably affected the epithelial cells of the duct (Fig. 126). They were rare, only 1 or 2 being found in a section. There was no evidence of an accompanying inflammatory response but 2 of the 6 had mild foci of a lymphocytic sialoadenitis elsewhere in the gland.

An incidence of 6,6% is probably less than the true level of infection with cytomegaloviruses (CMV) in the KNP for the following reasons. Firstly, only the first 20 baboons were examined in detail for inclusions by the preparation of 3 sections from different areas of the gland. Three of this group were positive. From the salivary glands of the remaining animals only 1 section was prepared per animal. Therefore a more accurate incidence would, extrapolating from the results in the first group, approximate 15%. Secondly, the inclusions were so rare that even 3 sections may not provide an accurate reflection of the true incidence.

The CMV have been observed in a large variety of animals (Cohrs, 1967) and man, and recently an excellent review on the subject was given by Weller (1971). The present study indicates that feral baboons can have a high rate of infection. A similar finding was made by Smith, Thiel, Newman, Harvey, Trousdale, Gehle & Clark (1969), who found CMV in 27 of 52 African green monkey kidney tissue cultures. These facts should be kept in mind when obtaining primates for laboratory purposes or when obtaining their organs for tissue culture. Another important consideration applies to organ transplant research where a large number of chacma baboons are used. Based on studies in man, where 47% of individuals who are dying after immunosuppressive therapy showed CMV pulmonary disease (Hill, Rowlands & Rifkind, 1964), it can be assumed that this agent will also become an important factor in experimental studies of a similar nature where baboons are used as the test subject. Finally, it has been postulated that the simian strains of CMV may represent a zoonotic hazard to man (Fiennes, 1968; Muchmore, 1971).

Other less important lesions of the salivary glands included the absence in 1 baboon (B88) of the left parotid gland. A large (3 × 1 × 1 cm) oblong piece of wood which had penetrated the cheek at the angle of the mouth (Fig. 127) caused a severe localized foreign-body reaction which probably destroyed the adjacent gland because of pressure, atrophy and/or inflammation. Another case (B3) had an unidentified microscopic foreign-body granuloma in the mandibular gland.

The right mandibular salivary gland in B89 was approximately one half normal size compared to the gland on the opposite side and in other animals of similar size. Microscopically this small gland was normal except for a mild lymphocytic sialoadenitis.

An interesting feature, not considered pathological, was the finding of numerous blue staining (HE) globular concretion-like bodies in the ducts of the mandibular glands in several cases. These appeared to be inspissated saliva. They were not classified as true sialoliths because they were so small and there was no associated lesion of the duct or gland itself.

Submandibular lymph node

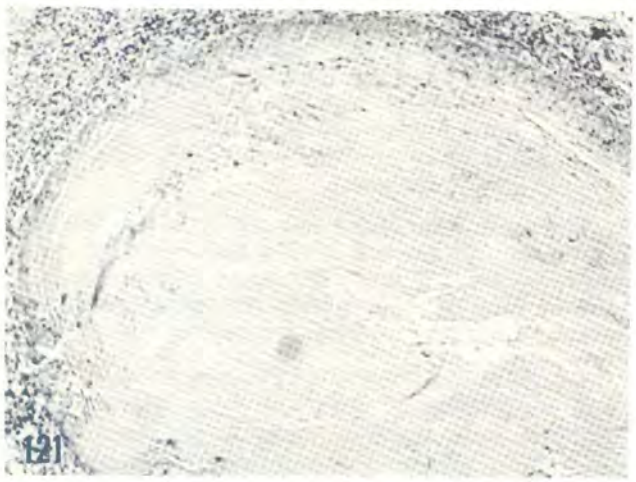
One hundred were examined macroscopically and 94 microscopically. The only macroscopic lesion observed was in B88, where the left submandibular lymph node was approximately 2–3 times the size of the one on the right. Microscopically, there was marked hyperplasia of germinal centres and oedema of the medullary region. This was the animal that had a large foreign body and abscess in the cheek near the left commissure of the lips and in which the parotid salivary gland had been obliterated by the inflammatory process. It was evident that the hyperplastic lymph node was a result of this lesion.

