

# New Associations With *Pseudomonas Luteola* Bacteremia: A Veteran With A History Of Tick Bites And A Trauma Patient With Pneumonia

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## Abstract

*Pseudomonas luteola* is a rare clinical infection, in which no epidemiological trend has been established. Herein described are two patients with *P. luteola* bacteremia; one with a history of multiple tick bites and a leg ulcer, and the other involved in an all-terrain roll-over crash who developed pneumonia. The rare isolation of *P. luteola* should be considered significant when isolated in the blood.

Work performed at the University of Louisville Hospital and the Veterans Affairs Medical Center, Louisville, KY

## INTRODUCTION

*Pseudomonas luteola* is rarely pathogenic to humans, and has been reported in several unrelated diseases such as colon cancer, peritonitis and catheter-related infections. We report two cases of bacteremia in patients due to *P. luteola* (formerly *Ve-1* and *Chryseomonas luteola*). Both patients had bacteremia and were immunocompetent, but did not share other similarities. Unique aspects to the cases presented include the association with tick bites in the first patient and pneumonia in the second patient. This report serves as evidence that the recognition of disease spectrum has expanded since its discovery in 1974.

## CASE STUDY 1

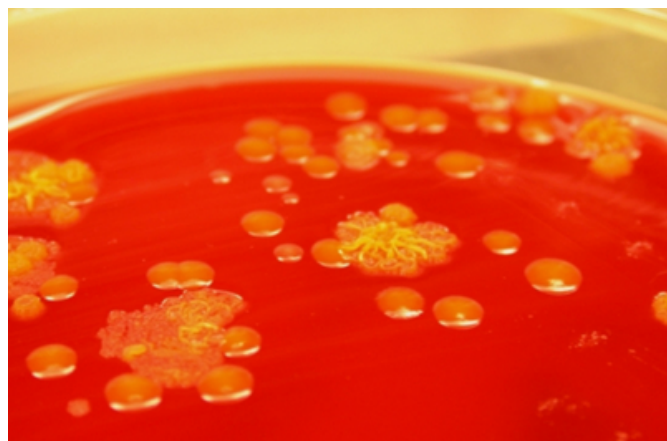
In November 2003, a 54-year old male with a history of tick exposures the previous week, presented to the Veterans Affairs Medical Center in Louisville, KY with a complaint of left lower leg swelling and redness at the bite sites. The patient presented with symptoms including a subjective fever, chills, general myalgias, a productive cough of clear sputum, a frontal headache, nausea, vomiting, and diarrhea for three days. He lacked neck stiffness or visual changes. His past medical history was significant for peripheral vascular disease, tobacco use with COPD and colon cancer, which required a partial colectomy in 1986. He was taking no new medications, and he had no pets.

Physical exam revealed a temperature of 101.8°F. The left lower extremity was erythematous, edematous, warm and tender in the anterior and lateral tibial areas. There was one dominant lesion approximately 1 cm in diameter having a necrotic center surrounded by several macular lesions (3-5 mm) with eschars and erythema. There was no drainage present, therefore cultures were not obtained. A serum leukocyte level was 17,000 cells/cm<sup>3</sup> (segmented neutrophils 79%, bands 15%). A urine culture and two sets of blood cultures were taken. A tick-borne disease was suspected, hence serology was obtained. The patient was started on doxycycline and cefazolin.

The following day both blood cultures showed pleomorphic gram-negative rods by gram-stain. Cultures at 24 hours showed two yellow colony types; one smooth and one rough (figure 1).

**Figure 1**

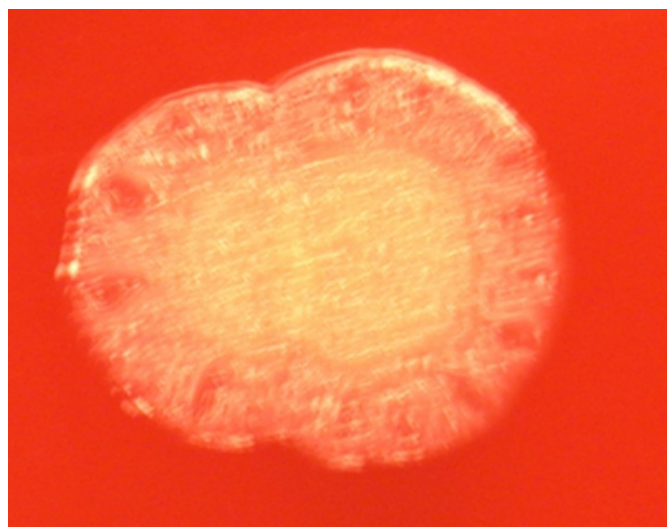
Figure 1: Rough and smooth colony types of after 48 hours.



