RABBIT POX

I. CLINICAL MANIFESTATIONS AND COURSE OF DISEASE

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PLATES 19 TO 21

(Received for publication, June 26, 1934)

In December, 1932, a disease presenting many of the characteristic features of small pox in man appeared in a colony of rabbits maintained for the study of problems of constitution and quickly assumed epidemic proportions with a high mortality in certain classes of animals. The nature of the disease and the origin of the outbreak were obscure, but the picture presented indicated that the disease was due to a virus and not to a bacterial infection. This impression was supported by observations made in the spring of 1930 when there was a small epidemic of a disease presenting the same clinical and pathological picture.

While it is known that infection with vaccine virus may be transmitted from one rabbit to another by contact or to other animals in the same room, the prevailing impression is that these infections usually are mild or asymptomatic. However, a number of severe epidemic infections have been attributed to neurovaccine virus. In the present instance, work with a number of viruses was being carried on in several laboratories, but at the time very little information could be obtained concerning the use of vaccine virus. It was subsequently learned, however, that prior to the outbreak of the epidemic in question, at least three laboratories had inoculated rabbits with vaccine virus and that in two of these neurovaccine had been used. Some of the inoculated animals were on a lower floor of a building in which a small section of the breeding colony was kept, while others were on the same floor of the building in which the main colony was housed and there were connecting links by means of which a highly contagious infection might be transported from one group of animals to another,
either in the same or in different buildings. If dissemination of vaccine virus occurred among the experimental animals in these laboratories, it apparently was not detected before the outbreak of this highly contagious disease in the breeding colony.

It seemed desirable to investigate this disease as fully as circumstances would permit. The colony in which the epidemic occurred is composed of pure bred and hybrid stocks of many breeds, and at the time of the outbreak contained more than 1,400 rabbits. Some were normal vigorous animals bred to standard specifications, while others showed or were known to transmit various physical and functional abnormalities. The colony had been under systematic observation for several years. The pedigrees and life histories of all animals were known, and the racial, familial and individual peculiarities of the stock had been made the subject of extensive investigation so that an unusual opportunity was presented for the study of the epidemic from several points of view.

Clinical, pathological and epidemiological studies of the spontaneous disease were carried out by the author; etiological studies were made by Dr. Pearce, Dr. Rosahn and Dr. Hu. All of this work was restricted by the necessity for the preservation of as much of the colony as possible, the use of measures to prevent the spread of the disease within the colony as well as to other stocks of rabbits, and by the lack of adequate facilities for the systematic management and study of an epidemic of such extensive proportions. Despite these handicaps, a fairly complete series of observations and experiments was carried out.

Investigations showed that the disease had been present in other stocks of rabbits for some time before it appeared in our breeding colony; later it was found in still other stocks, including animals under experimental observation, normal animals in the general stock room from which animals are obtained for experimental purposes, and in the Institute breeding colony. It is evident, therefore, that information concerning this disease is not only of medical interest, but is also of interest to those who breed rabbits or use them for experimental purposes. The reports to be submitted are intended to cover these several fields of interest, but the spontaneous disease and the epidemic have been studied with especial reference to the rôle of predisposing and constitutional factors for which the material is peculiarly appropriate.
A brief summary of the outstanding features of the disease has been published.\textsuperscript{1} The purpose of this paper is to present the clinical studies in more complete form. This will be followed by papers dealing with the pathology of the disease and an analysis of the results obtained from a study of the epidemic. Experiments dealing with the transmission of the infection, the disease produced by inoculation and the identification of the infectious agent will be reported by Pearce, Rosahn and Hu.

\textit{Materials and Methods}

Study of the spontaneous disease in its several relations was based on a stock of between 1,400 and 1,500 rabbits. A detailed classification of these animals will be given in connection with the epidemiological studies. For present purposes, it is sufficient to say that the colony contained pure bred and hybrid stock from sixteen breeds including males and females ranging in age from several years to new-born young. There were males in active service and others in reserve, while the females included resting, pregnant and nursing does. There were young of all ages and many litters were born during the epidemic.

