CASE 6

The patient was a 5-year-old male who awoke on the day prior to evaluation with a sore throat and fever. His mother had him stay home from kindergarten and treated him symptomatically with Tylenol. He slept well but the next day awoke still complaining of sore throat and fever, as well as headache and abdominal pain. He was an only child and neither parent was ill.

On physical examination, he was noted to have a fever of 38.4°C. His physical examination was significant for a 2+ (on a scale of 1 to 4+) red anterior pharynx, tonsillar region, and soft palate. His anterior cervical lymph nodes at the angle of the mandible were slightly enlarged and tender. No skin lesions or rashes were seen. A culture of the organism causing this patient's infection is shown in Fig. 1.

1. What is the most likely organism causing this patient's infection?
2. Why is detection of this organism important in management of this infection? How can this organism be detected? What are the strengths and weaknesses of these methods?
3. This patient is at risk for two noninfectious sequelae. What are they? Briefly describe our current understanding of the pathogenesis of these two disease processes.
4. What antimicrobial resistance problems have been observed with this organism?
5. Sore throat associated with a maculopapular rash is frequently seen with this organism. What is this usually benign condition called? What virulence factor is believed to be responsible for production of this rash?
6. What potentially fatal infection has been seen with increasing frequency with this organism? What virulence factors produced by this organism are believed to be important in the pathogenesis of this infection?
7. What is the current status of vaccine development for this organism?

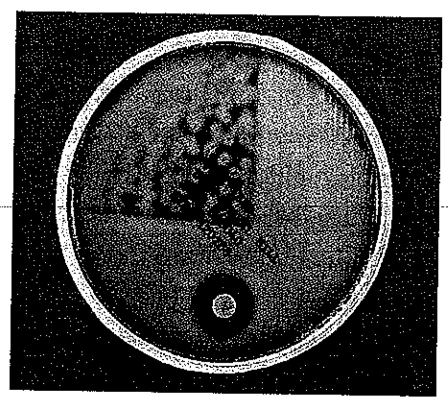

Figure 1

Cases 6, 7, 32,40, and 42 taken from:
Gilligan et. al. Cases in Medical Microbiology and Infectious Diseases 3rd, 2003, ASM Press, Washington.

[b] CF, cystic fibrosis.
[c] dsDNA, double-stranded DNA.
[d] ssRNA, single-stranded RNA.

CASE 7

The patient was a 64-year-old retired postal worker with a medical history of extensive facial reconstruction for squamous cell carcinoma of the head and neck. He had a 30-year history of smoking. The patient presented with progressive shortness of breath; a persistent, productive cough; purulent sputum; and fever to 39.0°C 2 days prior to admission.

On physical examination he had a temperature of 37.3°C, respiratory rate of 18/min, pulse rate of 103 beats/min, blood pressure of 154/107 mm Hg, and pO_2 of 92 mm Hg. Chest auscultation revealed coarse breath sounds at the left lower base with bibasilar fine crackles. He was found to have a left lower lobe infiltrate on chest radiograph. His admission white blood cell count was 10,600 with 70% neutrophils, and his hemoglobin was 9.4. Sputum Gram stain at admission revealed >25 polymorphonuclear cells and >25 squamous epithelial cells. Because of the high numbers of squamous epithelial cells, the specimen was not processed further. Two blood cultures obtained at admission revealed the organism seen in Fig. 1. The Gram stain from the blood culture bottle is shown in Fig. 2. Of note: this was the patient's third episode of this illness in the past month. Isolates from all three episodes belonged to the same serotype, type 23.

1. What is the organism causing this individual's infection? What are his risk factors for becoming infected with this organism?
2. What other patient populations are at risk for infection with this organism?
3. The organism infecting this patient produces two different virulence factors. What are they and what role do they have in the pathogenicity of this organism? 2.
4. What strategies are available to prevent infections with this organism? Why are preventive strategies becoming of greater importance with this organism? 3.
5. How do you explain the patient's having repeated episodes of infection with the same serotype of this organism? There are at least two and possibly more explanations.