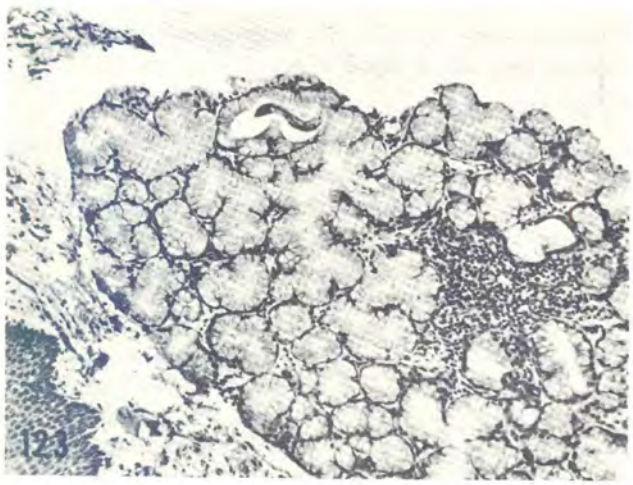
Less important findings included several cases of hyalinized germinal centres identical to those described in the spleen, various numbers of Russell body plasma cells and foreign body type microgranulomas of unknown cause, some of which contained numerous eosinophiles. For some unknown reason the endothelial lining of the sinusoids and small blood vessels was particularly prominent in the submandibular lymph node. Some of these cells had very large nucleoli which at times mimicked intranuclear viral inclusions.

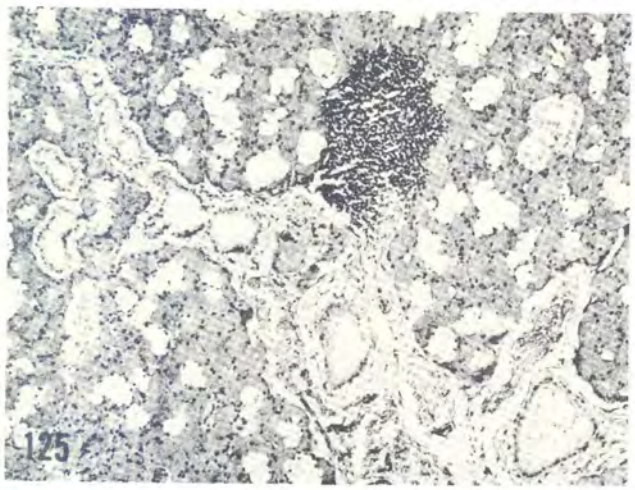
The lymphoid follicles were especially prominent and numerous in the submandibular lymph node. This, together with inflammatory and hyperplastic changes in the tonsil and buccal mucosa, indicated that this first line of defense is bombarded by pathogens.

Oesophagus

One hundred were examined macroscopically and 78 microscopically. The only lesion observed in the oesophagus was a mild diffuse lymphocytic infiltrate in the subepithelial connective tissue of 4 males (Fig. 128). The lesion was undoubtedly of little clinical significance and was probably a local response. Only 2 of the 4 animals had a concomitant lymphocytic myocarditis.