In the routine conduct of the colony, every litter is examined at birth and a record made. This is followed by a daily inspection of all young and of all nursing does for the purpose of noting any unusual development or any condition which requires attention, and the entire colony is examined once a week. These observations are made by members of the staff, but in addition the caretakers have been trained to note and report anything unusual, thus affording a double check on the condition of the colony from day to day.

Early in December the colony showed evidence of deterioration. Breeding operations were suspended, and a careful search was made for cases of illness including this particular disease. It was 2 weeks, however, before the first case was found. From this time on, cages containing infected animals were noted and all possible precautions were taken to prevent spread of infection until the disease became so widespread that further precautions appeared to be useless. However, strict isolation of the colony was maintained for about a month after the last case of the disease developed and all external lesions had healed.

During the epidemic, dead animals were collected daily for record and autopsy, cages containing young animals were inspected and obvious new cases of illness were recorded; sections of the colony were examined carefully day by day, especial attention being devoted to those animals which hitherto had shown no signs of illness. In this way, the entire colony was covered about twice a week and we were able to determine with reasonable certainty which animals, if any, had escaped infection. In the handling of supposedly uninfected animals, hand disinfection was carried out.

As a part of the routine management of the colony, all dead animals are autopsied. During the epidemic a special effort was made to distinguish between deaths due to rabbit pox and deaths due to other causes, to note conditions peculiar to rabbit pox and complications associated with the disease. The pathological material obtained in this way was supplemented by material from animals killed during all stages of the infection, including the period of recovery, and by material from animals presenting complications and sequelae of various kinds, especially those which persisted or developed after apparent recovery from the pox infection.

Experiments were carried out to determine the length of the incubation period, the probability of acquiring the infection by the contact of normal with recovered animals, by the mating of normal with recovered animals and by offspring from recovered parents. Experimental tests were also made to determine the extent of the effect produced on the reproduction capacities of both males and females.

Signs and Symptoms of Disease

The disease designated as rabbit pox occurred in two distinct forms, the one an asymptomatic affection which was recognizable only by the presence of characteristic lesions, while the other presented definite symptoms of an acute infection. It was found, however, that in either case the diagnosis could not be made with certainty except by careful examination and the detection of certain distinctive lesions. The lesions found on examination of living animals are divisible into four groups: (1) lymphadenitis, (2) papular lesions of the skin and mucous membranes, (3) keratitis or ophthalmia and (4) orchitis. These will be described in the order given.

Lymphadenitis.—The lymphoid system was invariably affected and usually the first definite sign of infection was enlargement and induration of the popliteal lymph nodes. The nodes of the inguinal region and anterior triangle of the neck were also consistently enlarged, and the lymphoid masses of the pharynx were usually swollen and in many cases filled the greater part of its posterior portion. In other regions, enlarged nodes were occasionally found but, as a rule, no appreciable change could be detected by palpation. Lymphadenitis persisted throughout the disease and in some animals was the only sign of infection.

Lesions of Skin and Mucous Membranes.—A macular rash preceded the appearance of papules and occurred either as the first sign of infection or a day or so after the discovery of enlarged popliteal lymph nodes. The rash was visible on those parts of the body not covered by hair and could be demonstrated elsewhere by clipping or shaving.

After a variable time papules erupted in the macular areas (Figs. 3 and 4). They first appeared as extremely small elevated swellings and in some cases re-
mained hardly visible or palpable throughout the infection. In other cases, growth occurred in an irregular manner and all variations in size up to nodules a centimeter in diameter were present in the same animal. They eventually became umbilicated, dry and covered with crusts. The vesiculation and pustule formation characteristic of smallpox did not occur. Crops of macules and papules appeared in succession, and all stages of papular development could be found in a single area as in chickenpox. In severe infections, there were hemorrhages in the skin and papules tended to be hemorrhagic.

