

## Case Report

# Acute Bacterial Prostatitis by Salmonella Infection



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Acute Salmonella prostatitis is a very rare disease. Herein, we report on a healthy 37-year-old man presented with recently developed lower abdominal pain, fever, dysuria, frequency, and perineal pain. Clinical symptoms and signs, as well as abdominal computed tomography scan suggested acute bacterial prostatitis. The initial urine culture revealed significant colonies of *Salmonella* species. We could not, however, find *Salmonella* species from subsequent specimens from blood and stool. Three days after admission, we examined his prostate and performed prostatic massage. While we could not find *Salmonella* species in the follow-up urine specimen, we found *Salmonella* species in his expressed prostatic secretion. His symptoms and signs were improved with ciprofloxacin treatments.

**Received:** 26 March, 2016

**Revised:** 20 May, 2016

**Accepted:** 9 June, 2016

**Keywords:** Prostatitis; Salmonella

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Salmonella infection is a great public health concern. While Salmonella gastroenteric infection is the most common presentation, the presence of Salmonella pathogens in urine sample is rarely reported. Furthermore, the reported cases of Salmonella associated acute prostatitis (SAAP) are extremely rare [1-3].

Acute prostatitis is common in patients with the risk of complicated urinary tract infection (UTI), and in some cases, SAAP patients have been shown to be associated with these risk factors [3]. In contrast, SAAP in healthy and young men is exceedingly rare.

We found a case of prostate culture proven SAAP in a healthy middle-aged man, who was successfully treated with an appropriate antibiotic. We also examined the genetic composition of the Salmonella culture specimen through a 16S ribosomal RNA sequencing method.

## CASE REPORT

A healthy 37-year-old man visited the emergency room

due to recently developed fever, lower abdominal pain, dysuria, frequency, and perineal pain. The patient denied clinical histories of drug use, prior sexually transmitted diseases, diabetes mellitus, and hypertension. On admission, his vital signs revealed blood pressure of 135/90 mmHg, heart rate of 87/min, respiratory rate of 20/min, and body temperature of 38.5°C. His complete blood count (CBC) was as follows: 19,390/ $\mu$ l of white blood cells (WBCs), 15.2 g/dl of hemoglobin, and 173,000/ $\mu$ l of platelet. Chemical profiles showed 0.93 mg/dl of creatinine, 100 mg/dl of glucose, 5.4% of HbA1c, 28.82 ng/ml of serum prostate-specific antigen, and 23.51 mg/dl of C-reactive protein (CRP). The result of enzyme-linked immunosorbent assay (ELISA) test for antibodies to human immunodeficiency virus was negative. A midstream specimen of urine revealed nitrite(-), WBC in urine stick(3+), WBC (> 100/high power field [HPF]), and red blood cell (RBC) (1-4/HPF). Abdominal computed tomography (CT) scan revealed a structurally normal urinary tract, but a mildly swollen prostate with diffuse enhancement with contrast,

which suggested acute prostatitis (Fig. 1).

Acute prostatitis was suspected with his symptoms, signs, and the findings of CT scan. We immediately started medical treatments, including a 0.8 g of ciprofloxacin per day and a 0.2 mg of tamsulosin per day. The urine culture sample from the sample visit revealed 30,000 colony forming units/ml serotype of *C. Salmonella* species (Joongkyeom, Ansan, Korea). The organism was sensitive to ampicillin, cefotaxime, ceftazidime, ciprofloxacin, and trimethoprim/sulfamethoxazole. However, we could not identify any specific pathogen from subsequent stool and initial blood cultures. Therefore, the patient was treated with the same medication for 10 days. Three days after admission, patient's symptoms and signs were improved. Moreover, the laboratory findings improved; the results from a follow-up tests including urinalysis were as follows: 9,430/ $\mu$ l of WBC in CBC, 4.1 mg/dl CRP, and RBC <1/HPF and WBC 30-99/HPF in urinalysis. In addition, we could not find any specific pathogens in a follow-up urine culture. Prostate



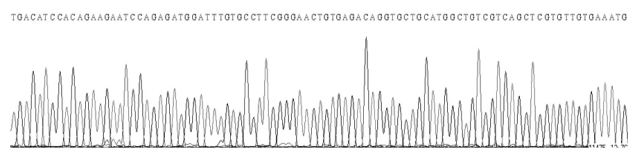
**Fig. 1.** Abdominal computed tomography scan revealed a structurally normal urinary tract, but a mildly swollen prostate with diffuse enhancement with contrast (arrows), which suggested acute prostatitis.

examination revealed soft and swollen prostate, but we were unable to find any prostate nodule. Expressed prostatic secretion (EPS) was yellowish-turbid and revealed many WBCs/HPF. The EPS culture sample revealed moderately growing *Salmonella* species. Ten days later, we re-evaluated the clinical conditions and examined laboratory tests from the patient. He was healthy, and the values from his CBC, CRP, and urine samples were all within normal ranges. He was discharged from the hospital with oral ciprofloxacin medication for 4 weeks. Four weeks later, we evaluated the chronic infection through one urine culture and one prostate culture. We could not find the *Salmonella* species from both culture plates.