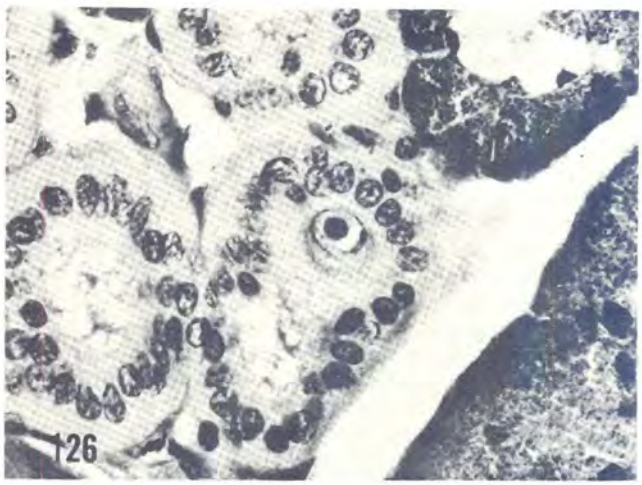
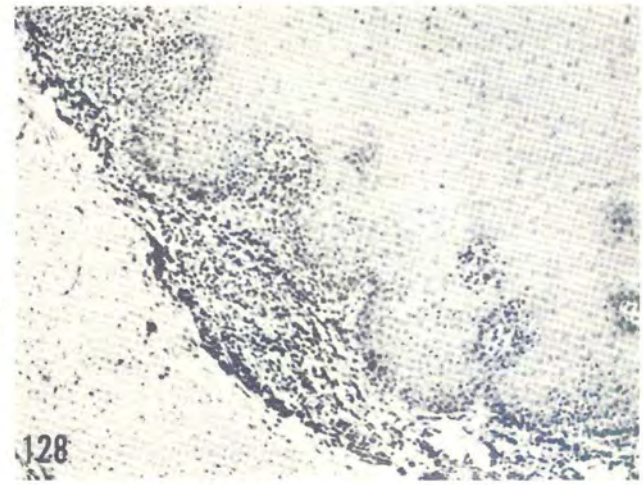
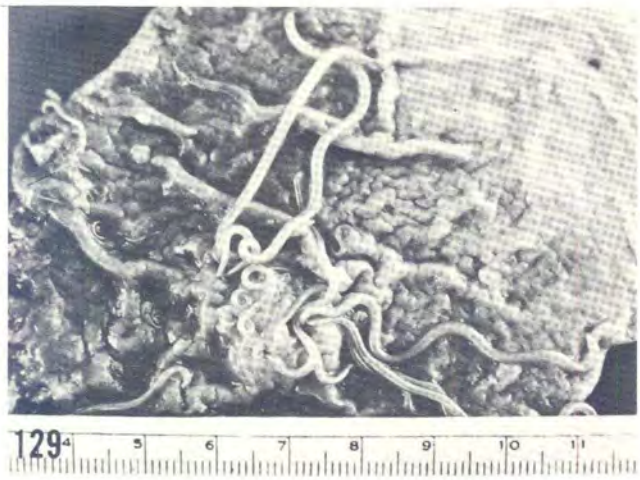


FIG. 121–126. 121. Photomicrograph of keratinized cyst within the tonsil of B36. HE × 75
122. Section from pharyngeal area showing mononuclear infiltrate surrounding the ducts of the submucosal mucous glands (B32). HE × 75
123. A portion of pharyngeal mucous gland from B19 which contains a microfilaria (arrow). Note the focus of mononuclear infiltrate around duct. HE × 75
124. Higher magnification of microfilaria in Fig. 123. HE × 500
125. Submandibular salivary gland with focus of lymphocytes near duct (B32). HE × 75
126. Cytomegalic inclusion in submandibular salivary gland of B30. HE × 500