Papules were usually scattered irregularly through the skin of the entire body and were detectable with the greatest ease in the ears (Figs. 5 to 7), the lips, the eyelids and brows, the nape of the neck, the skin of the trunk and the scrotum (Fig. 17). Occasionally they occurred as confluent masses, but more commonly, although arranged in concentrated groups, individual lesions remained discrete. Such distributions were usually associated with an abnormal looseness of the coat and affected areas could be plucked bare with little effort.

Papules were also common on mucous membranes and often occurred in confluent masses associated with extensive edema. They were found on the lips and inner surface of the cheek in most cases of severe infection (Fig. 9), and when confluent presented a striking picture. The edema usually involved neighboring tissues and caused an intense swelling (Fig. 10) which, in some cases, became hard and indurated and persisted long after other signs of infection had disappeared. Such areas often became necrotic and sloughed with the production of large defects which healed with scar formation and resulted in permanent disfigurement (Figs. 19 and 20). The tongue and palate were frequently the seat of hard nodular infiltrations (Fig. 15), the centers of which often became necrotic and sloughed with the formation of deep ulcers. Occasionally the gums showed a diffuse greyish swelling with localized areas of necrosis extending to the roots of the teeth, which caused permanent damage or loss of teeth in recovered animals. These lesions were usually accompanied by a clear blood-stained secretion or a mucopurulent discharge from the nose, suggestive of snuffles (Fig. 8), which dried with the formation of thick, brownish, adherent crusts.

Papules were also found about the anus, on the vulva of the female and on the sheath in the male. In these situations they usually occurred as discrete lesions. Occasionally they were confluent and accompanied by edematous swelling which caused obstruction of the urethra and retention of urine, and sometimes resulted in necrosis of the parts.

An extensive edema of ears, legs, genitalia and tissues about the eye was also of common occurrence when such parts were severely affected.

Eye Lesions.—Eye involvement was of almost constant occurrence and resulted in a variety of lesions (Figs. 11 to 14). Many cases of infection showed only a slight marginal blepharitis with excessive lacrimation, which usually accompanied the macular rash but sometimes preceded it. In some cases, infection spread to the lacrimal duct and a chronic dacryocystitis resulted. Diffuse keratitis with
corneal ulceration was common. Iritis and iridocyclitis occurred later in the course of infection and were often followed by secondary glaucoma. In many animals, the occurrence of those individual lesions was masked by an outspoken purulent ophthalmia. Typical eye lesions were occasionally the only visible sign of infection.

Orchitis.—In males, the testicles usually showed a nodular or diffuse orchitis with edema of the scrotum (Figs. 16, 17). The involvement in many cases was so extensive that sterility of animals seemed inevitable. Lesions resolved, however, with restoration of fertility in most instances.

Clinical Course of Disease

Incubation.—During the epidemic, it was impossible to fix the time of exposure of a given animal or of animals in a given cage, so that the incubation period could not be determined with accuracy. However, observations made on cage groups showed that there was considerable variation in the interval between the development of the first and subsequent cases of infection in the same cage. During the early stages and at the height of the epidemic, there was rarely more than 2 to 3 days between the development of the first and last cases, and not infrequently all of the animals came down at the same time. As the epidemic progressed, the irregularity increased until, in the terminal stages, the interval between known exposure and the appearance of definite lesions was frequently as much as a week and occasionally as long as 2 weeks.

In order to determine the incubation period with greater accuracy, two experiments were carried out during the terminal stages of the epidemic. In each case, six rabbits 2 months old and of the same litter were exposed to infection in the following manner. In one experiment the six rabbits were placed in a clean cage with a rabbit of about the same age which showed an active infection, and left for 24 hours after which the infected animal was removed. In the second experiment the animals were placed in a cage of the same size in which all except one of a group had died. The survivor was in the terminal stages of the disease and died in less than 12 hours.

