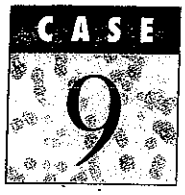


The patient was a 5½-week-old male who was transferred to our institution with a 10-day history of choking spells. The child's spells began with repetitive coughing and progressed to his turning red and gasping for breath. In the prior 2 days, he also had three episodes of vomiting in association with his choking spells. His physical examination was significant for a pulse rate of 160 beats/min and a respiratory rate of 72/min (both highly elevated). The child's chest radiograph was clear. There was no evidence of tracheal abnormalities. His white cell count was 15,500/μl with 70% lymphocytes. The culture from the nasopharyngeal swab is seen in Fig. 1.

1. What was the organism infecting this child?
2. Were this child's clinical course and chest radiograph consistent with his infection? Explain your answer.
3. Why are specimens from the nasopharynx the specimens of choice in the diagnosis of this infection? Other than culture, what other methodology can be used to identify the presence of this pathogen in a specimen?
4. Why did this patient have a predominance of lymphocytes?
5. Vaccination is important in protecting children from infection with the organism infecting this child. How has the vaccine used to prevent this infection changed? What events led to this change?
6. The drug of choice to treat this infection is erythromycin. Clinically, the cough may persist for some time following therapy with erythromycin. Give possible reasons why a cough may persist in the face of erythromycin therapy.

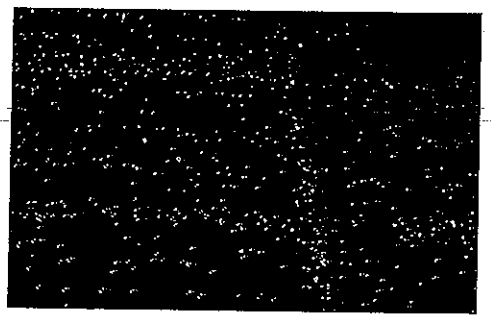
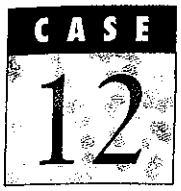


Figure 1

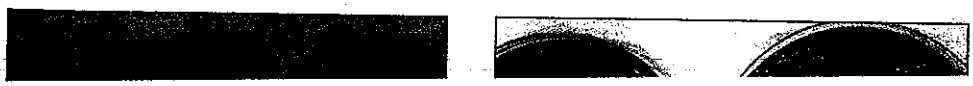
Gilligan et al, Cases in Medical Microbiology 3rd ed, 2003

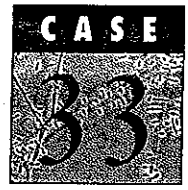


This 40-year-old male with multisystem failure secondary to bilateral pneumonia was transferred to our hospital via helicopter. He had presented to his local physician 3 days previously complaining of fevers, malaise, and vague respiratory symptoms. He was given amantadine for suspected influenza. His condition became progressively worse, with shortness of breath and a fever to 40.5°C, and he was admitted to an outside hospital 24 hours prior to transfer. A laboratory examination revealed abnormal liver and renal function. Therapy with Timentin (ticarcillin-clavulanic acid) and trimethoprim-sulfamethoxazole was begun. On admission, he underwent a bronchoscopic examination that revealed mildly inflamed airways containing thin, watery secretions. A Gram stain of bronchial washings obtained at bronchoscopy is shown in Fig. 1. Based on these findings, he was begun on appropriate antimicrobial therapy. Culture results are shown in Fig. 2.

Despite appropriate antimicrobial agents and supportive therapy, the patient never recovered adequate pulmonary function and died 9 months later in a long-term care facility.

1. Which organisms are common causes of community-acquired pneumonia?
2. What are bronchial washings and how are they obtained?
3. On the basis of the Gram stain of the bronchial washings and the patient's presentation, what is the most likely cause of this patient's catastrophic infection? Why must the laboratory be notified if this organism is considered in the differential diagnosis?
4. What techniques other than culture can be used to detect this organism within 24 hours of obtaining the culture?
5. What is the epidemiology of this organism? What infection control precautions are necessary with this patient?
6. What is the appropriate antimicrobial agent for treatment of this infection?





