EDITORIAL COMMENT†

POLIOMYELITIS FROM FLY-CONTAMINATED FOOD

Evidence has accumulated within recent years that the alimentary tract may be one of the most important portals of entry for poliomyelitis virus. The virus has been repeatedly demonstrated in human stools, in sewage and in flies collected in epidemic areas. Fly-contaminated food may thus be a theoretically logical source of human infection with polio virus. Experimental evidence in support of this hypothesis is reported by Ward[1] and his associates of the Section of Preventive Medicine, Yale University School of Medicine.

The evidence was drawn mainly from the 1944 poliomyelitis epidemic in Catawba County, North Carolina. This outbreak was rural in character. Most of the affected families were of the lower income group, hygienic conditions poor, and outdoor privies the rule. The weather was hot and flies abundant. Foods were exposed in 20 homes of poliomyelitis patients within a week of the onset of the disease. The food was purchased locally and consisted of bananas. These were peeled and sliced on the spot, and sprinkled with a little sugar and water. About half of the food samples were supplanted by fly-bait, consisting of liver or fish, likewise obtained locally. One or two plates of this food were exposed for 24 to 48 hours in or about each home. These were usually placed in the kitchen, on the back porch or under a fly-trap in the yard. At the end of the exposure the food was frozen on dry ice, transported to the laboratory and held in a frozen state until used for feeding experiments. In most instances flies were observed to rise from the food at the time of collection. There was gross evidence of fly-contamination in the form of vomit or fecal spots. Of the flies trapped at the time of exposure, 80 per cent have been identified as Musca domestica.

Chimpanzees were selected as the test animals. Howe and Bodian[2] of Johns Hopkins University had previously shown that chimpanzees are extremely susceptible to orally administered poliomyelitis virus, producing both paralytic and non-paralytic infections in these animals. In non-paralytic cases large amounts of the virus are given off in the stools. The only recognizable symptom is fever of moderate intensity (101°F.). This viral enteritis is followed by specific antibody production.

Under strictest quarantine conditions two chimpanzees were each fed approximately one quart of fly-contaminated bananas daily for from 6 to 10 days. Rectal temperatures were taken daily, and daily stool specimens collected. The stools prepared by ultracentrifugation[3] were tested for virus by intracerebral inoculation into rhesus monkeys.

The pre-feeding stool specimens of both animals gave negative tests for poliomyelitis virus. Three or four separate stool specimens from each animal taken during the post-feeding period gave positive tests for polio virus, producing typical fever, paralyses, and cord and medulla lesions in test monkeys. With each chimpanzee the virus persisted for several weeks after the last contaminated feeding. Both chimpanzees thus acquired a subclinical infection (or carrier state) with apparent multiplication of the virus in the intestinal tract.

From these data Ward concludes that fly-contamination of food in epidemic areas is presumably an important method of spread of poliomyelitis virus to human beings. He plans testing this conclusion by reduction of the number of flies in a selected locality during some future epidemic.

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IN VIVO INHIBITION IN ANTIBIOTICS

In 1943 Schatz[1] and his associates of the New Jersey Agricultural Experiment Station isolated streptomycin from broth cultures of Actinomycetes griseus. The new antibiotic was found to be active both in vitro and in vivo against a large number of both gram-positive and gram-negative microörganisms. Robinson[2] and his associates of the Merck Institute for Therapeutical Research afterwards found sterptomycin to be relatively non-toxic for mice and rabbits and superior to streptothricin in its therapeutic efficiency against experimental gram-negative infections of these animals. They suggested its use in human medicine as a supplement to penicillin, which is inactive against typhoid fever, bacillary dysentery and other gram-negative diseases.

A preliminary report of the clinical application of streptomycin to the treatment of typhoid fever patients is currently made by Elias and Durso[3] of the Wyeth Institute of Applied Biochemistry, Philadelphia. A technique for the titration of streptomycin was first developed by these biochemists. This was based on the method proposed by Foster[4] for the titration of streptothricin, B. subtilis being used as the test organism. They found that an old laboratory culture of E. typhosa was sterilized by the addition of 2 Foster units of streptomycin per cc. of serum-broth. Recently isolated typhoid cultures were found to be slightly more resistant. All, however, were killed by 6 units of streptomycin per cc. of serum-broth.

