4108

Bacteriology of Blood and Joints in Chronic Infectious Arthritis.

RUSSELL L. CECIL, EDITH E. NICHOLLS AND WENDELL J. STAINSBY.

From the Cornell Clinic and the Second (Cornell) Medical Division of Bellevue Hospital.

During the past 2 years, we have been making a bacteriological study of patients suffering from chronic deforming arthritis, giving special attention to cultures of the blood and joints.

The technique employed for blood cultures is as follows: 20 cc. of blood are taken aseptically from the arm with a Luer syringe, placed in 2 sterile culture tubes, allowed to clot, and put in the ice-box overnight. In the morning the tubes are centrifuged, and the serum drawn off with a sterile pipette. Care is taken to remove all the serum. The clot is then broken up in the original tube with a sterile glass tube, diameter ¼ inch, drawn up in the same tube, and transferred to a 3 oz. bottle containing 50 cc. broth (beef-heart infusion broth, 0.5% saline, 1% peptone, pH 7.6). The two bottles are then put in the incubator at 37° and left there unopened for 5 days.

At the end of this time, 2 tubes, each containing 8 cc. of a 1.5% beef-infusion-broth-agar, are melted, partially cooled, and 0.5 cc. of whole rabbit's blood added to each tube. Each tube is then seeded with a loopful of broth culture and the contents poured into a petri dish. The plates are allowed to incubate for 24 to 48 hours. Pour-plate cultures are repeated at 3 day intervals for 4 weeks unless the colonies appear sooner. All contaminated cultures are discarded.

In the 56 cases studied of chronic infectious arthritis with swelling, 47 presented one or more characteristic fusiform fingers, while the remaining 9 had one or more swollen joints in various parts of the body. Of the 56 cases, 38 or 68% showed an atypical *Streptococcus* in the circulating blood. In the 14 cases studied of chronic infectious arthritis without swelling, 7, or 50%, were positive. 43 controls without exception yielded negative results. These controls included 16 cases of chronic degenerative arthritis, 6 rheumatic heart disease, 1 gonococcal arthritis, 1 gout, 13 patients having various other infections without joint symptoms, and 5 normal healthy individuals.

Cultures from joints and lymph glands were made in the same manner except that rabbit's blood instead of human blood was added to the bottles of broth. Cultures were made from involved joints in

6 cases. In 2 of these the material was curettings from the head of the femur; in another 2 it was synovial membrane of the knee joint; and in the remaining 2 cases, the synovial membrane from fusiform fingers was cultured. In the 2 cases cultured from bone-curettings, an atypical *Streptococcus viridans* was recovered identical morphologically and culturally with the organisms recovered from the blood. The remaining joint cultures yielded no organisms.

Two enlarged lymph nodes which were taken from patients suffering from this disease yielded sterile cultures.

The most striking characteristic of these streptococci is the very slow growth of the first generation in broth. The average time of appearance of the streptococci in sub-culture was 15.7 days, but ranges from 4 to 30 days. In blood broth cultures, they cause slight turbidity of the broth, and a heavy granular sediment, with a small amount of hemolysis of the blood. The supernatant broth takes on a greenish tinge. On blood-agar plates, the colonies appear as small greyish dots, surrounded by a narrow, partially hemolyzed zone of greenish tinge. The hemolysis is much smaller in amount than that observed in a typical strain of *Streptococcus hemolyticus.*

All strains are insoluble in bile. None ferment inulin and mannit. All ferment dextrose, salicin, and lactose.

At the present time agglutination studies on the various organisms isolated are being carried out. A diffuse growth of the streptococci is obtained by growth in potato broth. Immune sera are obtained by injecting rabbits at 4 day intervals with 20 cc. of a 24 hour broth culture heated for one hour at 56°. This work has not been completed to date, but immune sera from 6 rabbits, immunized against 6 strains, strongly agglutinate all other strains with a very few exceptions. The evidence so far obtained tends strongly to confirm the theory that chronic deforming arthritis is an infectious disease caused in the majority of cases by a biologically specific strain of streptococcus.