TABLE I.
The Effect of Insulin on the Amino Nitrogen Content of Rats.

Insulin	Saline	Insulin and glucose	Insulin
36.8	44.8	39.5	36.5
40.2	50.1	39.9	38.8
43.9	43.9	37.4	41.6
39.5	49.5	45.0	36.5
41.8	47.4	36.3	39.7
40.2	46.4	36.5	43.0
41.9		38.0	39.4
42.0	47.1	37.4	37.9
42.5	46.5	38.2	38.2
42.4	47.0	47.0	36.5
35.4	40.5	36.5	44.2
32.2	37.9	40.2	41.9

insulin effect. Although these experiments are preliminary in nature, they necessitate the conclusion that the effects of insulin on protein metabolism are not secondary to the accompanying hypoglycemia but are probably primary phenomena. The final report will include the results of urea estimations and experiments in which the hypoglycemic action of insulin has been combated in other ways.

4433

Infection of Monkeys With Poliomyelitis Virus by the Gastro-Intestinal Route.

E. W. SCHULTZ.

From the Department of Bacteriology and Experimental Pathology, Stanford University, California.

Aycock[1, 2] has recently reported 3 outbreaks of poliomyelitis which he believes can be traced to contaminated milk. The observations recorded by Aycock are of particular interest in the face of essentially negative results which have been realized under experimental conditions. Leiner and v. Wiesner[3] succeeded in producing the disease in only 2 out of 5 monkeys fed with large quantities of the virus, after neutralizing the hydrochloric acid of the stomach with sodium bicarbonate and reducing the motility of the intestines

[1] Knapp, A. C., Godfrey, E. S., Jr., and Aycock, W. L., *J. Am. Med. Assn.*, 1926, lxxxvii, 635.

[2] Aycock, W. L., *Am. J. Hyg.*, 1927, vii, 791.

[3] Leiner, C., and v. Wiesner, R., *Wien. Klin. Woch.*, 1910, xxiii, 91.

with morphia. Following the same procedure, Amoss[4] obtained entirely negative results, even though the monkeys were fed a considerable quantity of the virus over a period of 42 days. The animals not only failed to develop the disease, but also failed to acquire an immunity as a result of the massive ingestion of virus material. Levaditi and Landsteiner[5] were unsuccessful in producing infections in monkeys fed with virus-contaminated milk. No immunity was noted on subsequent intracerebral inoculation.

Though the results reported appeared to indicate quite clearly that in monkeys, at least, infection by the gastro-intestinal tract is extremely difficult, if not practically impossible, nevertheless, the important observations made by Aycock seemed to justify a repetition of feeding experiments in monkeys.

We have accordingly endeavored to infect 2 normal monkeys with heavily contaminated milk. In order that natural conditions might be maintained, nothing was previously done to the monkeys except to subject them to a brief period of fasting. The animals then had placed before them approximately 150 cc. of milk containing about 7 gm. of a finely ground cord and medulla of a monkey having recently succumbed to the disease (P.M. No. 44). This the animals consumed entirely within 2 hours. Several hours later (in the evening) a similar quantity of virus in milk was placed before them, this time prepared from the cord and medulla of another monkey (P.M. No. 70) having succumbed to the disease. This was consumed by the following morning. At noon they received another dish of milk containing the same quantity of virus material (P.M. No. 68). The feeding was discontinued at this point. The animals were kept under observation from November 23rd until February 2nd, during which time they remained perfectly normal. On February 2nd each received an injection of 0.75 cc. of a 5% virus-cord suspension intracerebrally. One of the monkeys (P.M. No. 48) developed typical poliomyelitis on the fifth day, the other on the seventh day. These monkeys were, therefore, still fully susceptible to the usual mode of inoculation. The strain of poliomyelitis employed in these experiments is a fully virulent, and highly dependable strain originally isolated by Aycock, and supplied to us through the courtesy of Dr. Flexner.

These observations tend to show that it is quite impossible to

[4] Amoss, H. L., Filterable Viruses, Rivers *et al.*, Williams and Wilkins, Balt., 1928, 174.

[5] Levaditi, C., *Ectodermoses Neurotropes. Poliomyélite, Encéphalite, Herpès.* Monograph l'Institut Pasteur, Masson et Cie, 199, 66.

infect monkeys by the gastro-intestinal route, even though a poliomyelitis virus is employed which regularly produces an infection in monkeys when administered by the intracerebral route. They, however, do not necessarily invalidate the possibility that the disease in man may at times be spread through the medium of milk. One must keep in mind that poliomyelitis is not a natural disease of monkeys. From our experience and those of others, it is apparently impossible to infect fully susceptible normal monkeys by caging them with incubational and sick animals. Monkeys must, therefore, enjoy a relative immunity to the disease, an immunity which is broken down only by such artificial, and relatively brutal, methods as intracerebral inoculation. The fact that monkeys are not naturally susceptible to the disease makes the solution of some of the more important questions as they relate to the human disease extremely difficult. Among such problems, for example, is an effective method of immunization against the naturally acquired disease. Whatever the intrinsic merits of any procedure may be, in so far as it applies to the protection of man against natural contact infection, it is perforce obscured in the laboratory experiment by the relatively drastic procedures necessary to induce the disease in monkeys. This condition undoubtedly also influences the solution of such epidemiologic questions as the one just referred to. The fact that man is naturally susceptible to the disease, and that monkeys are not, must therefore unquestionably occupy a prominent place in any consideration which has to do with the application of observations made on monkeys to the circumstances as they apply to man.

4434

Relationship of Atopens of Timothy (Phleum Pratense) and Australian Rye (Lolium Multiflorum) Grasses as Indicated by Passive Transfer Studies.

EDWARD MATZGER. (Introduced by K. F. Meyer.)

From the George Williams Hooper Foundation for Medical Research, University of California, San Francisco.

There is an assumption that the atopens of timothy grass pollen contain atopens that will protect patients who are sensitive to other grasses. The basis for this belief has been the clinical evidences of satisfactory results. Coca and Grove added the weight of experi-