This 65-year-old woman was bitten by her cat on the dorsal aspect of the right middle finger at 8:00 a.m. She rinsed the bite with water, and at 4:30 p.m. she noted pain and swelling in the finger and the dorsum of the right hand. She then noted pain in the axilla, red streaking up the forearm, and chills. On examination, she had a temperature of 38°C and her right upper extremity was notable for swelling, erythema, warmth, and tenderness on the dorsum of the hand. Two small puncture wounds were seen on the proximal phalanx of the long finger, and erythema was visible over the extensor surface of the forearm. Axillary tenderness was also noted. Laboratory studies demonstrated an elevated white blood cell count of 12,000/μl with a left shift (the presence of immature neutrophils in the peripheral blood). Aspiration of an abscess on her finger was sent for culture, and the patient was taken to the operating room for incision and drainage of the abscess. Gram stain of the organism causing this woman's infection is seen in Fig. 1, and Fig. 2 shows cultures on sheep blood and chocolate agars. There was no growth on MacConkey agar.

1. Which organism was isolated on culture of the abscess?
2. What is the reservoir of this organism? How do humans most commonly become infected by this organism?
3. How can infection with this organism be prevented?
4. What other clinical syndromes can be caused by this organism?

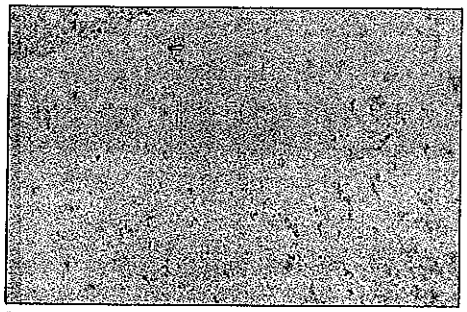


Figure 1

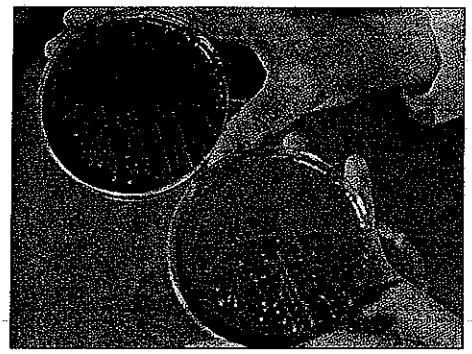


Figure 2

The patient was a 34-year-old male who presented with a 6-week history of acute, intractable lower back and right leg pain. A magnetic resonance imaging (MRI) study was done and showed a large extradural defect at the L4-5 space in the lumbar spine. The MRI study was consistent with a possible herniated disk, and he was admitted for surgery. A frozen section done during the operative procedure showed acute inflammation. A biopsy from the lumbar spine was sent for pathologic testing and culture. The tissue showed acute and chronic inflammation as well as scattered giant cells consistent with granulomatous inflammation. On the basis of the operative findings, purified protein derivative (PPD) and control skin tests were placed immediately postoperatively. The patient was anergic. Laboratory studies were within normal limits except for an elevated erythrocyte sedimentation rate. Cultures of biopsy material and blood cultures obtained postoperatively grew the organism shown in Fig. 1 (Gram stain) and Fig. 2 (growth on sheep blood agar). This organism was rapidly urease positive.

When the identity of the organism infecting this patient was known, a more extensive social and travel history was elicited. It was learned that 11 months earlier he had visited his family in Mexico. During his visit, both his mother and a brother had a febrile illness. He also admitted to consuming goat milk and cheese obtained from his father-in-law, who raised goats.

1. What organism do you think is causing his infection? You should be able to give the species name based on a clue in the case. What is the clue?
2. Why was a PPD test done on this patient? What does anergic mean? What skin test antigens are used to test for anergy?
3. In what organs are lesions usually seen with infection due to this organism? Explain the probable steps in the pathogenesis of this patient's infection.
4. What factors concerning the pathogenicity of this organism should be taken into account when deciding on antimicrobial therapy to manage the infection?
5. If this patient had no identifiable risk factor for the organism that was infecting him, what possibility must be considered?

MICROBIOLOGY CASE 5–10

A 73-year-old man, Elmer W., reported to his physician with complaints of fever, nausea, and abdominal pain and tenderness of 2 days' duration. Elmer was a chronic diabetic with end-stage renal disease. His diabetes was being regulated with insulin injections and diet. His kidney disease was being treated with continuous ambulatory peritoneal dialysis (CAPD). On examination, Elmer was tachycardic and had a temperature of 103.6°F. Before dialysis, blood was drawn for CBC, routine chemistry analysis, and culture. A sample of CAPD fluid was also collected for routine culture and sensitivity testing. See Tables 5–2 to 5–4.