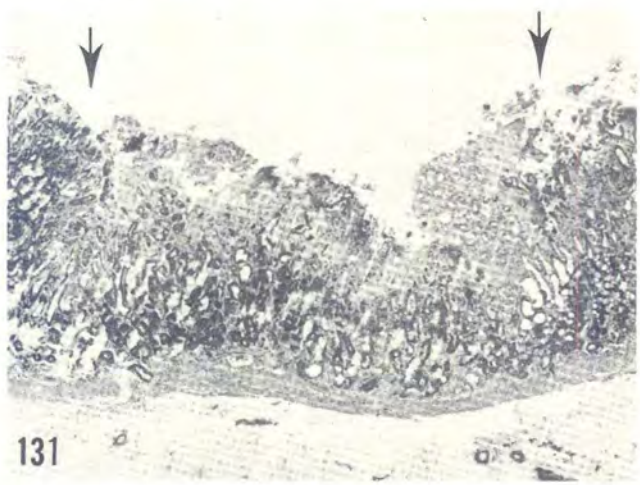


FIG. 127–132. 127. Large wooden foreign body lodged above and posterior to the oral commissure (arrow). Note the bony ring which formed around it
128. Section of oesophagus showing diffuse accumulations of lymphocytes beneath the epithelium (B36). HE×75
129. *Abbreviata caucasia* embedded in fundus region of the stomach of B21.
130. Two small ulcers in a fold of the stomach of B97 where nematodes had been removed. ×2
131. Photomicrograph of erosion similar to that in Fig. 130. (Arrows outline edge of lesion). HE×30
132. Section from nodule shown in Fig. 129. Submucosa has been altered by large inflammatory lesion. HE×12

Stomach

One hundred were examined macroscopically and 97 microscopically. The commonest finding in the stomach was an infestation by the nematodes *Streptopharagus armatus* and *Abbreviata caucasica* (Table 4). *A. caucasica* could usually be differentiated by its relatively fleshy nature and pink tinge from *S. armatus,* which was more threadlike and pale. They were found in 36 baboons, 23 males and 13 females, from all areas of the park. The masses of animals involved varied from 3,2–31,1 kg. Most baboons had infestation rates of 1–10 parasites, with only 6 infestations exceeding this number. The nematodes were usually well attached to the mucosa, mostly in the fundic region (Fig. 129). The lesions were very small and slightly nodular with central ulceration (Fig. 130). Occasionally there was a very narrow collar of haemorrhage around the ulcer. When more than 1 parasite was present they were frequently attached to the same focus, which was raised above the surface (Fig. 129).

Microscopically the erosions (Fig. 131) and, occasionally, ulcers were surrounded by haemorrhage and a mixed-cell type of inflammatory reaction characterized by a large proportion of eosinophiles. The severity of the lesion appeared to depend on the number of parasites attached at a given focus. In the more pronounced lesions (Fig 132) there was proliferation of capillaries and fibrous connective tissue in addition to the above leukocytic change. This formed the raised nodules observed macroscopically.

Species of *Streptopharagus* are common gastric parasites in baboons, as shown by their appearance in Kenya (Kuntz & Myers, 1967), Tanzania (Myers & Kuntz, 1967) and the Republic of South Africa (Mönnig, 1924; Myers, Kuntz & Malherbe, 1971). In the latter study the authors found an infestation rate of 4% (2 of 54) based on examination of faeces for ova. In the present study there was a fairly close correlation between direct identification of the parasite and ova in the faeces, suggesting that faecal sampling may be an adequate method of sampling a population to determine the presence of this parasite.

The local patholgical effect of *S. armatus* and *A. caucasica* were directly related to the level of infestation. Even the most severe lesion in this study, however, probably would have only minimal deleterious effects on the host.

Spirochaetes were found in the mucosa of the stomach of all cases, including the very young. They appeared as typical spiralled organisms both on the surface and deep in the gastric pits. They also appeared to penetrate the parietal cells, without any untoward effect (Fig. 133). Similar spirochaetes have been observed in a variety of mammals (Lockard & Boler, 1970) and man (Palmer, 1954). To our knowledge, however, this is the first time they have been observed in the baboon. Their importance is probably best summed up by Lockard & Boler (1970), who stated: "Even though the organisms are consistently present, they do not seem to produce pathologic changes and are probably the indigenous fauna of the gastric mucosa."

Occasionally, small white depressed foci (1–2 mm diameter) were found near the pylorus. Macroscopically these resembled shallow pits, but microscopically they were found to be lymphoid germinal follicles covered by a thin layer of mucous membrane. Their importance lies in the fact that they should not be confused with true ulceration.

