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CASE REPORTS

Legionella pneumophila Serogroup 4 Isolated from Joint Tissue

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We report the isolation of *Legionella pneumophila* serogroup 4 from synovial tissue obtained from an 80-year-old female with chronic swelling of her right metacarpophalangeal joint. Synovial tissue infections caused by *L. pneumophila* are rare. Interestingly, this isolate was recovered from chocolate agar after 5 days of incubation.

CASE REPORT

An 80-year-old female, initially seen for possible rheumatoid arthritis, presented with a recent seronegative inflammatory arthropathy characterized by pain and swelling in her fourth proximal interphalangeal (PIP) joint; this pain and swelling subsequently spread to other proximal interphalangeal joints. The patient was treated with cephalexin, which was discontinued after she developed hives, and then given prednisone at 40 mg per day for 5 days. She was referred to a rheumatologic consultant, who found evidence of underlying osteoarthritis of the hands, primarily involving the distal interphalangeal joints and the first carpal metacarpal phalangeal joints. The initial laboratory data for the patient were nondiagnostic in that she had a weakly positive antinuclear antibody test result, with a titer of 1:80 in serum without significant stigmata of lupus, and a negative test result for rheumatoid factor. A radiograph of the left hand showed osteoarthritis of the left metacarpal phalangeal (MCP) joint as well as the PIP joints. Three months later, the patient returned, having developed synovitis involving the right MCP and PIP joints, as well as pitting edema over the dorsal part of the right hand. She was later referred to UCLA Medical Center for synovectomy for both diagnostic and prognostic reasons.

Upon incision through the extensor tendon, an abundant amount of brownish synovium was noted, along with the absence of frank pus. The MCP joint was opened, and the presence of additional brownish synovium was documented. Some destruction of the articular cartilage within the joint was also noted. Joint tissue was sent for both aerobic and anaerobic cultures. No other laboratory tests were ordered at this time, and no antibiotic treatment was administered.

The joint tissue was processed according to standard operating procedures and inoculated onto sheep blood agar, chocolate agar supplemented with pyridoxal, and thioglycolate broth (BBL Microbiology Systems, Cockeysville, Md.) and incubated for 5 days at 37°C with 5 to 10% CO_2. Additionally, brucella blood agar, laked kanamycin-vancomycin blood agar, anaerobic phenylethyl alcohol agar, and thioglycolate broth (BBL Microbiology Systems) were inoculated and incubated for 7 days at 37°C under anaerobic conditions. All anaerobic cultures were reported to be negative. Gram stains of the clinical specimen revealed no organisms or white blood cells.

On day 5, small, catalase-negative, oxidase-positive pinpoint colonies were noted on chocolate agar only. Buffered charcoal yeast extract agar was included as a medium for subculture to aid in the growth of this obviously fastidious organism. There was insufficient material from the original tissue specimen to inoculate buffered charcoal yeast extract agar for *Legionella* culture. The organism was subjected to serotyping with polyvalent conjugate containing fluorescein isothiocyanate-labeled antisera to *Legionella pneumophila* serogroups 1 through 6 (SciMedX Inc., Denville, N.J.), followed by testing against individual monovalent conjugates of types 1 through 6. The isolate was confirmed to be *L. pneumophila* serogroup 4 by the Los Angeles County Public Health Laboratory.

Hematoxylin and eosin stained sections of the right third joint synovial tissue indicated chronic synovitis with focal acute component and fibrin deposition. A Dieterle stain performed on the tissue section did not reveal any microorganisms.