There was no decided difference between the results of the two experiments. Most of the animals came down between the 5th and 7th days after exposure. The shortest incubation period was about 4½ days and the longest 9 days. It seems probable that during the
height of the epidemic the average incubation period may have been shorter. On the other hand, it is known that, during the terminal stages, the incubation was as long as 2 weeks in some instances, and may have been longer.

Symptomatology.—Constitutional symptoms of infection varied both in occurrence and severity, dependent upon breed, age and physiological status of affected animals, and, as has been pointed out, were frequently absent. A full account of this variation will be found in the report dealing with epidemiological studies.

In typical cases the onset was marked by an elevation of temperature which in some instances was as high as 106°F., and animals were obviously ill. Apathy and loss of appetite were early symptoms and rapid prostration was not uncommon. Diarrhea was common in the early part of the epidemic, both in young animals and in adults, but was infrequent later and its occurrence in the early stages of the epidemic was probably influenced by a coexisting dietary disturbance.

Symptoms resulting from involvement of individual organs were more constant. Infection of the upper respiratory tract was accompanied by labored respiration, mouth breathing and extreme weakness. Photophobia was commonly associated with lesions of the eye and could be recognized by partial closure of the lids. Animals with extensive lesions of the mouth and tongue generally refused food, probably more because of the pain caused by eating than from actual loss of appetite, and rapidly became emaciated.

Nervous system involvement was manifest in some animals by incoordinate muscular movement, fibrillary twitching and nystagmus. Paralysis occurred in other instances and was usually limited to special muscle groups. The sphincter muscles were most commonly affected, and such cases showed dribbling of urine and frequent passage of loose fecal material which adhered to the perineum, hardened and, unless removed, blocked the anus and urethra, causing retention of urine and feces. Generalized paralysis was not common and usually occurred in the terminal stages of a severe infection.

Types of Disease.—The majority of affected animals showed generalized lesions and symptoms referable both to systemic infection and involvement of individual organs. In many instances, however, lesions were more prevalent or conspicuous in a particular organ or part and although strict localization seldom occurred, this inequality allowed a basis for recognition of other disease types (Figs. 1, 2). Thus, in some cases the eruption in skin and mucous membranes constituted the clinical picture, while in others glandular enlargement, orchitis or ophthalmia was the only external manifestation of infection.
The limitation in distribution did not affect the severity of lesions, for they were no more pronounced than when associated with lesions of other parts. A purulent ophthalmia often persisted in an animal as the only sign of infection. On the other hand, a slight inflammation of the lids without lesions elsewhere was of equally frequent occurrence. Symptoms of constitutional disturbance bore little relationship either to distribution or severity of external lesions. The mildest cases of ophthalmic, genital and cutaneous infections were usually asymptomatic, but occasionally showed the severest signs of ill health. Moreover, animals with extensive lesions of these parts often appeared in perfect health. Asymptomatic cases were also common both in animals with widespread lesions and in others in which lesions were so poorly defined that their presence could only be detected by the most careful examination. In respect to mortality, however, such cases were as serious as others, and at autopsy animals showed typical changes in internal organs.

Mild and abortive types of infection were common during the terminal stages of the epidemic, and a large proportion of animals of the most susceptible breeds and age groups survived infection contracted at that time.

Effects in Pregnant and Lactating Does.—In pregnant and lactating does, infection produced the severest symptoms. Such animals were extremely ill and presented the characteristic facies of the disease, hunched in a corner of the cage in a stupor, breathing stertorously through nostrils obstructed by thick brownish crusts, lids partially closed over dull, lusterless eyes or glued together by dried secretions and, when forced apart, revealing a diffuse keratitis or destructive ophthalmia. Pregnancy was commonly terminated by abortion and marked improvement usually followed. Abortion was also frequent in non-infected, apparently healthy does, both in the latter part of the pre-epidemic period and during the epidemic. Young born at term were usually either dead, abnormal in some respect and non-viable, or deserted by the doe. Clinical or pathological signs of infection were never found in feti or young born dead. Lactating does were even more seriously affected and unless relieved of the strain of nursing, rapidly deteriorated and died. The separation of young from nursing does often improved their condition and, in many instances, brought about rapid recovery.