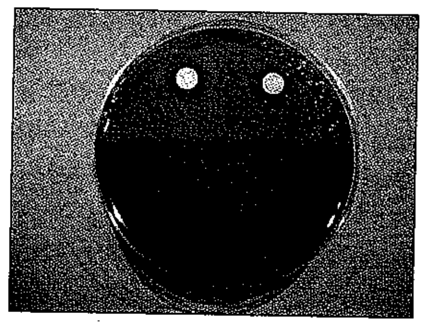

Figure 1

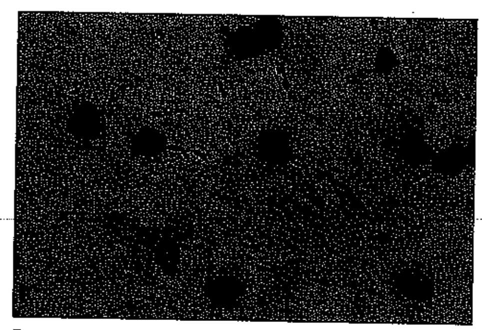

Figure 2

2. Why were incision and drainage necessary to treat this infection? Why would antimicrobial agents alone not be effective in treatment of this infection?

3. What other types of infections does this organism frequently cause?

4. Two days after the incision and drainage, the susceptibility results of this patient's isolate were available (Fig. 4). When these results were known, the patient's physician changed his antimicrobial therapy. Why was this done? Explain the mechanisms of resistance seen in this isolate. Hint: there are two different mechanisms at work here. How common is each one for this organism?

5. A new drug resistance problem is emerging with the organism infecting this patient. What is it? Is this patient at risk for becoming infected with a strain of this organism? Explain.

6. If this patient initially presented with fever, diffuse skin rash, low blood pressure, and diarrhea, what virulence factor might the organism causing his cellulitis be producing? Briefly explain how it causes its pathophysiologic effect.

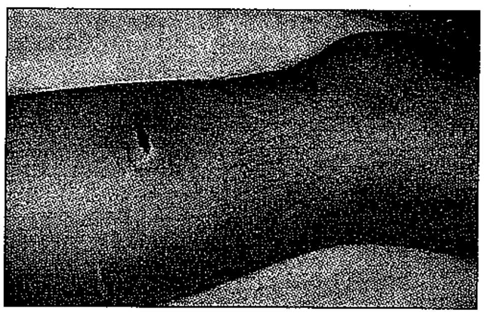

Figure 3

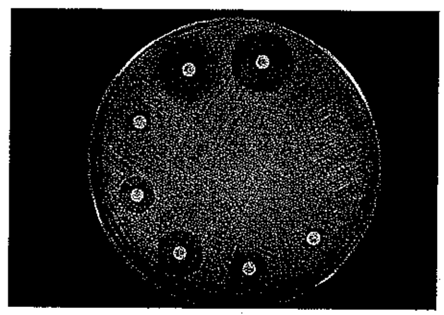

Figure 4 Disks (clockwise, starting at 4 o'clock): penicillin, oxacillin, gentamicin, vancomycin, erythromycin, clindamycin, trimethoprim/sulfamethoxazole.

CASE 32

The patient was a 45-year-old male who was in his usual state of good health when he awoke at 3 a.m. with pain in the lateral aspect of his left calf. He looked at his calf and thought that the pain was due to an ingrown hair and went back to sleep. At 10 a.m., he expressed a small amount of pus from the ingrown hair. Over the next 8 hours, the patient developed an area of cellulitis on the lateral aspect of the calf of approximately 5 by 10 cm. At that time, a small amount of pus was again expressed from the area of the ingrown hair. The next morning, the area of cellulitis extended from just below the knee to just above the ankle. The patient visited his physician. His vital signs at that visit, including pulse, respirations, blood pressure, and temperature, were all within normal limits. Physical exam was significant for an area of cellulitis as described that was red and warm to the touch but with no area of obvious fluctuance. No lymphadenopathy was observed. The central area of the cellulitis, near the area that the patient described as where the ingrown hair had been, was punctured three times with a 20-gauge needle but no pus was drained. The patient was referred to the surgery service. The surgeons examined the patient and said they would follow him. The patient was given 2 g of ceftriaxone intramuscularly and begun on oral cephalexin.