■ Table 5–2 ■ HEMATOLOGY RESULTS

	CBC	
	Elmer W.	*Reference Range*
WBC	9.5	5–10 × 10^9/L
RBC	3.29	5–6 × 10^{12}/L
Hb	98	135–180 g/L
Hct	.31	.41–.53 L/L
MCV	95	80–100 fL
MCH	30	26–34 pg
MCHC	31	31–37%
RDW	14.8	11.0–14.5
Platelets	202	150–400 × 10^9/L
MPV	6.5–12.0 fL	
RBC morphology:	1+ microcytes	
	1+ macrocytes	
	2+ target cells	
	1+ burr cells	

	Differential	
	Elmer W.	*Reference Range*
Polymorphonuclear neutrophils	77	25–60%
Bands	3	0–10%
Lymphocytes	18	20–50%
Monocytes	2	2–11%

■ Table 5–3 ■ CHEMISTRY RESULTS

	Elmer W.	*Reference Range*
ALT	88	6–37 U/L
ALP	101	30–90 U/L
Cholesterol	245	< 200 mg/dL
Triglycerides	320	67–157 mg/dL

■ Table 5–3 ■ CHEMISTRY RESULTS *(continued)*

	Elmer W.	*Reference Range*
Chloride	107	95–105 mEq/L
Amylase	301	95–290 U/L
Lipase	2.2	0.5–1.2 U/L
Random glucose	246	65–110 mg/dL
Total protein	5.0	6.0–8.0 g/dL
Albumin	1.9	2.6–5.2 g/dL
BUN	85	5–20 mg/dL
Creatinine	5.8	< 1.2 mg/dL
Potassium	6.0	3.5–5.0 mEq/L
PO_4	6.2	2.7–4.5 mg/dL
Sodium	133	135–145 mEq/L
CO_2	18	21–28 mmol/L
Ca^{++}	7.5	8.6–10.0 mg/dL

Abbreviations: ALP, alkaline phosphatase; ALT, alanine aminotransferase; BUN, blood urea nitrogen.

On examination in the laboratory, the CAPD fluid appeared turbid, and the initial Gram's stain revealed many neutrophils and numerous gram-negative bacilli. After overnight incubation, the culture plates (both BAP and chocolate agar) showed large, spreading, gray colonies. Blood cultures showed no growth after 5 days.

Biochemical results from the organism isolated from the CAPD fluid are shown in Table 5–4.

■ Table 5–4 ■ MICROBIOLOGY RESULTS

Dulcitol = negative	Nitrate = positive	Lysine decarboxylase = negative
Sucrose = positive	VP = positive	Arginine dihydrolase = positive
Lactose = positive	Motility = positive	Ornithine decarboxylase = positive
Sorbitol = positive	Indole = negative	Phenylalanine deaminase = negative
Arabinose = positive	DNase = negative	Urea = positive
Citrate = positive	TSI = A/A no H_2S	Oxidase = negative

Abbreviations: VP, Voges-Proskauer; TSI, triple-sugar iron agar.

QUESTIONS

1. Based on the data presented here, what organism is most likely causing Elmer's peritonitis?

2. What general characteristics do members of the family *Enterobacteriaceae* have in common?

3. What biochemical reactions are most helpful when identifying organisms within the family *Enterobacteriaceae*?

4. What biochemical reactions were key to identification of this organism to the genus level?

5. What biochemical reactions were key to identification of this organism to the species level?

6. Many different methods may be used to determine indole production. Independent of the method used for detection, what precursor must be present in the growth media in order to perform an indole test?

7. Explain the nitrate reductase test. Be sure to include the method of detection and the confirmation process.

8. What do the methyl red (MR) and VP tests measure?

9. Given the biochemical reactions of this organism, describe the appearance of this organism on MAC.

10. a. List the carbohydrates present in TSI and state their relative concentrations.

    b. If an organism is A/A on TSI and colorless on MAC, what can be deduced about that organism with respect to its ability to use each carbohydrate in TSI?