Complications.—Some complications were of such frequent occurrence and so intimately associated with the disease that they have
been described as signs of infection. Thus, corneal ulceration occurred
in most animals showing eye involvement and was often followed by
perforation, iridocyclitis or glaucoma. Chronic inflammation of the
lacrymal duct with mucocele was occasionally observed. Laryngitis
was a constant complication of upper respiratory infections and was
frequently accompanied by edema of the glottis which caused the
stertorous breathing characteristic of many cases. Infection of the
submaxillary glands was common and occasionally resulted in visible
enlargement.

In many cases death was apparently due to a terminal broncho-
pneumonia which was a frequent complication and in some instances
may have resulted from the aspiration of foreign material due to dimin-
ished sensibility of the larynx. Pulmonary abscess was less common
but was the direct cause of the majority of postepidemic deaths. Other
secondary pyogenic infections were rare. Dental abscess oc-
curred in a number of animals and in a few instances involved the bone
of the jaw.

During the early part of the epidemic the disease was frequently
complicated by gastrointestinal disorders. Diarrhea has been men-
tioned. In young animals, the discharges consisted of thick tenacious
mucous but in adults were usually made up of loose watery fecal mate-
rial. Intestinal obstruction caused by impactions in the cecal region
was also common. These disorders were of frequent occurrence
previous to the epidemic and are not attributable to the disease. However, they were serious complications and when superimposed
upon the infection, usually resulted in death.

Mortality.—Death might occur within a few hours after infection
was first noted or be delayed for days or weeks. The total mortality
was 46.4 per cent but showed wide variations in different age groups
and breeds. Among animals less than 14 weeks of age, 71.8 per cent
of cases of infection died; the mortality rate was highest among those
4 to 8 weeks old. In adults, although the mean mortality was about
15 per cent, the rate in different breeds varied widely, certain lines
being almost completely wiped out while in others no deaths occurred.

A full discussion of the mortality will be reserved for the report
concerned with the epidemiological features of the disease.

Recovery.—Many animals with severe infections recovered (Fig. 18).
Prognosis based on the nature of symptoms and type of disease sometimes proved correct, but as a rule no indication of the final outcome of infection could be obtained from clinical examination.

In cases of recovery, lesions underwent slow resolution extending over a period of weeks, and in some instances healed with the formation of scars. Reactivation and reinduration of skin papules with the development of new lesions was occasionally noted after healing was well advanced, but it is not certain that relapse occurred.

Sequelae.—All recovered animals bear stigmata of the disease. Corneal scars and scarred hairless areas in the skin of the ears (Fig. 21) have persisted to the present time. Many animals were permanently disfigured by the healing of large defects by secondary intention and subsequent contracture (Figs. 19, 20). In other instances, the sloughing of portions of the genitalia rendered the animals unfit for breeding service.

A variety of abnormalities of the incisor teeth resulted from gum lesions and dental necrosis. In many animals both primary and secondary incisors were completely destroyed, and in others regeneration resulted in malalignment which led to direct antagonism with loss of cutting edge or to an outspoken deformity in which antagonism was entirely lost and growth, therefore, unrestrained.

Although to outward appearances animals were sufficiently recovered and fit for the resumption of breeding 2 months after the beginning of the epidemic, the occurrence of two widespread disorders later in the spring indicated that not even at that late date had they reached a normal level of general health and vigor. Although a thorough investigation of these conditions could not be made, they appeared to be attributable in part at least to the reaction of convalescent and constitutionally weak animals to adverse nutritional or other environmental factors and, in this sense, were sequelae of the pox epidemic.