We picked up one colony in *Salmonella* positive EPS culture plate and extracted the *Salmonella* DNA from the sample by using a Wizard genomic DNA purification kit (Promega, Madison, WI, USA). Polymerase chain reactions were performed from the genomic DNA, using consensus primers for the bacterial 16S ribosomal subunit gene [4]. The amplified products were sent to Solgent (Daejeon, Korea) for automatic sequencing. We read 1,423 base pairs of DNA sequence that were completely matched with *Salmonella enterica* serovar Infantis (LN649235.1) and Pratyphi C strain C3 (EU118092.1) (Fig. 2, Table 1).

## DISCUSSION

The incidence of *Salmonella* associated UTI is unusual, and most infected patients complain of cystitis or pyelonephritis associated symptoms [1,2,5]. Because SAAP



**Fig. 2.** Analysis of the 16S ribosomal RNA gene sequences.

**Table 1.** Four similar *Salmonella* species reference sequences

| Serotype  | Accession  | Expect | Identities         |
|---|------------|--------|--------------------|
| <i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Infantis                | LN649235.1 | 0.0    | 1,423/1,423 (100%) |
| <i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Paratyphi C strain C3   | EU118092.1 | 0.0    | 1,423/1,423 (100%) |
| <i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Panama str.             | CP012346.1 | 0.0    | 1,421/1,423 (99%)  |
| <i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Enteritidis strain SEE2 | CP011791.1 | 0.0    | 1,421/1,423 (99%)  |
| <i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Enteritidis strain SEE1 | CP011790.1 | 0.0    | 1,421/1,423 (99%)  |

We compared our DNA sequences with the references in GenBank by using the BLAST (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>) program. Subsp.: subspecies.

is a very rare occurrence, it is difficult to estimate the true incidence in real clinical practices. Furthermore, Salmonella associated UTI is predominantly observed in older patients with underlying diseases, such as urinary tract obstructions, diabetes mellitus, and immune compromised conditions. SAAP in healthy, middle-aged men, who do not have predisposing conditions, has rarely been reported [5].

The route of infection remains unclear in this case. Generally, the suggested routes of infection for SAAP could be postulated into two pathways: either hematogenously or through an ascending prostate infection via the urethra [6]. We took one blood culture in the emergency room due to high fever. We could not find specific pathogens in the blood culture plate. Because of urinary Salmonella infection, we cultured the patient's stool to evaluate the Salmonella reservoir. No Salmonella species in his stool were discovered. Furthermore, he did not complain of specific symptoms associated with gastroenteritis. Therefore, it is reasonable to assume that in this case, the route of infection for SAAP may have been the latter pathway—ascending infection via the urethra.

The genus *Salmonella* can be classified into serotypes with surface antigens. The O antigen is commonly determined based on oligosaccharides associated with Salmonella's surface lipopolysaccharide [1]. Saphra and Winter [2] analyzed the specific serotypes from 7,779 Salmonella UTIs. They reported that the four serotypes—*Salmonella typhimurium*, *Salmonella oranienburg*, *Salmonella paratyphi C*, *Salmonella choleraesuis*, and *Salmonella montevideo*—were commonly found in urine samples. In additions, the two groups (C1 and E) were significantly recovered more often from the urinary tract than stool compared with the more common groups, such as B and D [7]. In addition, *Salmonella* species isolated in SAAP include *Salmonella typhimurium* (group B), *Salmonella St. Paul* (group B), *Salmonella enteritidis* (group D), *Salmonella panama* (group D), and *Salmonella paratyphoid* (group B) [3]. Prostatitis caused by *Salmonella* species serotype C, as in this case, has rarely been reported. Our DNA sequences in 16S RNA gene support our serotyping results (Table 1).

It is a general agreement that patients with acute bacterial prostatitis seem to warrant a longer duration of antibiotics treatment than those with cystitis. Because of its rarity, however, we do not have specific guidelines with respect to the treatment duration for this infection. Furthermore,

a complete eradication from its reservoirs is very important to stop the spread of infection. Even though the symptoms and signs of SAAP were improved and a follow-up urine culture revealed no further infection with the empirical ciprofloxacin treatments for 3 days, we could not decide on the duration of antibiotic treatment for the complete eradication in reservoirs of this communicable infection.

Bacterial prostatitis can be diagnosed through pre-massage urine sample and EPS culture or post-massage urine sample [8]. Therefore, we decided to examine his prostate and took an EPS culture, and we simultaneously took a repeated urine culture. While we could not see any significant pathogens in the follow-up urine culture, we could see the moderately growing Salmonella species in the EPS culture plate. Such finding can be a strong evidence for SAAP [8].

The clinical courses of SAAP cannot be estimated due to its rarity. Our patient's symptoms and vital signs improved within three days. Though urine revealed a negative culture for this infection with a three-day treatment, his prostate still has the infection, requiring longer antibiotics treatment.

His positive response to antibiotics treatment may be contingent on his clinical characteristics, such as a younger aged man without risk factors for complicated UTIs.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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