

MICROBIOLOGY CASE 5-1

A 75-year-old man, Patrick R., presented to the emergency room with fever, shortness of breath, chest pain, and severe, extremely productive cough. Patrick had been a heavy smoker for almost 50 years before he quit 7 years ago, when he was diagnosed with emphysema. Patrick occasionally used oxygen at home when he had difficulty breathing, and on presentation he was using portable oxygen because of his severe respiratory distress. A chest x-ray revealed a right lower lobe infiltrate, and Patrick was admitted to the hospital. Sputum, urine, and blood cultures were collected.

The direct Gram's stain of the sputum specimen revealed the following:

Many neutrophils (>25 per low-power field)

Rare squamous epithelial cells (<1 per low-power field)

Many gram-positive lancet-shaped diplococci and cocci in short chains
(>25 per oil immersion field)

Few gram-negative diplococci (<10 per oil immersion field)

Few gram-positive bacilli (<10 per oil immersion field)

After overnight incubation at 35°C in 5% to 7% CO₂, a blood-agar plate inoculated with the specimen revealed a mixture of two colony types. Rare, non-hemolytic, tiny, white, dry-looking colonies were present. A predominance of small, wet-looking, convex (crater-form), entire-edged colonies were also seen, with a greening of the medium around them.

The urine culture showed no growth at 24 hours. All blood cultures were negative after 5 days' incubation.

QUESTIONS

1. Based on the direct Gram's stain, what is the quality of this sputum specimen? Is this specimen of acceptable quality to provide clinically relevant information?

2. Based on the colony morphology and the Gram's stain, what organism is suspect as the cause of Patrick's pneumonia?
3. What type of hemolysis is being described by the term "greening" of the medium?
4. What other (nonpathogenic) organisms commonly found in this type of specimen also cause this type of hemolysis?
5. What laboratory tests are useful in differentiating these organisms and identifying the pathogen? List at least two tests, and be sure to include expected reactions for each organism.
6. Organisms other than the predominant organism were seen in the Gram's stain and culture. Does this mean that the patient has a polymicrobial pneumonia? Why are those other organisms present?

7. Should antimicrobial susceptibility testing be performed on this pathogen? If so, what antimicrobial agent(s) should be tested? If not, why not?
8. What virulence factor does the pathogen possess that can help it evade the host's defense mechanisms?
9. What preventative measures can be used to prevent infection or reinfection with this pathogen?
10. In this case, the symptoms were quite diagnostic of pneumonia. Why were urine and blood cultures also collected?

RECOMMENDED READINGS

Koneman, Elmer W., et al. (1997). *Color Atlas and Textbook of Diagnostic Microbiology*. 5th ed. Philadelphia: J. B. Lippincott.