nitrates materially increases the utilization of glucose by all varieties.

Studies in synthetic media gave no evidence that nitrates can supply the nitrogen requirements. Nor did the addition of increasing amounts of utilizable nitrogen compounds effect nitrate reduction any more than could be accounted for by the multiplication rate. Compounds containing reduceable sulphur retard nitrate reduction. Cystine and thiosulfates in concentrations which are ordinarily tolerated become toxic in conjunction with nitrates.

Iodides exert an antagonistic or synergetic inimical action. Nitrate reduction is facilitated by 0.2% KI. However, 1.0% KI in media with 0.2% KNO_3 inhibits multiplication although 2.0% KI is tolerated in the absence of nitrates. The *abortus* and *melitensis* are more sensitive in this respect than are the *suis* types. The toxic effect is thought to be due to an accumulation of nitrites from the rapid reduction of nitrates. In media containing 0.2% each of KNO_3 and KI the nitrates quickly disappear. The test is of some differential value. Every *suis* type produced an abundance of nitrogen gas to the exclusion of the other 2 varieties when grown in such a medium.

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Cross Immunization Experiments with the Poliomyelitis Virus and that of Encephalomyelitis in Horses.

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During the summer and fall of 1930 and 1931, an epizootic of an acute encephalomyelitis broke out among the horses and mules in the rural districts of California.[1] Meyer, Haring and Howitt[2] report the recovery of a filterable virus as the causative agent and describe hemorrhage, oedema and acute inflammatory lesions in the brain with slight involvement of the cord. Since there were certain similarities between the equine malady and human poliomyelitis and since outbreaks of both forms chanced to occur simultaneously dur-

[1] Haring, C. M., Howarth, J. A., and Meyer, K. F., Univ. Calif. Agri. Exp. Station, 1931, Circular 322, 1.

[2] Meyer, K. F., Haring, C. M., and Howitt, B., *Science*, 1931, **74**, 227.

ing 1930 in California, a series of cross immunization experiments were undertaken with both viruses.

Serum was obtained from each of 11 monkeys that had recovered from experimental poliomyelitis, either entirely or with muscular atrophy of certain extremities. According to previous tests these serums neutralized the poliomyelitis virus *in vitro*. Equal parts of the encephalomyelitis virus (20% brain suspension diluted 1 to 25 with saline) and the undiluted serums were mixed, incubated 2 hours at 37°C. and held in the icebox over night. 0.3 cc. of each mixture was then injected intracerebrally into a series of guinea pigs, 2 for each serum. Control animals were also inoculated with the same amounts of normal monkey serum and 1 to 25 virus. Temperatures were taken daily. All of the animals showed a typical rise in temperature followed by symptoms of the disease. Prostration and death occurred after 4 or 5 days, showing a complete absence of neutralization.

The serums of 4 rabbits and of one monkey recovered from encephalomyelitis neutralized the latter virus *in vitro*. Each serum was used in a second series of *in vitro* neutralization tests, prepared with the poliomyelitis virus in the proportion of 1 cc. of serum to 0.3 cc. of 5% virus. The mixtures were kept for 2 hours at 37°C., held over night in the ice box and injected intracerebrally into each of 4 monkeys. A control animal was given normal rabbit serum and virus. All except one of the monkeys became completely prostrated and were killed in 5 to 11 days. One animal showed no definite paralysis but had a high temperature for several days, accompanied by a tremor and preparalytic symptoms. No cross neutralization occurred, therefore, between the encephalomyelitis serum and the poliomyelitis virus.

Three monkeys which recovered from an experimental infection with the poliomyelitis virus were then injected intracerebrally with 1.5 cc. filtrate of a 20% encephalomyelitis virus. A normal monkey and 2 guinea pigs were inoculated at the same time. One of the monkeys had completely recovered from poliomyelitis, one had shown paralysis of an arm with muscular atrophy, while the third had never been able to use both legs and was crippled. The serum of each monkey neutralized the poliomyelitis virus *in vitro*.

All of these animals, including the guinea pigs, showed high temperatures and developed typical symptoms of encephalomyelitis within the usual incubation period. One monkey died and the others were killed after complete prostration.

From these experiments, it seems evident that no cross immunity

occurs between the encephalomyelitic and the poliomyelitic virus diseases although they exhibit certain similarities with respect to epidemiology and pathology. The horse, therefore, need not be considered a possible reservoir for poliomyelitis in man.

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Reaction of the Perfused Isolated Lung of Sensitized Guinea Pig to Horse Serum.

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There has been great need of a simple method of studying objectively the response of the bronchial smooth muscle of the sensitized guinea pig to antigens. Older methods of observing changes in bronchial tone in intact animals are not only difficult of application to small animals but are often complicated by changes in circulation which make the interpretation of such observations uncertain. More recently Koessler and Lewis[1] obtained striking graphs in the sensitized guinea pig by studying the changes in intrapulmonary pressure and the corresponding variations in ventilation depending upon varying degrees of bronchospasm produced by the injection of horse serum into horse serum sensitive guinea pigs. Similar responses may be obtained by perfusing the isolated sensitized lung of the rabbit (Sollmann and von Oettingen[2]) and of the guinea pig (McDowall and Thornton[3]). This method is superior to the use of ring preparations of tracheal or bronchial muscle because by means of it a study can be made of the reactivity of the smaller bronchioles which play the major part in bronchial reactions.

This method has been applied by us to a study of the reactivity of the bronchial smooth muscle of guinea pigs sensitized to horse serum. The procedure consists essentially of perfusing the bronchi through the trachea, the fluid making its exit through scarifications on the lung surface. The arrangement of apparatus and the technical details are described by Sollmann and von Oettingen,[2] and

[1] Koessler, K. K., and Lewis, J. H., *Arch. Int. Med.*, 1927, **39**, 163.

[2] Sollmann, T., and von Oettingen, W. F., PROC. SOC. EXP. BIOL. AND MED., 1928, **25**, 692.

[3] McDowall, R. J. S., and Thornton, J. W., *J. Physiol.*, 1930, **70**.