Upon notification of the physician by the laboratory that *L. pneumophila* was recovered, the patient was directed to return to the clinic for further evaluation. The patient denied any history of pneumonia or traumatic injury to either hand. A complete blood count, urinalysis, two blood culture sets, and a *Legionella* urinary antigen were ordered. Laboratory results were as follows: white blood cell count, $6.4 \times 10^3/mm^3$; red blood cell count, $3.55 \times 10^6/mm^3$; total hemoglobin concentration, 11.9 g/dl; and hematocrit, 35.0%. An automated differential analysis revealed levels of 53.1% neutrophils, 34.6% lymphocytes, 8.9% monocytes, 2.7% eosinophils, and 0.7% basophils. Urinalysis results were within normal limits; the *Legionella* urinary antigen test result was negative, and blood cultures were negative for both sets. Chest films revealed no evidence of pneumonia. Although paired sera were not available for testing, a convalescent-phase serum was sent to an

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outside reference laboratory for the detection of *L. pneumophila* immunoglobulin G (IgG) antibody directed against serotypes 1 through 6 by use of an enzyme-linked immunoassay. An IgG value of 6.49 was obtained, indicating a current or previous infection with *L. pneumophila* (values of >1.10 are indicative of IgG antibody to *L. pneumophila*).

Our patient exhibited symptoms of pain, swelling, and a limited range of motion of the affected area, which could indicate rheumatoid arthritis, gout, or infectious arthritis. Radiograph analysis and surgical debridement of the hand showed cartilage destruction and osteoarthritis of the MCP and PIP joints. *L. pneumophila* serogroup 4 was isolated from the joint tissue.

Legionnaires' disease is the most common manifestation of infections caused by *L. pneumophila* (11, 16). Studies have shown that Legionnaires' disease occurs at a higher rate in persons with an altered immune system or rheumatoid arthritis or in association with drug therapy (3, 5, 15). The typical mode of transmission for *L. pneumophila* is inhalation of aerosols containing the organisms, which results in respiratory infection. Hematogenous spread is suspected as the primary source of infections for extrapulmonary infections. Extrapulmonary manifestations of *L. pneumophila* infection are rare in the absence of overt pulmonary infection. Most of these extrapulmonary infections have been associated with direct inoculation of the organism into a wound site during bathing, contact with a colonized water source, or the use of potting soil (4, 14, 19). Examples of extrapulmonary infections associated with *L. pneumophila* have included hip and sternal wound infections, prosthetic valve endocarditis, pyelonephritis, sinusitis, and cellulitis (4, 6, 7, 14, 18, 22). Soft tissue infections caused by *Legionella cincinnatiensis* and *Legionella micdadei* have been reported (12, 13), and *L. micdadei* has been reported to cause cutaneous abscesses in an immunosuppressed patient (1). The first reportable case of *L. pneumophila* arthritis involved a serogroup 1 organism recovered from an articular fluid specimen (2).

In the first case of infection with *L. pneumophila* serogroup 4, identified in Los Angeles in 1978, the organism was recovered from a chocolate agar plate after 7 days of incubation (10). Our *L. pneumophila* serogroup 4 isolate was also recovered from chocolate agar. Numerous reports in the literature describe selective, supplemented media available for the cultivation of *Legionella* species, but accounts of growth on routinely utilized, enriched media such as chocolate agar are rare (9, 17, 20, 21). As a result, the frequency at which this organism has been recovered from chocolate agar with or without pyridoxal supplementation is not known. Dumoff (8) discusses the recovery of *L. pneumophila* from a pleural fluid specimen and a lung tissue specimen on commercially available chocolate agar at 4 days and 9 days, respectively. Over the last several years, our institution has seen two other instances in which *L. pneumophila* serogroups 1 and 4 were recovered from respiratory specimens inoculated onto chocolate agar with pyridoxal (unpublished data).

Although the *Legionella* urinary antigen test can be used to support a diagnosis of legionellosis, it is important to remember that this assay is designed to detect only serogroup 1 and returns negative results for other serogroups.

The request for microbiological cultures in addition to radiology and pathology studies was an important feature of this case. Oftentimes, an infectious etiology is not considered in cases of suspected gout, osteoarthritis, or rheumatoid arthritis. This case also illustrates the importance of maintaining cultures of tissue or surgical specimens for a minimum of 5 days to detect the growth of fastidious organisms. Diagnosis of infectious arthritis can be readily achieved by microbiological, histological, and/or molecular methods.

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