



**FIGURE 261e-3** Progression of chest x-ray findings in a patient with inhalational anthrax. Findings evolved from subtle hilar prominence and right perihilar infiltrate to a progressively widened mediastinum, marked perihilar infiltrates, peribronchial cuffing, and air bronchograms. (From L Borio et al: *JAMA* 286:2554, 2001; with permission.)

distances up to 10 km. Although the offensive bioweapons program in the United States was terminated prior to production of sufficient quantities of plague organisms for use as a weapon, it is believed that Soviet scientists did manufacture quantities sufficient for such a purpose. It has also been reported that more than 10 Soviet institutes and >1000 scientists were working with plague as a biologic weapon. Of concern is the fact that in 1995 a microbiologist in Ohio was arrested for having obtained *Y. pestis* in the mail from the American Type Culture Collection, using a credit card and a false letterhead. In the wake of this incident, the U.S. Congress passed a law in 1997 requiring that anyone intending to send or receive any of 42 different agents that could potentially be used as bioweapons first register with the CDC.

**Microbiology and Clinical Features** Plague is caused by *Y. pestis*, a non-motile, gram-negative bacillus that exhibits bipolar, or “safety pin,” staining with Wright, Giemsa, or Wayson stains. It has had a major impact on the course of history, thus adding to the element of fear evoked by its mention. The earliest reported plague epidemic was in 224 B.C. in China. The most infamous pandemic began in Europe in the fourteenth century, during which time one-third to one-half of the entire population of Europe was killed. During a plague outbreak in India in 1994, even though the number of confirmed cases was

relatively small, it is estimated that 500,000 individuals fled their homes in fear of this disease. In the first decade of the twenty-first century, 21,725 cases of plague were reported to the World Health Organization (WHO). Over 90% of these cases were from Africa, and the overall case fatality rate was 7.4%.

The clinical syndromes of plague generally reflect the mode of infection. *Bubonic plague* is the consequence of an insect bite; primary *pneumonic plague* arises through the inhalation of bacteria. Most of the plague seen in the world today is bubonic plague and is the result of a bite by a plague-infected flea. In part as a consequence of past pandemics, plague infection of rodents exists widely in nature, including in the southwestern United States, and each year thousands of cases of plague occur worldwide through contact with infected animals or fleas. Following inoculation of regurgitated bacteria into the skin by a flea bite, organisms travel through the lymphatics to regional lymph nodes, where they are phagocytized but not destroyed. Inside the cell, they multiply rapidly leading to inflammation, painful lymphadenopathy with necrosis, fever, bacteremia, septicemia, and death. The characteristic enlarged, inflamed lymph nodes, or *buboes*, give this form of plague its name. In some instances, patients may develop bacteremia without lymphadenopathy following infection, a condition referred to as *primary septicemic plague*. Extensive ecchymoses may develop due