Fungal infections are caused by microorganisms that can be found in soil, air, and water as well as on plants, animals, and people. There are at least 100,000 species of fungi. They can be the cause of both superficial and systemic infections. Superficial fungal infections, such as ringworm or athlete’s foot, are common in the athletic population. Systemic infections, which take opportunity inside the body’s tissues and organ systems, are uncommon among healthy athletes. These widespread infections usually occur in those with a compromised immune system, such as individuals with AIDS, cancer, or organ transplants. When a healthy athlete is exposed to a fungus, the immune system is usually sufficiently competent to prevent a systemic infection from occurring. Fungal lung infections are commonly caused by Aspergillosis, Blastomycosis, Histoplasmosis, Cryptococcus, and Coccidioidomycosis. Aspergillosis is the most common source of fungal lung infections. It enters the system simply by inhaling the spore. Pulmonary Aspergilli is very common and usually develops in open spaces in the body, such as the lungs. The infection develops into a ball of tangled fungus fibers, blood clots, and white blood cells. The ball gradually enlarges and can destroy lung tissue. Although the mass itself does not spread, the irritation created can cause severe illness (see Figure 1).

Figure 1  An example of pulmonary aspergilli compared to a normal lung x-ray.
Symptoms of a fungal lung infection depend on the underlying causes. They can range from hemoptysis (coughing up blood), hematemesis (vomiting up blood), fatigue, fever, chest pain, difficulty breathing, or loss of appetite. If the infection becomes severe, it can progress to septic shock or even death. Diagnosis usually involves a chest x-ray, computed tomography (CT scan), and blood samples. When fungus is suspected, a bronchoscope is performed to obtain tissue samples and cultures to determine the best treatment plan. Treatment for fungal lung infection includes antifungal medications. The selection of antifungal medication depends on the species of the infecting organism. If the fungus ball in the lung grows near large blood vessels, surgery may be required to remove the mass. Fungal infections can be difficult to treat and can cause severe or even fatal infections. For this reason, fungal lung infections should be treated with the aid of a pulmonologist.

**Case History**

A healthy 21-year-old male football player presented with cold symptoms during the middle of the season. He had a productive cough with blood tinged sputum. He denied history of trauma or sick contact. On his initial presentation to the school health center, there was concern for tuberculosis. He had a tuberculin (TB) skin test done, which was negative. He was then examined by the team physician, who reported a normal lung exam and vital signs. He was negative for chest pain, weight loss, fatigue, or fever. He was allowed to continue to play and traveled with the football team for a weekend game. He was given over-the-counter medication by the team physician and played with no limitations. Following the game, he continued to complain of hemoptysis. Subsequently, he was referred to a pulmonologist for further evaluation. At that visit, a CT scan was performed, which revealed a 3-cm mass in the right middle lobe. All blood values were within normal limits.

The pulmonologist believed the mass to be the result of an infectious process, rather than a malignant tumor or tuberculosis. Pneumonia was ruled out, and the student athlete was allowed to play for the remainder of the season. At one month follow-up, he was still having hemoptysis. A repeat CT scan was done, which showed that the lung mass was unchanged. He was treated with an antibiotic for suspected bacterial infection and had a bronchoscope procedure performed. The bronchoscope results showed respiratory abnormality (unspecified) and no malignancy. No further treatment was rendered at that time. A CT scan and blood work was repeated at 5 months after initial presentation. The CT scan showed the lung mass had decreased to 2 cm, blood values were within normal limits, and cough and hemoptysis had completely resolved.

**Discussion**

Because development of hemoptysis is uncommon in a young healthy athlete, it is important to rule out serious lung conditions, such as a malignancy, pneumonia, and tuberculosis. These diagnoses have similar signs and symptoms and initial presentations. TB is a serious bacterial infection that is still one of the world’s deadliest diseases. TB commonly presents with chronic cough, blood sputum, fever, fatigue, and night sweats. It is an airborne disease that is spread as easily as the common cold, i.e., through a simple cough, sneeze, or conversation in close proximity with an infected individual. Due to the ease of transmission, an infected athlete could easily affect an entire football team. In this case, the student athlete had a negative TB skin test called a PPD. His chest X-rays did show a possible mass but the mass did not resemble the common presentation for TB. Therefore with a negative PPD and the chest X-ray findings, TB was ruled out in this athlete.

Pneumonia is much more common lung infection. It can be caused by bacteria, viruses, and fungi. The symptoms of pneumonia are a cough that can produce bloody mucus, fever, shortness of breath, and fatigue. Crackles or coarse sounds in the lungs in the area of infection are commonly presented. This student athlete did not have crackles, nor did his blood values present concern for pneumonia. His chest X-rays showed a focal mass, rather than diffuse infiltrates that are typically presented with pneumonia. Fungal lung infections do not present many of the common lab and imaging findings that are presented with bacterial pneumonia.

Because there was a mass present on his chest X-ray, it was also important to rule out lung cancer. It was this concern that prompted the CT scan and biopsy. The student athlete was not a smoker, nor was