An unusual change, observed in the gastric mucosa in 2 adult males (B39 and B75), was a few isolated glands with a microcystic appearance (Fig. 134 and 135). They were lined by low cuboidal epithelium, did not contain any clearly stainable material (HE) and were similar to those described in beagle dogs by Feron & Mullick (1971). In their study they were unable to establish a pathogenesis or cause and thought the lesion was of minor importance.

There was 1 example (B72) of a foreign body granuloma of plant origin in the submucosa of the fundic region. This was not surprising considering the baboons' diet.

Small intestine

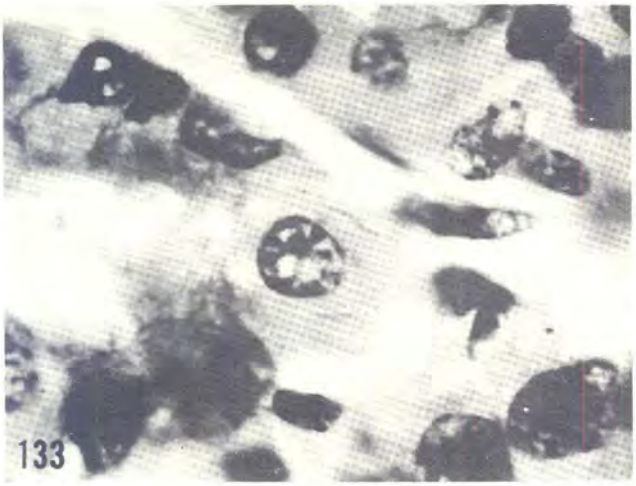
One hundred were examined macroscopically and microscopically. *S. armatus* and/or *A. caucasica* were found in the small intestine of 21 baboons (Table 4), invariably in the proximal $\frac{1}{3}$–$\frac{1}{2}$, where they did not appear to cause any lesions. In the more heavily infested individuals they were often covered by mucus (Fig. 136), which suggests that they stimulated an increased production of this substance.

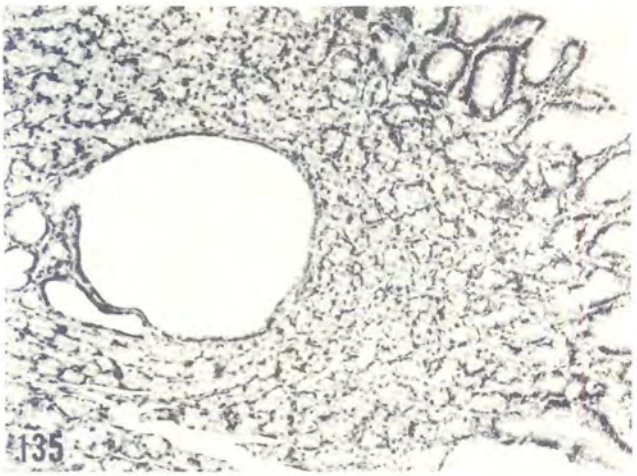
Tapeworms (*Bertiella studeri*) were found in the jejunum of 26 animals. There were usually only 1–5 per individual, but in 1 baboon (B17) a large segment of the jejunum was filled with these parasites. They varied in length from 2–50 cm and did not cause any local pathologic condition; even the most severely affected animal appeared to be in good state of nutrition. Infestation with *B. studeri* is suspected of being a zoonosis in East Africa (Buckley & Fairley, 1950; Thompson, Jellard & Buckley, 1967).

