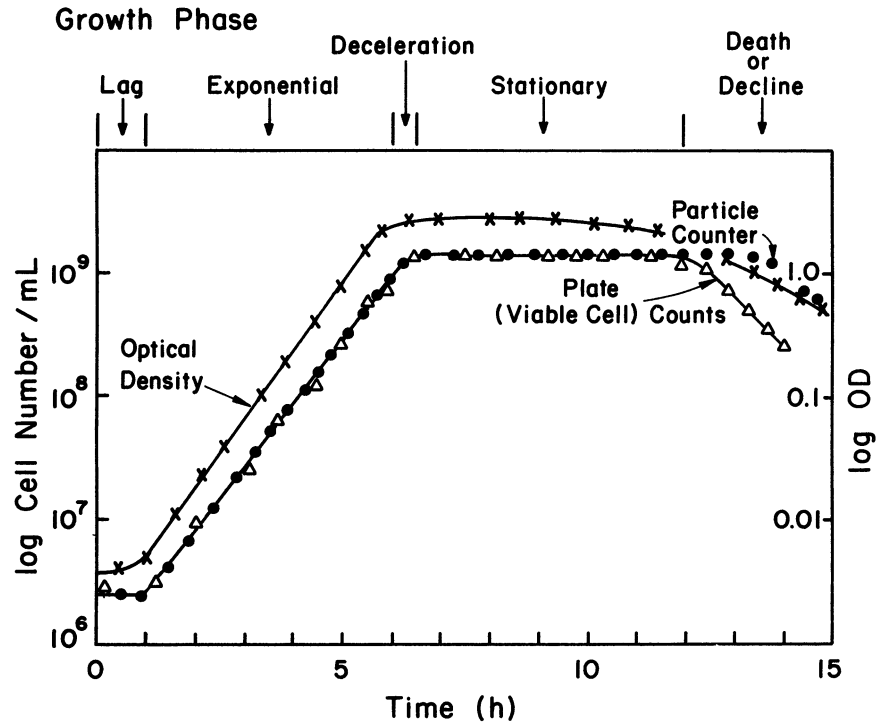

Figure 6.3. Typical growth curve for a bacterial population. Note that the phase of growth (shown here for cell number) depends on the parameter used to monitor growth.

The *lag phase* occurs immediately after inoculation and is a period of adaptation of cells to a new environment. Microorganisms reorganize their molecular constituents when they are transferred to a new medium. Depending on the composition of nutrients, new enzymes are synthesized, the synthesis of some other enzymes is repressed, and the internal machinery of cells is adapted to the new environmental conditions. These changes reflect the intracellular mechanisms for the regulation of the metabolic processes discussed in Chapter 4. During this phase, cell mass may increase a little, without an increase in cell number density. When the inoculum is small and has a low fraction of cells that are viable, there may be a pseudolag phase, which is a result, not of adaptation, but of small inoculum size or poor condition of the inoculum.

Low concentration of some nutrients and growth factors may also cause a long lag phase. For example, the lag phase of *Enterobacter aerogenes* (formerly *Aerobacter aerogenes*) grown in glucose and phosphate buffer medium increases as the concentration of Mg^{2+}, which is an activator of the enzyme phosphatase, is decreased. As another example, even heterotrophic cells require CO_2 fixation (to supplement intermediates removed from key energy-producing metabolic cycles during rapid biosynthesis), and excessive sparging can remove metabolically generated CO_2 too rapidly for cellular restructuring to be accomplished efficiently, particularly with a small inoculum.