The patient returned to the surgical clinic 48 hours later with an obvious area of fluctuance in the center of the area of cellulitis. Over the preceding 48 hours, the patient reported low-grade fevers. Approximately 1 ml of pus was aspirated and was sent for Gram stain and culture (Fig. 1 and 2). When pus was aspirated from the lesion, the surgeon decided to excise and drain the lesion (Fig. 3).

1. Based on Gram stain and culture, what is the organism most likely causing this patient's infection? How do you think he became infected with this organism?

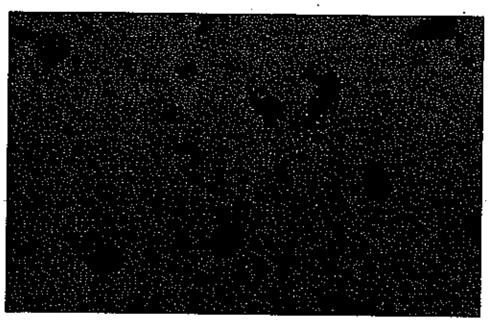

Figure 1

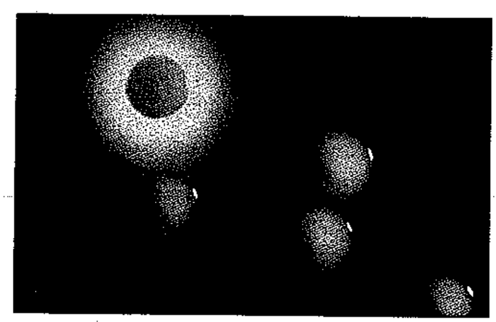

Figure 2

CASE 40

The patient was a 4-year-old female with a fraternal twin. Her medical history was unremarkable and her vaccination status was appropriate for her age. During the previous week, she and her twin and two younger siblings had had upper respiratory tract infections with nasal congestion. On the night prior to admission, she developed fever and left ear pain. She was examined and found to have a bulging left eardrum consistent with otitis media. She was begun on oral amoxicillin/clavulanic acid. Early the next afternoon, she continued to have fever and was irritable. Later that afternoon, she also complained of a headache and neck pain and was brought to the emergency department. On physical examination, she was lethargic, listless, and had a stiff neck. There were no focal neurologic findings, but it was noted that she had a rash on her right cheek which the physician thought might be an early stage of a petechial rash. He performed a lumbar puncture. The fluid was cloudy with a white blood cell (WBC) count of 6,750/μl (normal, 0 to 3 cells/μl), 95% being neutrophils, and 189 red blood cells/μl. Her cerebrospinal (CSF) protein level was 170 mg/dl (normal, 15 to 45 mg/dl) and CSF glucose level was 25 mg/dl (normal, 50 to 75 mg/dl). A Gram stain of the CSF is shown in Fig. 1. The culture of the organism recovered from CSF is shown in Fig. 2. Of note, her serum immunoglobulin (Ig) levels (IgG, IgA, IgM) were normal.

1. What pathologic process is going on in this child? What organism do you think is infecting this patient?
2. What is the significance of her having otitis media in the development of her infection? What is the major virulence factor(s) produced by this organism? When this organism does not produce one of these virulence factors, what types of infection does it typically cause?
3. What is the significance of her developing a petechial rash? What organism that causes bacterial meningitis frequently has this type of rash associated with it? What are the pathophysiologic events respsonsible for the rash?