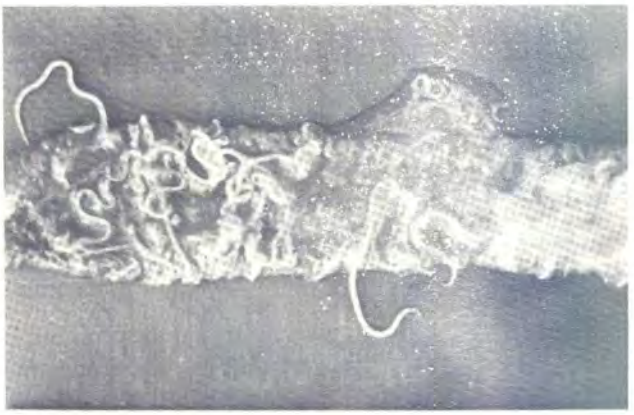
Of the helminths found in the small intestine, only *Trichostrongylus* sp. or *Strongyloides* sp. (indistinguishable histologically) caused observable pathologic illness in the host. They were seen microscopically in 21 animals, and the ova of *Trichostrongylus* sp. and larvae of *Strongyloides* sp. were found in the faeces of 24, which included animals of both sexes and both young and old individuals. Of the 21 baboons examined histologically, 17 had these parasites in the duodenum and 8 in the jejunum, i.e., a few had them in more than 1 location. There was an obvious predilection for the proximal portion of the small intestine, especially the duodenum. Microscopically, the parasites (both adults and immature stages) were found in the lamina propria of the villi and sometimes somewhat deeper in the lamina propria between the glands (Fig. 137). In this position they stimulated a minimal inflammatory reaction consisting mainly of lymphocytes and plasma cells. Surprisingly there were very few eosinophiles. The parasite was surrounded by a single layer of fibroblasts (Fig. 138). The infestations were invariably mild and did not affect the host significantly.

All the above helminths have been found previously in South African baboons (Myers *et al.,* 1971) and also in those from East Africa (Kuntz & Myers, 1967; Kuntz *et al.,* in press; Myers & Kuntz, 1965), but descriptions of their pathological effects were not given.

There were 2 baboons (B64 and B90) which had adult schistosomes in the mesenteric vessels of the small intestine, but no lesions were observed. One baboon had both adult forms and the nodules of *Oesophagostomum* sp. in the terminal ileum. There were also a few animals with protozoa resembling *Balantidium* sp. in the terminal ileum. (See *Large intestine* for a description of these 2 parasites).







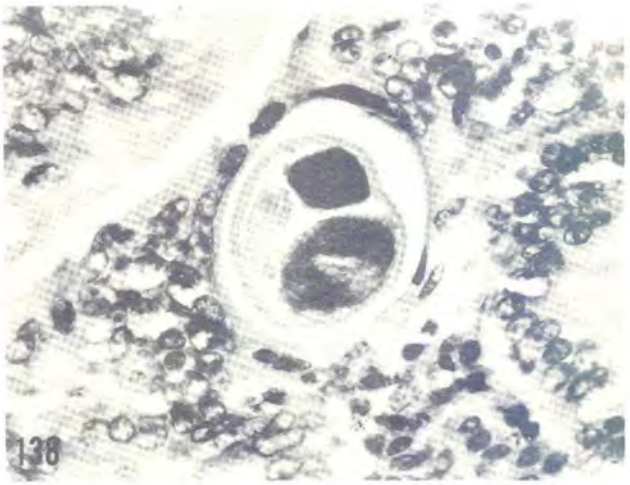


FIG. 133–138. 133. Photomicrograph of parietal cell which contains two spirurids. HE×1 200
134. Fundus area of stomach showing two mucosal cysts (B39). HE×75
135. A similar but larger cyst than Fig. 134 showing that it is lined by flattened glandular epithelium. HE×75
136. Numerous nematodes in the small intestine of B95. Note that they are enmeshed in mucus
137. A section of duodenum which contains several portions of a small nematode, either *Strongyloides* sp or *Trichostrongylus* sp (B21). HE×75
138. Higher magnification of an area in Fig. 137. Note that the parasite is walled off by flattened cells. HE×500