At 48 hours, both colony types became rough, centrally raised with peripherally pitting colonies. Colonies appeared as lobate, with a “fried egg” morphology (figure 2) and a cheese-like texture.

**Figure 2**

Figure 2: “Fried egg” morphology of colonies after 48 hours.



Incidentally, the bioterrorism agent, *Burkholderia pseudomallei*, also has a similar morphology, but differs in its reaction to chemical tests. Identification of *P. luteola* was by the Vitek GNI card (bioMérieux Vitek, Inc., Hazelwood, MO, USA), followed by confirmation with the API 20 NE non-fermentor identification panel (bioMérieux Vitek). Subsequently, antimicrobial susceptibilities to *P. luteola* were determined with the Epsilon Test Strip technology (AB Biodisk Inc., Solna, Sweden). (table 1)

**Figure 3**

Table 1: Sensitivities of antimicrobials to from four previous case reports plus the present case reports.

Antimicrobial	Rastogi et al <sup>9</sup>	Ghosh <sup>10</sup>	Chinab et al <sup>11</sup>		Tsakris et al <sup>13</sup> MIC (mg/L)	Present reports MIC (mg/L)	
			Case 1	Case 2		Case 1	Case 2
ampicillin	S				R ≥ 32		
amoxicillin			R	R			
amoxicillin/ clavulanate					R ≥ 32/16		
cefazolin	R						
cefuroxime					R ≥ 32		
cefotixin					R ≥ 32		
ceftriaxone	S		R	S	R ≥ 64		S ≤ 8
ceftazidime		S	R	S	S 4		S ≤ 8
cefepime					S 2	S 0.75	S 0.38
imipenem			S	S	S 0.5		I 4
meropenem						S 0.016	S 0.19
piperacillin					S ≤ 8		S ≤ 16
piperacillin/ tazobactam		S				S 3.0	S 1.0
aztreonam					R ≥ 32	I 24.0	S 3.0
amikacin			S		S 4	S 0.038	S 0.75
gentamicin	S				S 2	S 0.094	S 0.38
ciprofloxacin	S	S	S	S	S 0.5		S ≤ 1
levofloxacin						S 0.064	S ≤ 2
gatifloxacin						S 0.032	
moxifloxacin						S 0.064	
trimethoprim/ sulfamethoxazole	S		R	R	R ≥ 8/32	S 1.0	S 1.5

R = resistant, S = sensitive, I = Intermediate, MIC = Minimal Inhibitory Concentration, mg = microgram, L = milliliter

Cefazolin was changed to levofloxacin, and on the fourth hospital day, the patient was discharged on doxycycline (three weeks) and levofloxacin (two weeks). Follow-up blood cultures were negative, and results of the tick-borne tests were: negative for *Borrelia burgdorferi* serologies (Immunoglobulins M and G (IgM and IgG)), equivocal for *Rickettsia rickettsiae* serologies (IgM and IgG), and not performed for *Ehrlichia chaffeensis*. A screening colonoscopy, which was normal, was performed because *P. luteola* had been previously shown to be associated with colon cancer.<sup>1</sup> After five months the patient presented for another follow-up appointment. The area that had previously been an ulcer was a dried desquamating eschar. No intermittent antimicrobials had been given. A culture was not obtained, but magnetic resonance imaging was performed, which showed no evidence of osteomyelitis, and revealed soft tissue defects over the anterior and lateral aspect of the left lower extremity consistent with the history of an ulcer. The patient remained well off of antimicrobials after ten months.

## CASE STUDY 2

In August 2004, a healthy 47-year-old Caucasian male presented to the University of Louisville Hospital after an

all-terrain vehicle rollover accident. He was admitted with multiple, left side rib fractures. The patient was hemodynamically stable with non-life threatening injuries that did not require surgical intervention.