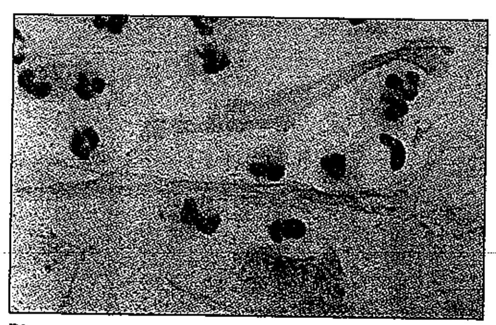

Figure 1

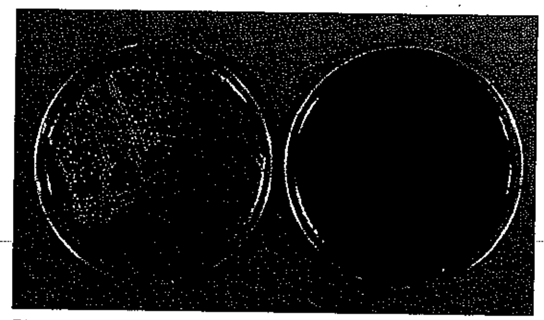

Figure 2

CASE 42

The patient was a 3½-week-old male who was born at term by cesarean section. At birth he had a left diaphragmatic hernia that was repaired soon thereafter. He required intubation at that time and continued to require respiratory support. Over a 24-hour period, the infant developed bulging anterior fontanelles, increased respiratory and heart rates, wide fluctuations in blood pressure, and difficulties maintaining adequate tissue perfusion, and his peripheral white blood cell (WBC) count increased from 6,300 to 13,700/μl. The child began to have focal seizures as well. A cerebrospinal fluid (CSF) examination showed 3,900 WBC/μl with 92% neutrophils, glucose level of 2 mg/dl, and protein level of 350 mg/dl. Gram stain of the child's CSF is shown in Fig. 1. The organism from the CSF is shown in Fig. 2.

1. What is your diagnosis for this patient? Is it consistent with his physical and laboratory findings? Explain.
2. What is the most likely organism causing his infection? What other organism has similar Gram stain and colonial morphology? What simple, rapid test would you use to distinguish these two organisms?
3. There are two forms of this infection in neonates. Compare and contrast these two forms. Which form does this patient have?
4. Beside infections in neonates, what other populations are at risk for invasive infection with this organism?
5. Describe the key virulence factor produced by the infecting organism and discuss its rôle in pathogenesis of infection. 3
6. Vaccines are currently under development for this organism. Describe the components that you would include in this vaccine. Who should receive this vaccine? Why would they receive it?
7. Since vaccines against the organism are not currently available, discuss strategies for prevention of neonatal infections with this organism. How effective have they been in preventing early-onset disease? How effective have they been in preventing late-onset disease?

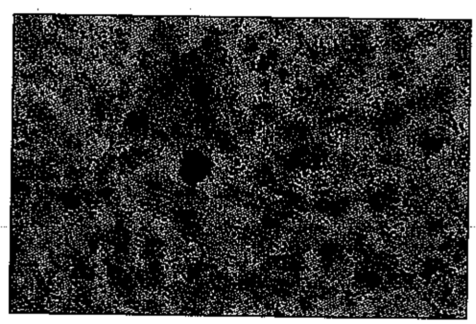

Figure 1

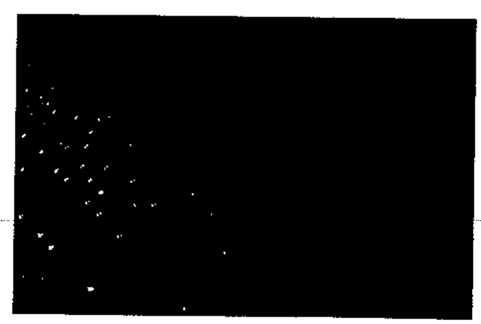

Figure 2

Reproductive Organ Case Studies - Part II

CASE 5: Chancroid (Haemophilus ducreyi)

A 43-year-old male truck driver who has been divorced for two years is driving a full load of wood products from Los Angeles to Dallas by himself. After a long hot day on the road, he decides to eat dinner at an interstate truck stop in a distinctly rural part of eastern New Mexico. While eating dinner at the counter, he is engaged in conversation by an unusually friendly young woman. Eventually, it becomes clear that this woman is a professional "escort" who is looking for some business. The woman appears to be on the desperate end of the escort business, as the proposed charge for services is very reasonable. The man's cargo is not time-sensitive, so he decides to avail himself of this unexpected opportunity. The escort has no entertainment facilities of her own, so they use his truck's sleeper cab. He is concerned about not taking precautions, but the escort assures him that she is not infected with an STD.