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Daily doses of streptomycin ranging from 1 million to 4 million units given as divided doses at 3 hour intervals were then administered intramuscularly or intravenously without apparent toxic reactions to several typhoid patients. Urinary excretion was demonstrable within 90 minutes after the first fractional dose and was completed within 72 hours after the final dose, from 44 to 70 per cent of the total administered dose being recovered from the urines of different patients. A peak serum level (28 units per cc.) was reached within a few hours after the first dose. The serum titer fell to zero within 24 hours after the last dose. Four million daily units given by the intravenous route gave rise to a concentration of from 100 to 130 units per gram of fresh feces.

Given by mouth, four million daily units produced no demonstrable blood level, and only 1 per cent total recovery from the urine. At least 64 per cent of the oral dose was eliminated in the stools, the stool titers often reaching as high as 20,000 units per gram of feces. Positive stool cultures of E. typhosa were isolated from patients after prolonged oral therapy with as much as 15 million units of streptomycin. The organisms thus isolated showed no acquired resistance to streptomycin, all being killed by 6 units of streptomycin per cc. of serum-broth.

Bearing in mind the enormous dosage administered in these patients, and the lack of acquired streptomycin resistance, Elias concludes that some effective inhibitory substance for streptomycin exists in the intestinal contents. If so, streptomycin would be without theoretical promise as an intestinal antiseptic against gram-negative infections. Its only theoretically predictable therapeutic value would be against the bacteremia which usually accompanies typhoid infections. Detailed report of its clinical value against this phase of typhoid fever is promised for the near future.[5] Meanwhile the reported data may serve a useful purpose in emphasizing the existence of strong inhibitory factors in the human body, which have often been overlooked in the exploitation of such commercial products as bacteriophage and leucocytic extract.[6]

A second recent example of such inhibitory factors is currently reported by Klein and Stevens[7] of the Department of Bacteriology, University of Pennsylvania. These investigators compared the in vitro and in vivo effects of 20 detergents and related compounds against influenza A virus. Seven of these were found to be virucidal in vitro when tested in dilutions often as high as 1:16000, sterilization being completed within from 60 seconds to ten minutes. However, none of these compounds when administered intranasally as a 5 to 10 per cent solution either by instillation or by prolonged spray (18 to 120 minutes) protected mice against experimental infection with influenza A virus.

The results clearly show that in spite of the high in vitro activity of many of these compounds they are completely inert in vivo even under optimal conditions of prophylaxis. The utilization of such compounds as gargles or sprays for human prophylaxis against influenzal infections would be of questionable value.

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Strümpel-Marie Disease

Adolph Strümpel (1853-1925), in the second volume of the first edition of his *Lehrbuch* (Leipzig, 1884, page 152), described this peculiar form of chronic arthritis. A portion of the translation follows.

"Those forms may here be mentioned in passing as a remarkable and, as it seems to us, a distinct disease in which there results a gradual and painless complete ankylosis of the vertebral column and hip joints so that the head, the trunk and the thighs are firmly united to each other and become completely stiff, while all the other joints retain their normal mobility. It is apparent that a characteristic modification of the posture and gait must occur as a result. We have seen two quite similar cases of this peculiar disease."

He discusses the entity in more detail in an article, "Bemerkung über die chronische ankylosirende Entzündung der Wirbelsaüle und der Hüftgelenke. [A note on Chronic Ankylosing Inflammation of the Vertebral Column and Hip Joints]." It was published in the *Deutsche Zeitschrift für Nervenheilkunde* (11:338-342, 1897) as a comment on the preceding article on the same subject by Bechterew.

Pierre Marie (b. 1853) wrote "Sur la spondylose rhizomélique [Rhizomelic Spondylosis]" in the *Revue de Médecine* (18:285-315, 1898). A portion of the translation follows:

"In the session of February 11 of this year, I presented to the Sociéte médicale des Hopitaux two patients afflicted with a disease whose symptoms, identical in both cases, seemed to me to be sufficiently interesting to be brought to the attention of clinicians. In this preliminary discussion, I indicated the principal characters of this disease entity and particularly stressed the extremely marked rigidity of the spine and the more or less complete ankylosis of the coxofemoral and scapulohumeral joints. Calling attention to the fact that the articulations of the roots of the extremities were affected with this kind of spinal rigidity, I proposed to designate it by the name *rhizomelic spondylosis.*" . . .

After a careful review of the facts observed in his cases, he concludes:

"It seems to me that it is permissible for clinicians to contrast deforming polyarthritis affecting the small joints of the extremities (acromelic deforming polyarthritis) with the ankylosing process that attacks primarily the spine and the joints at the roots or attachments of the extremities (rhizomelic spondylosis)."—R. W. B., in *New England Journal of Medicine.*