one woman. Through a slit in the side of the proximal portion of the ureter a catheter is inserted distally toward the bladder and over it the ureteral ends are joined by 2 fine catgut sutures. Through the same slit in the ureter a snugly fitting rubber catheter is inserted toward the kidney to divert the urine from the site of suture for 8 days or more until healing occurs. The free ends of both catheters are brought outside the body in the lumbar region. The ureters of 6 dogs examined at intervals of 19 to 270 days after such an operation healed without narrowing or appreciable dilation of the lumens, with a minimum scar, without changes in the renal pelves, and without evidence of any considerable damage to the kidneys. Five months after a similar operation in a woman the ureter is slightly dilated but is not constricted at any point. The renal pelvis and calyces are not appreciably altered.

4117

Experimental Immunization of Horses with Herpes Virus.

EARL B. MCKINLEY.*

From the Biological Division of the Bureau of Science, Manila.

It is well known that various strains of herpes virus produce encephalitis in rabbits. Some investigators believe that the herpes virus is the etiologic agent in epidemic encephalitis in human beings. At present there is little evidence to support this view. The fact remains, however, that the herpes virus has been recovered from the brain tissue of several cases of epidemic encephalitis and the question naturally arises as to whether the herpes virus is related to the disease process in such cases or whether it is merely present by accident as a contaminating agent. A critical discussion of the question is contained in another publication.[1]

In a previous communication[2] we have shown that rabbits may be hyperimmunized with herpes virus attenuated by fresh rabbit serum and that the serums from such rabbits are capable of producing passive immunity in healthy rabbits when injected intravenously. Attempts to immunize sheep were unsuccessful even when fresh virus was administered subcutaneously.

* Member of Field Staff, International Health Division, Rockefeller Foundation.

[1] McKinley, E. B., *Phil. J. Science*, in press.

[2] McKinley, E. B., and Holden, M., *Arch. Path. and Lab. Med.*, 1927, iv, 155.

The possibility of immunizing horses against the herpes virus occurred to us as a possible means of throwing some light upon the true etiology of epidemic encephalitis. If the serums from such horses proved virucidal for the herpes virus *in vitro* and were capable of producing passive immunity in rabbits when injected intravenously, the possibility of treating cases of epidemic encephalitis would present itself. While such a therapeutic test for etiology would not be conclusive evidence it might throw some light on the question, particularly if the cases so treated were properly controlled with other cases receiving normal horse serum.

In December, 1927, immunization of 2 horses with herpes virus "H. F." and herpes strain "Beckley" was begun. Both horses received injections of fresh saline emulsions of herpetic rabbit brains from rabbits which had just died of encephalitis. Injections were given at 3 day intervals subcutaneously. The first 4 injections consisted of 2 cc. each; the 5th of 3 cc.; the 6th of 4 cc.; followed by 6 injections of 5 cc. each. After the initial 12 inoculations each horse received 3 injections of an entire herpes infected rabbit brain emulsified in 50 cc. of salt solution given at 5 day intervals. In each case the emulsion was tested on rabbits and proved infectious. There were no reactions noted in either horse following the inoculations. Two weeks after each horse received the final inoculation both horses were bled and the 2 serums were brought to the laboratory for testing.

Neither the serum from the horse receiving the "H. F." strain nor the serum from the horse which had received the "Beckley" strain possessed any virucidal properties for the 2 strains of herpes virus employed in the experiment. Furthermore the anti-"H. F." herpes serum did not produce the slightest degree of immunity in normal rabbits when injected intravenously. Rabbits receiving 3 injections of 5 cc. each of this serum intravenously and subsequently tested subdurally with the virus died invariably within 4 to 6 days with typical symptoms of encephalitis. Furthermore the virus was recovered from these test animals when emulsions of the brains were inoculated into other healthy rabbits.

The anti-Beckley herpes serum was found unsuitable for immunizing rabbits. As small a quantity as 1 cc. of this serum when injected intravenously into rabbits produced convulsions and death of the rabbits within a few minutes. Subsequently it was discovered that a few drops of this horse serum when added to 5 cc. of citrated rabbit blood produced complete hemolysis within a few minutes. This phenomenon is not unknown and has been met with by other workers.

It appears from these experiments that suitable immune serums cannot be produced in horses against the herpes virus. Due to a paucity of cases of epidemic encephalitis in the Philippines we have been unable to test either of these serums in patients having this disease. From these experimental data it would appear that there is little scientific basis upon which to base such clinical tests.

4118

Experimental Herpetic Encephalitis Produced by Feeding Herpes Virus to Guinea Pigs.

EARL B. McKINLEY.*

From the Biological Division of the Bureau of Science, Manila.

Herpetic encephalitis may be produced in rabbits by inoculating such animals either subdurally, intravenously, subcutaneously, or intraperitoneally. The possibility of inducing herpetic encephalitis in guinea pigs by feeding occurred to us. While there is little evidence to support the view that epidemic encephalitis in man is caused by the herpes virus, any evidence regarding the portals of entry of this virus into the animal body is important. Nothing is known concerning the portal of entry of the true virus of epidemic encephalitis and epidemiological control of the disease is based largely upon speculation. It is known that paralysis follows the inoculation of the virus of poliomyelitis into the stomach and intestines of monkeys and it seemed probable to us that infection might be produced in this way with the herpes virus.

Four guinea pigs were fed by catheter 3 cc. of a freshly prepared emulsion of herpetic (Beckley) rabbit brain. One guinea pig received 4 cc. while a 6th received 5 cc. Of the 6 guinea pigs so treated 3 died. The animals which had received 4 cc. and 5 cc. of herpes emulsion respectively died on the 8th day following feeding. One of the guinea pigs which had received 3 cc. of the herpes emulsion by mouth died on the 10th day. The other 3 guinea pigs remained unaffected.

The brains of the 3 guinea pigs which died were removed and emulsions were prepared. Rabbits inoculated with these emulsions subdurally developed typical symptoms of herpetic encephalitis and

* Member of Field Staff, International Health Division, Rockefeller Foundation.