died of the disease. Cultures prepared from the brains of the guinea pigs and inoculated rabbits were without growth. The herpes virus passed through guinea pigs by way of the gastro-intestinal tract and then passed back to rabbits appears to be somewhat attenuated at first but quickly regains its virulence. For example the virus recovered from the brain of the guinea pig which had received 5 cc. of herpes emulsion by mouth required 9 days to produce a fatal encephalitis in the first rabbit tested. When the virus from this rabbit was passed to 2 healthy rabbits subdurally both animals died with typical symptoms on the 5th day following the inoculation. Cultures prepared with the brains from both of these animals remained sterile.

It appears from these experiments that the herpes virus passes from the intestinal tract of guinea pigs to the central nervous system under these experimental conditions and that the virus may be recovered from the brains of guinea pigs following death of the animals and that the emulsions of such brains when inoculated into rabbits subdurally produces a typical herpetic encephalitis.

4119

Experimental Rinderpest in Goats.

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The study of the virus of rinderpest has been rendered difficult because of the lack of a suitable experimental animal. The virus of rinderpest is pathogenic for cattle, carabaos, hogs, boars, sheep, goats and camels. With the exception of goats and sheep the other susceptible animals are either too expensive to use for experimental purposes or are unobtainable. That goats are susceptible to the virus of rinderpest has been shown by Kolle and Turner[1] and by Topacio.[2] In the Philippines where rinderpest has a high incidence among cattle it is possible to obtain goats in large numbers and they are even less expensive than rabbits. As a rule the mortality in goats from this disease is very low. This animal, however, manifests very definite symptoms of the disease. These symptoms con-

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[1] Kolle and Turner, *Z. f. Hyg.*, 1898, xxvii, 45.

[2] Topacio, *Phil. Agr. Rev.*, 1922, xv, 229; *Ibid.*, 1926, xix.

sist of a gradual rise in temperature reaching a maximum of 40.2 degrees C. to 40.8 degrees C. on the 5th or 6th day. About this time the animal develops a diarrhoea which persists for some time while the temperature gradually returns to normal if the animal is to recover. Meanwhile the animal eats little or refuses to eat at all and there may be considerable loss in weight. Occasionally under experimental conditions a goat succumbs to the infection. The rule, however, is for the animal to recover.

In searching for an experimental animal in which to study the virus of rinderpest we have attempted to infect chickens, rabbits, guinea pigs and monkeys. All of these animals were found to be immune to the virus. Regardless of the quantity of virus administered and of the route of inoculation (subdural, intravenous, subcutaneous and intraperitoneal routes were tried) there were no reactions whatsoever. As much as 100 cc. of virus infected carabao blood has been given to monkeys without producing any manifestations of the disease. Rabbits have received as much as 20 cc. of virus intravenously without any indication of infection.

We have found that goats are susceptible to the virus of rinderpest in very high dilutions. According to Boynton[3] the smallest quantity of rinderpest virus which will infect cattle is 1/2960 cc. In goats we have found that 2 cc. of a 1/10,000 dilution of virus infected carabao blood is sufficient to provoke a typical infection. On the other hand the same dilution of virus induced delayed symptoms of the disease in Davao cattle which are considered to be more resistant to the disease than are carabaos.

Goats were infected with rinderpest and passed through the disease, returning to good health. Subsequently these goats were infected again in order to ascertain if they were immune. We have been interested in determining if the serums from goats immune to rinderpest are virucidal for the virus of rinderpest *in vitro* as is known to be the case for immune serums in several other filterable virus infections. Several goats which had successfully passed through an attack of experimentally induced rinderpest and had subsequently been found to be immune were bled. The rinderpest virus used in these experiments consisted of infected carabao blood which was taken from the infected animal about the 5th day at the peak of the temperature curve. For each cubic centimeter of rinderpest infected carabao citrated blood in small test tubes were added 4 cc. of rinderpest immune serum from goats. Controls were prepared with normal goat serum, both fresh and inactivated, and also

[3] Boynton, *Phil. J. Sci.*, 1928, xxxvi, 1.

with fresh and inactivated rabbit serum. After allowing the mixture to stand for 24 hours at room temperature, following frequent shaking, healthy goats were inoculated subcutaneously with 2 cc. of each mixture. In every case the inoculated animals developed typical symptoms of rinderpest. In other experiments the mixtures were incubated at 37.5° C. for 6 hours before testing but there proved to be no virucidal activity of the immune goat serums.

Rabbits were injected intravenously with 20 cc. of rinderpest infected carabao blood and 24 hours later were bled from the heart, the blood being immediately injected subcutaneously into susceptible goats. In no case did rinderpest develop.

It appears from these experiments that goats are excellent animals for the experimental study of rinderpest; that goats which have recovered from rinderpest are immune to subsequent attacks of the disease but that the serums from such goats possess no virucidal properties for the virus of rinderpest *in vitro* when virus and immune serums are mixed in a ratio of one to four. Further it appears that while fresh rabbit serum is nonvirucidal *in vitro* for the rinderpest virus this virus is either quickly destroyed or entirely eliminated from the blood stream of healthy rabbits following intravenous injections of large quantities of rinderpest infected carabao blood known to provoke the disease in goats in dilutions of 1/10,000. Experiments of this nature are facilitated by studying the disease experimentally in this animal.

4120

Chloroform-Treated Tissue-Vaccine in Experimental Herpetic Encephalitis.

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During the past year Kelser[1] has prepared a chloroform-treated tissue-vaccine for rinderpest which is highly efficacious in protecting cattle and carabaos against this disease. Kakisaki, Nakanishi

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[1] Kelser, *J. Am. Vet. Med. Assn.*, 1927, xxiv, 97; *The Military Surgeon*, July, 1927; Paper F. E. A. T. M., Calcutta, December, 1927; *Phil. J. Sci.*, 1928, xxxvi, 4.