Physical exam revealed no fever, but crepitus consistent with his injuries. His head, neck, cardiac and abdominal exams were unremarkable except for an abrasion on his forehead. Initial medical management included placement of a spinal epidural for pain management. Post-traumatic respiratory failure occurred on hospital day three requiring intubation and mechanical ventilation. Although he was weaned five days later, re-intubation was necessary. Ciprofloxacin was started when *Pseudomonas aeruginosa* grew from a sputum culture, followed by one of two blood cultures taken six days later that was positive for *P. luteola*. Characteristics of the culture showed yellow, flat, rough, lobate colonies with concentric rings. Identification of the organism was by the Microscan Walkaway (Dade Behring, Inc., Sacramento, CA, USA), followed by confirmation with the API 20E (bioMérieux, Inc., Durham, NC, USA). Follow-up cultures were negative. On hospital day 25, the patient was successfully transferred to a rehabilitation facility.

## DISCUSSION

*P. luteola* is an aerobic, motile, non-spore forming gram-negative rod that produces a characteristic yellow pigment. It is also oxidase-negative, catalase-positive, MacConkey-positive, and non-fermenting with round, smooth colonies that may become rough or wrinkled after 48 hours of incubation. Several other organisms are glucose oxidizing, non-fermenting, MacConkey-positive and oxidase-negative, such as *Acinetobacter baumannii*, *Pseudomonas oryzae*, *Burkholderia cepacia*, and *Stenotrophomonas maltophilia*, but only *P. luteola* is distinguished by having a yellow pigment, growing at 42 degrees Celsius, being esculin-positive, ONPG positive, and arginine dihydrolase-positive.

*P. luteola* was first described by Tatum et al (1974).<sup>2</sup> Since then, it has only been involved in 17 reported infections.<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15</sup> The use of steroids, the presence of a foreign body and post-surgical instability have been suggested to predispose to infection with *P. luteola*.<sup>1,8</sup> In our cases, however, the patients were not prescribed steroids (e.g. prednisone, steroid inhaler), did not have any foreign material in their bodies nor were they critically ill.

No other reported cases have been associated with tick bites,

and only two other cases have been in immunocompetent patients, both of whom also had cutaneous lesions. One patient injured his finger with a hammer in the tree clearing industry,<sup>14</sup> and the other patient had a gluteal abscess with bacteremia at the site of an injection.<sup>15</sup> The three other cases involving skin and soft tissue infections included bacteremia in a homosexual man with facial cellulitis,<sup>9</sup> a superficial cutaneous infection over the right nasal septum in a patient with human immunodeficiency virus,<sup>10</sup> and a leg ulcer in a patient with sickle cell disease.<sup>13</sup> The antimicrobial sensitivities obtained in the present cases were similar to those reported previously (table 1).

Previously, *P. luteola* was noted in patients with bacteremia, endocarditis, meningitis, peritonitis, and osteomyelitis. The diversity of the 17 published case reports does not reveal an epidemiological trend. Furthermore, not even the association with immunosuppressed patients that has been emphasized may be consistent with the broad pathophysiologic capability of this organism.<sup>9</sup> The present cases support the introduction of infections with *P. luteola* in immunocompetent patients.

The diversity of patient presentations complicates determining how *P. luteola* is acquired. The port of entry for our first patient may have been a tick bite that allowed a breach in his integument. Our second patient may have acquired it similarly to *P. aeruginosa* in other ventilator-associated pneumonias. Exposure to *P. luteola* in water may begin to explain how both patients acquired the pathogen. *P. luteola*, which possesses beneficial kinetic characteristics for microbial decolorization of azo dye, is released into water in the environment, and subsequently has been isolated from sink drains and respiratory therapy equipment.<sup>2,16,17</sup>

## CONCLUSION

In summary, the environmental organism *P. luteola* is known to cause human disease, and its association with catheters or peritonitis in immunocompromised patients has been emphasized. In the present cases, however, *P. luteola* caused a skin and soft tissue infection and pneumonia in two immunocompetent patients, respectively. The identification of *P. luteola* in the present patients support its opportunistic pathogenicity as well as its adaptation to a diversity of anatomical sites.

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