Can you name this pathogen?

A 39 year old, HIV positive male presented with pulmonary complaints. Radiology of the chest showed an enlarged right upper lobe mass (5-6 cm) with no cavitations.

A bronchoalveolar lavage (BAL), bronchial washing (BW), and biopsy were performed one week later and sent for cultures, cytology, and pathology.

Cytology showed no malignant cells and pathology showed chronic inflammation with no granulomas, dysplasia, or malignancy.

The BAL grew 3,000 CFU/ml of a gram-positive organism which was first reported as a rod but changed to a coccus after repeating the gram stain the next day (Figures 1 and 2).

On day three, the Director of Microbiology was consulted. Examination of the slightly pink colonies on the SBA plate (Figure 3) suggested a possible pathogen which was later confirmed by additional testing.

What is your presumptive diagnosis based on clinical history and preliminary morphologic characteristics?
SBA growth on day three revealed colonies with a slight pink coloration when examined closely under light and when picked up on the tip of a swab. A modified acid fast stain was initially inconclusive, but positive when repeated from growth on a subcultured LJ slant (Figure 4).

The organism was subsequently confirmed as *Rhodococcus equi* using an API CORYNE identification strip.

In 1889, Zopf coined the term “Rhodochrous complex” to describe the aerobic actinomycetes with properties of both *Nocardia* and *Mycobacterium*. The *Rhodococcus* designation originates from an ability to produce pinkish colored colonies after prolonged incubation. Related organisms now also include members of *Gordonia* and *Tsukamurella*. The genus *Rhodococcus* contains a diverse group of organisms with variable morphologies, growth patterns, and biochemical characteristics. Cells are aerobic, gram-positive, catalase-positive, and non-motile. *R. equi* (formally called *Corynebacterium equi*) is the most important human pathogen in the genus.

It was first isolated in 1923 from the lungs of foals in Sweden. Since that time *R. equi* has been found in many animals as well as soil samples from most continents. The organism also thrives in both fresh water and marine habitats. *R. equi* is a recognized veterinary pathogen, mainly in horses and an emerging human opportunistic pathogen, especially in immune-compromised hosts. The first human infection was reported in 1967. Between 1967 and 1983, only 12 more cases were reported in the literature. Since 1983, however, many more cases have been reported, the vast majority in immune-compromised patients (two-thirds with AIDS). Historically, 80% of cases have pulmonary involvement, but the organism can also be recovered from tissues and body fluids. The most common form of infection is a necrotizing pneumonia, which may be
complicated by abscess, empyema, pleural effusion, and spontaneous pneumothorax. There is a high propensity for dissemination to the brain, liver, and spleen in AIDS patients.

*R. equi* grows optimally at 30° C (10-40° C) on ordinary non-selective media and colonies that are smooth and mucoid appear within 48 hrs. A salmon-pink pigment may appear after 2 to 4 days. The organism has the ability to vary between coccal and bacillary forms (see Figure 5). The organism can easily be mistaken for diphtheroids, *Bacillus* or *Micrococcus*.

*R. equi* isolates are catalase and oxidase-positive and are usually urease-positive. They are weakly acid fast positive, but frequently only a few cells in the population appear red. *R. equi* also exhibits synergistic hemolysis on SBA when cross streaked with *S. aureus*, *Listeria* or *C. pseudotuberculosis* (Figure 6).

In-vitro testing shows usual susceptibility to a number of antimicrobial agents, but optimal therapy is unknown. Combination therapy using at least two drugs, including one with intracellular activity for at least two months, may be needed.