

11461

Experimental Arthritis in the Albino Rat Produced by a Group A Hemolytic Streptococcus.*

SIDNEY ROTHBARD. (Introduced by E. L. Opié.)

From the Department of Pathology, Cornell University Medical College, New York City.

Collier¹ described a spontaneous polyarthritis in rats from which no microorganism was cultivated. However, bacteriologically sterile organs produced the disease on reinoculation into other rats. Rhodes and van Rooyen² reported a similar disease in rats from which no bacteria were recovered by aerobic or anaerobic methods. Findlay, Mackenzie, MacCallum and Klieneberger³ also described a spontaneous, infectious arthritis in rats, but they were able to isolate a pleuropneumonia-like organism (L 7) in pure culture which reproduced the arthritis when injected into other rats. Recently Watson⁴ has shown that an acute purulent arthritis can be produced in mice after injections of several strains of hemolytic streptococci.

Because of the interest aroused in this subject by these reports and because a review of the literature reveals no account of the disease in rats due to the streptococcus, it seems advisable to report the production of an acute polyarthritis in the albino rat by the intravenous injection of a hemolytic streptococcus recently isolated from the blood stream of a patient with septicemia.

The streptococcus was of the "matt" variety, Group A and of an unclassified type.† 0.5 cc of an 18-hour broth culture when injected intravenously produced arthritis in 100% of rats weighing from 70 to 100 g while a smaller dose (0.1 cc) produced it in approximately 70% of the animals.

The arthritis appears as early as 48 hours after inoculation. It is multiple in character and new joints develop in succession for 8 days after inoculation. In a few instances the swelling in some joints has decreased during the period of observation while other joints are

* Supported by a grant from the John and Mary R. Markle and the Ophthalmological Foundations.

¹ Collier, W. A., *Geneesk. Tijdschr. Ned.-Ind.*, 1938, **78**, 2845.

² Rhodes, A. J., and van Rooyen, C. E., *J. Path. and Bact.*, 1939, **49**, 577.

³ Findlay, G. M., Mackenzie, R. D., MacCallum, F. O., and Klieneberger, E., *Lancet*, 1939, **2**, 7.

⁴ Watson, R. F., personal communication, 1940.

† Grouped by R. C. Lancefield of the Hospital of the Rockefeller Institute for Medical Research.

becoming involved. The diseased joints are swollen, dusky red in color, hot and painful to palpation. (Fig. 1.) In some animals as many as 8 different joints develop arthritis. The ankle joint is involved most often, the wrist next in frequency and then the tarsal and carpal interphalangeals. Many of the joints healed completely, but others have progressed, and the arthritis has been present for 8 weeks after inoculation. The rats move about with difficulty, drag their hind limbs and appear ill, but as a rule, do not succumb to the infection.

Gross and microscopic examinations have been made up to 7 days after onset of the disease. At this period the joint is enlarged, the periarticular tissues are oedematous and have a mucinous consistency. The synovial membrane is grey yellow in color and covered with a gelatinous exudate. The synovial fluid is in slight excess, viscid and opaque, but not purulent. The cellular content of the

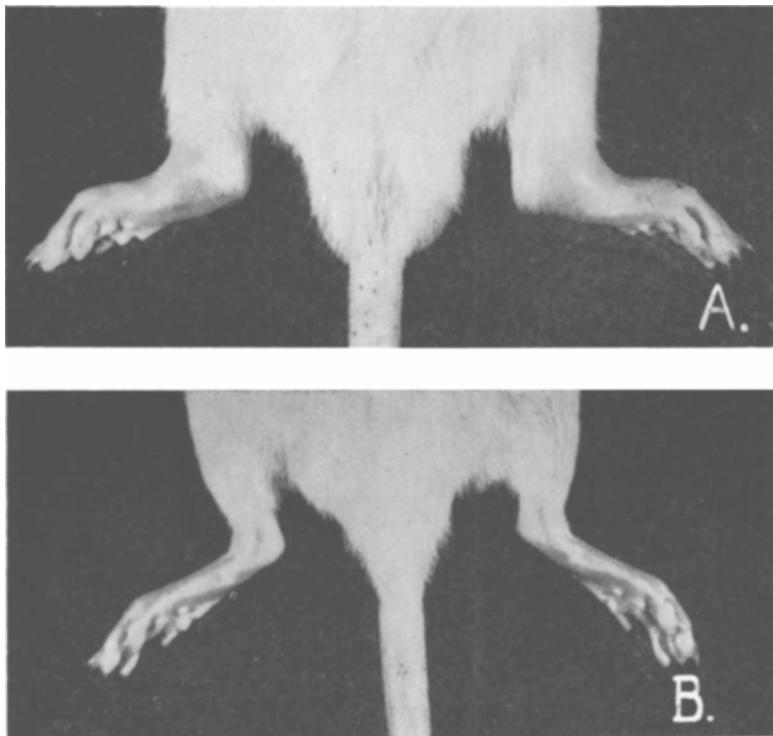


FIG. 1.

Comparison between the ankle joints of a rat with arthritis 7 days after the intravenous injection of 0.5 cc of hemolytic streptococci (A) and those of a normal rat (B).

exudate shows on an average, 65% polymorphonuclear leukocytes and 35% round cells. Streptococci are demonstrable in smears of the synovial fluid and are cultured without difficulty. These organisms, when reinjected into other rats, reproduce the disease. The cartilage and bone show no changes at this stage. Heart blood cultures are positive for 5 days after the intravenous injection. In 5 instances an acute purulent endophthalmitis involving one eye was found.

Microscopically, the periarticular tissues are oedematous with separation of the muscle fibres and fascia. Fibrin and pink-staining fluid are present in the interstitial spaces. The tissues are infiltrated with polymorphonuclear leukocytes which are found in focal collections in some areas, a few monocytes and an occasional lymphocyte. The subsynovial fat shows the same type of cellular reaction that is present in the periarticular tissue. The most conspicuous inflammatory reaction appears in the synovial villi. In some areas the synovial membrane is absent, but in others there is evidence of proliferation of synovial cells. The joint cavities contain considerable cellular debris, fibrin, polymorphonuclear leukocytes and round cells.

A more detailed study of this experimental disease is now in progress.

Summary. An acute multiple arthritis has been produced in 45 of 51 albino rats by the intravenous injection of a Group A hemolytic streptococcus. In the eyes of 5 rats, an acute monocular purulent endophthalmitis was present.

The author wishes to thank Dr. D. M. Angevine for his assistance in this work.