The first disorder to appear was characterized by jaundice, progressive weakness and emaciation. After prolonged illness most adults improved or recovered, but the disease was usually fatal in young rabbits. Those that died were autopsied and showed marked cirrhosis of the liver of mixed type, entirely different from the cirrhosis due to coccidiosis. The second condition was characterized by paralysis of the hind quarters, atrophy and degeneration of the fibers of the mas-
seter muscles and extreme weakness—a condition resembling that attributed to the addition of excessive amounts of cod liver oil to the diet of rabbits and other herbivora. The two conditions were occasionally combined in a single animal and produced an affection which resembled clinically the hepatolenticular degeneration described by Wilson in man. The paralytic condition was the more fatal of the two and many seriously affected animals were killed. In addition to the muscular atrophy and degeneration, the only constant finding at autopsy was enlargement and cystic degeneration of internal lymph nodes. Gross changes in the cord or lenticular nucleus were not found and sections have as yet revealed no microscopic lesion.

The frequency of litter, cage and location occurrence of these diseases suggested the possibility of infection, but attempts to transmit the diseases gave negative results (Pearce, Rosahn and Hu). The animals were on a diet which contained cod liver oil, and it is possible that this may have contributed to the production of one or both of these conditions. But on other occasions much larger quantities of cod liver oil have been used with no ill effects. The cause of the diseases is still obscure. It is possible, however, that prolonged feeding of oil which may have been of poor quality or added in excessive amounts played some part in the occurrence of these affections.

Effects on Reproduction

Breeding was resumed about 2 months after the beginning of the epidemic and a study was made of the reproductive capacities of recovered animals. A number of normal animals were added to the colony and their breeding record was used as a control. After a preliminary low fertility rate, the proportion of pregnant matings in recovered stocks rose rapidly, equalled that in normal animals, and by the end of April the unprecedented figure of 100 per cent fertility was reached. Abortions, still births and desertions were no more frequent than under usual conditions.

In males testicular lesions resolved, parenchyma regenerated and the fertility of all recovered animals has been proved. Occlusion of the Fallopian tubes in the female occurred in some cases and sterility resulted. In most instances of this kind, however, blockage was present in only one horn of the uterus and the other bore young in a normal fashion.

During the fall following the epidemic, the fertility of the colony, which was made up almost entirely of recovered animals and their offspring, was higher than at any period previous to the outbreak. However, there was an increase in the number of deaths of pregnant
and parturient females, and at autopsy all showed similar lesions consisting chiefly of changes in the liver comparable with those found in the toxemias of pregnancy. It is noteworthy that these were all recovered animals and showed large, persistent scars in the liver, but the exact relationship of the disorder to previous pox infection is uncertain.

**Carrier Transmission**

Following the epidemic many seriously affected animals were discarded. However, a selected group was retained for tests of carrier transmission which were performed simultaneously with tests of reproductive functions. Normal animals were mated with recovered animals, recovered males with normal females and recovered females with normal males, but in no instance was a mating of this kind followed by the development of disease. As a further test, normal animals of the most susceptible age groups were imported into the colony and were kept in continuous contact with recovered animals but showed no sign of infection. Moreover, approximately 500 litters containing over 2,500 animals have been born from recovered animals since the end of the epidemic. All of these young have been examined clinically and many have been subjected to postmortem examination, but in no case has any indication of the transmission of the infection been found.

**Contagiousness of Infection**

A comparison of the present epidemic with that of 1930 indicates that the contagiousness of the infection may vary greatly in different epidemics. In 1930 only a small part of the colony contracted the disease. Spread of the infection was effectually checked by prompt isolation or killing of animals which developed the disease, as was indicated by the fact that there were no immunes among the survivors of the first epidemic. In the present instance, however, isolation of rooms with systematic disinfection and removal of infected or apparently healthy animals to other quarters had no appreciable effect on the spread of disease.