About one week later, the man notices that three papular lesions have formed on his penis. The area surrounding these lesions is erythematous. Over the next 2 to 3 days, the papules evolve into pustules, which then rupture and form sharply circumscribed ulcers that are painful and bleed easily if disturbed. By the time the man seeks medical help, two of these ulcers have coalesced to form a larger ulcer. The man's vital signs are normal. The physical examination reveals tender inguinal lymphadenopathy.

Question 5.1: What is your preliminary diagnosis?

The location of the ulcers and the man's recent history indicate that an STD is likely. Although it is not possible to make a definitive diagnosis from the symptoms alone, they are suggestive of chancroid. The differential includes syphilis, genital herpes, granuloma inguinale, and lymphogranuloma venereum (LGV). Pain is uncommon in syphilis and granuloma inguinale, whereas the lesions of genital herpes and LGV are usually superficial and very seldom bleed. Based on these distinctions, chancroid seems the most likely possibility (see Table 1, below).

Question 5.2: What is the causative agent?

The causative agent of chancroid is a bacterium named Haemophilus ducreyi, which is a Gram-negative coccobacillus. Because this organism has a fastidious metabolism, it is rather difficult to culture in the lab. Selective and supplemental media are usually required for this purpose.

Question 5.3: How is the diagnosis confirmed?

Gram staining of a swab of one of the lesions might reveal a predominance of the characteristic Gram-negative coccobacilli associated with this disease, but the presence of other bacteria often makes it difficult to interpret the results. A definitive diagnosis of chancroid depends on culturing of H. ducreyi from one of the lesions, in which case the lab must be told to look specifically for this organism. Because this is an STD, you may want to order tests for other common sexually transmitted pathogens as well, in order to eliminate the possibility of a mixed infection.

Question 5.4: What is the prevalence of this disease?

Chancroid is a common cause of genital ulcers in developing countries. Although less common, it is also endemic in some parts of the U.S. and several large outbreaks have occurred since 1981. The incidence of chancroid in the U.S. will undoubtedly increase in coming years. Chancroid is the third most frequent cause of genital ulcers in the U.S (after genital herpes and syphilis).

Question 5.5: How is this disease transmitted?

Transmission is by direct sexual contact. Transmission is predominantly heterosexual, and prostitutes have been important in transmission of the disease. The disease occurs more frequently in men than in women, with the male:female infection ratio ranging from 3:1 to 25:1. Symptomatic infections are rare in women. Chancroid has been strongly associated with illicit drug use.

Question 5.6: How is this disease connected to AIDS?

Chancroid is associated with HIV infections because of the role of genital ulceration in the transmission of HIV. The lesions provide an opening for blood-to-blood transfer of the virions during intercourse, thereby rendering a chancroid victim more susceptible to HIV. This is thought to be a highly significant factor in the transmission of AIDS in Africa and other areas where chancroid is common and where AIDS is frequently transmitted during sexual intercourse involving prostitutes. Chancroid also plays a role in HIV transmission in the U.S. and may become increasingly important in this regard over the next few years.

Question 5.7: How is this disease treated?

Several regimens have proven to be effective, including: azithromycin (1 g PO single dose), ceftriaxone (250 mg IM single dose), ciprofloxacin (500 mg PO bid x 3 days), or erythromycin (500 mg PO qid x 7 days). (Ciprofloxacin is contraindicated in patients who are pregnant, lactating, or less than 18 years of age.) Patients should be reexamined 3 to 7 days after initiation of antimicrobial therapy. Ulcers should improve symptomatically within 3 days and objectively within 7 days after initiation of successful therapy.