have, unfortunately for the sake of comparison, been fed cholesterol at lower levels of fat intake and have consequently had a lower percentage of total liver lipid. Analysis of all of our figures at present available shows little or no relationship between level of liver cholesterol ester and growth rate. Data at present available do not justify any conclusion as to the exact nature of the factor responsible for this difference in results in the two laboratories. It seems probable that some accessory substance is necessary to permit normal growth coincident with the storage of high levels of cholesterol ester in the liver, and that lack of this, rather than the cholesterol itself, may have been responsible for the retarded growth reported.

8529 P

Prevention of Intranasally Inoculated Poliomyelitis in Monkeys by Previous Intranasal Irrigation with Chemical Agents.*

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That the normal portal of entrance of poliomyelitis virus is the olfactory nerve is now well established.[1] It is also clear from recent studies[2] that the administration of specific immune serum does not afford significant protection against subsequent intranasal instillation of monkeys with poliomyelitis virus. The relative ineffectiveness of immune serum may be attributed to the fact that the terminals of the olfactory nerve are so situated that they cannot be effectively guarded by immune plasma. Once established in a nerve the virus travels to its destination in the medulla and cord by axonal paths,[3] quite safely out of reach of immune substances in the plasma. Recent attempts at active immunization against this disease have also proved disappointing in that the injection of vaccines results merely

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1 Schultz, E. W., and Gebhardt, L. P., PROC. SOC. EXP. BIOL. AND MED., 1934, **31**, 728; Brodie, M., and Elvidge, A., *Science*, 1934, **79**, 235; Lennette, E. H., and Hudson, P., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 1444.

2 Schultz, E. W., and Gebhardt, L. P., *J. Ped.*, 1935, **7**, 332.

3 Faber, H. K., *Medicine*, 1933, **12**, 83; Faber, H. K., and Gebhardt, L. P., *J. Exp. Med.*, 1933, **57**, 933.

in the production of humoral antibodies, with no significant increase in resistance to virus administered by the intranasal route.[4] In the face of this impasse it becomes necessary to seek a practical solution of the poliomyelitis problem in other directions.

In May, 1935, shortly after launching our present studies, Armstrong and Harrison[5] reported protection in monkeys following intranasal instillation of a 4% solution of alum. Their observations have recently been confirmed and extended by Sabin, Olitsky and Cox,[6] who add that protection is also afforded by 4% tannic acid. We wish to report similar results with picric acid, p-nitrophenol, trinitrocresol and mercurochrome.

Our observations are based on a number of experiments involving more than 120 test monkeys and controls. We are permitted to present these observations in only sufficient detail to indicate the scope of the investigations and the trend of the results.

In 3 experiments in which a total of 11 monkeys were given intranasal irrigations with 1% picric acid on 3 successive days, 10 animals have without further treatment exhibited a well defined resistance to intranasal instillations of virus for periods ranging from at least 2 days to more than 69 days. Two animals resisted intranasal instillations of virus 1, 18 and 40 days after treatment; one resisted virus instillations 69 days after treatment; 3 out of 4 in one experiment, resisted instillations 7 and again 38 days after treatment, while one developed the disease following the first instillation of virus 7 days after the treatments. The remainder have not yet been tested for resistance beyond the second day following treatment. The results of several experiments in which only a single intranasal wash with 1%, 0.5, 0.25, 0.1 or 0.01% of picric acid preceded the instillations of virus have been inconstant and indicate that for fairly uniform results *repeated* washings with 1% picric acid are necessary.

Three daily intranasal washes with 1% p-nitrophenol, or with 1% trinitrocresol also seem effective in protecting monkeys against intranasal instillations of virus for at least 2 days, while 1% ammonium picrate seems to be without any protective action.

In an experiment in which 3 monkeys were given intranasal irrigations with 1% mercurochrome on 3 successive days, all resisted

[4] Schultz, E. W., and Gebhardt, L. P., *Calif. and Western Med.*, 1935, **43**, 11; Olitsky, P. K., and Cox, H. R., *J. Exp. Med.*, 1936, **63**, 109.

[5] Armstrong, C., and Harrison, W. T., *Pub. Health Rep.*, 1935, **50**, 725.

[6] Sabin, A. B., Olitsky, P. K., and Cox, H. R., *Proc. Soc. Am. Bact., J. Bact.*, 1936, **31**, 35.

instillations of virus one day and again 18 days later. Three additional monkeys so treated resisted virus instillations 2, 31 and 57 days later. Further instillations to determine the duration of the resistance remain to be made.

In all of the virus instillations referred to above the controls generally equalled the animals treated with a given reagent and the percentage of infection in the parallel control group averaged above 90%. The intranasal irrigations with the chemical solutions indicated were all carried out thoroughly while the animals were under ether anesthesia and held in a special vertical holder, with the head downward.

Further studies are in progress not only with the reagents above mentioned, but with a number of others, including a variety of dye stuffs, chosen particularly for their potential ability to modify the permeability of the normal portal of entrance of this virus. Among the various possibly effective agents may be one or more which may prove effective, agreeable, and harmless enough for prophylactic application in man during epidemic periods.

8530 C

Acute Toxicities of Rotenone and Mixed Pyrethrins in Mammals.

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Rotenone and pyrethrum are proposed as harmless substitutes for inorganic insecticides,[1] and mixed pyrethrins are recommended as anthelmintics[2] and as scabicides.[3] The only critical report on the toxicity of rotenone in mammals is by Haag,[4] who indicates that there is little if any danger of acute intoxication following the ingestion of foodstuffs sprayed with rotenone. Chevalier[2] states that pyrethrum orally produces no untoward effects even when given to children.

In order to ascertain the probable toxic range of rotenone* or

[1] Roark, R. C., *Ind. Eng. Chem.*, 1935, **27**, 530.

[2] Chevalier, J., *Bull. l'acad. de Med.*, 1928, **99**, 446.

[3] Sweitzer, S. E., and Tedder, J. W., *Minn. Med.*, 1935, **18**, 793.

[4] Haag, H. B., *J. Pharmacol. Exp. Therap.*, 1931, **43**, 193.

* Kindly supplied by Dr. R. C. Roark, Insecticide Division, Department of Agriculture, Washington, D. C.