At the beginning of the outbreak, infection invariably followed exposure and spread was so rapid that within 2 weeks the distribution
was pandemic, and in less than a month nearly every animal in the colony had been infected. Toward the end of the epidemic there was, however, a decrease in both the contagiousness and severity of the infection so that a few litters born after the peak of the epidemic was passed entirely escaped infection; others showed only a mild disease with slow spread of the infection. Moreover, two experimental groups of the most susceptible age introduced into the colony at that time survived the disease.

The pathology of epidemic rabbit pox will be described in a separate paper and the clinical manifestations will be discussed in conjunction with this phase of the subject.

SUMMARY

The clinical manifestations and course of a highly contagious and acutely fatal disease designated as rabbit pox have been described. The general symptomatology of this infection varies within wide limits and accurate diagnosis rests on the occurrence of certain characteristic lesions. The most distinctive sign of infection is a pock-like eruption which is often outspoken and widespread over the body, but is sometimes poorly defined and detectable only after careful physical examination. Other lesions depend upon the involvement of particular organs and give rise to special symptoms. As a rule, the incubation period of the epidemic infection varies between 5 and 7 days. No evidence of the transmission of the infection by recovered animals could be obtained. Furthermore, breeding tests demonstrated that the reproductive capacities of most animals were not permanently impaired.

EXPLANATION OF PLATES

PLATE 19

Figs. 1 and 2. Litter mates with different types of disease. The course of infection was mild in the animal shown in Fig. 1 and external lesions were limited in the skin, while the animal in Fig. 2 was seriously ill and its posture is a manifestation of acute respiratory distress resulting from extensive mouth lesions.

Fig. 3. Cutaneous lesions on the trunk of a young hybrid animal. The coat in this area was abnormally loose and was easily plucked by hand. Individual papules show considerable variation in size; many approach a centimeter in diameter, while others are barely visible. This difference is not entirely due to the
age of the lesion, for marked variation in size is also found among papules of equal maturity. Many of these lesions are hemorrhagic.

Fig. 4. Skin of a pregnant Himalayan doe self-plucked for nest fur, showing both dry, crusted papules and others in earlier stages of development. Minute lesions of this type occurred in all adult Himalayans.

PLATE 20

Fig. 5. Transilluminated ear showing early macular lesions distributed in the more vascular areas.

Fig. 6. Ear at the height of infection showing typical papules.

Fig. 7. Ear showing unusually large papules with umbilication.

Fig. 8. Sanguinous discharge from the nares in an acutely fatal infection. This was a frequent early sign of disease, and in the young Belgian rabbit shown in this photograph it was the only external sign of infection.

Fig. 9. Typical papular lesions of the lips.

Fig. 10. Diffuse edematous infiltration of the muzzle in a young Rex rabbit. Compare with Figs. 8 and 9.

Fig. 11. Eye showing diffuse clouding of the cornea. This was the only visible lesion found in this animal—a monosymptomatic infection with no constitutional symptoms.

Fig. 12. Panophthalmitis with total destruction of the lens.

Fig. 13. Purulent ophthalmia with ectropion of lids.

Fig. 14. Unilateral secondary glaucoma. A common sequel of ophthalmic infections.

Fig. 15. Nodular lesions of the tongue and palate with infiltration of gum margins.

PLATE 21

Fig. 16. Diffuse orchitis with edema of scrotum in an adult Belgian buck.

Fig. 17. Nodular orchitis with papular lesions of scrotum in an American blue buck.

Fig. 18. Recovery with permanent impairment of vitality after severe illness.

Fig. 19. Healing of a diffuse lesion with contracture resulting from necrosis and sloughing of a portion of the right upper lip.

Fig. 20. Gangrene followed by sloughing of upper lips and nose in a young Rex. The incisor teeth show malocclusion resulting from the infection in which the upper and lower cutting edges are in apposition. Root infections with permanent injury to the teeth were common.

Fig. 21. Scarred hairless areas in the skin of the ears 1 year after recovery.
(Greene: Rabbit pox. I)