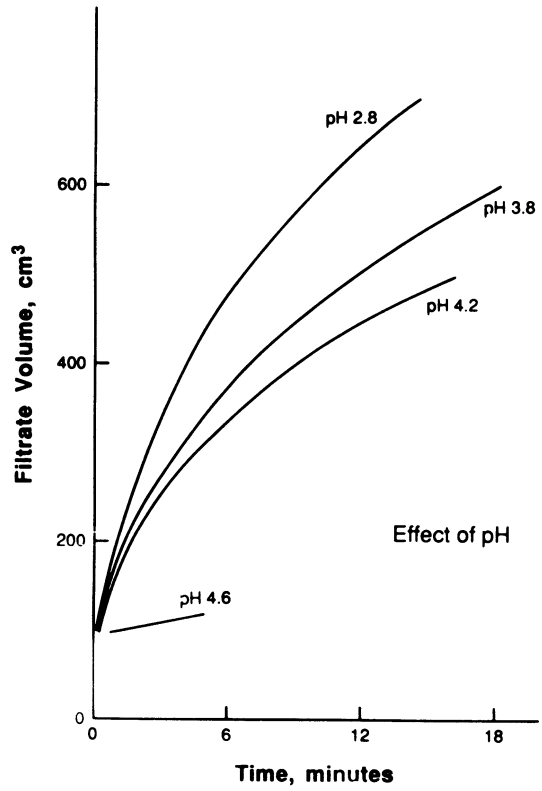

Figure 11.6. Effect of pH on the rate of filtration of *Streptomyces griseus* with 2% filter aid. (With permission, from P. A. Belter, E. L. Cussler, and W-S. Hu, *Bioseparations: Downstream Processing for Biotechnology*, John Wiley & Sons, New York, 1988, p. 18.)

fermentation broth in mycelial fermentations such as penicillin. The duration of fermentation also affects filterability and antibiotic activity in penicillin fermentations and represents an example of the interplay of upstream processing (e.g., fermentation) with downstream processing. Fermentation times of 180 to 200 h are used in penicillin fermentations to minimize the cake resistance and maximize antibiotic activity. Typical filtration conditions for streptomycin fermentations are pH = 3.6, 2% to 3% filter aid, following a heat treatment of 30 to 60 min at $T = 80°$ to 90°C.

Cell separation can also be accomplished by cross-flow filtration using ultrafiltration or microporous filtration. These systems are described in more detail in Section 11.4.8. This technique has achieved rather rapid acceptance and has replaced centrifugation and vacuum filtration in many applications. Cross-flow filtration is well suited to the removal of dispersed cells such as *E. coli* and yeast. Microporous filters with pores of 0.02 and 0.2 μm are useful for bacterial separations, while larger sizes 0.2 to 2 μm can be used with yeast.