

Figure 17-1 Microbial growth and death.

Eventually microbial growth will plateau (stationary phase in Fig. 17-1) when a critical nutrient is depleted or oxygen diffusion cannot go on, or toxic metabolites accumulate. Although variable, the approximate population where stationary phases exist are 10,000,000 cells/mL.

Microbial death kinetics is also exponential. Logarithmic plots of microbial population versus time for heat or gas sterilization or versus dose for radiation sterilization allow microbiologists to develop rate constants for sterilization conditions just like chemical kinetic plots are used to determine drug stability profiles. An example of a microbial death kinetic plot is given in Figure 17-2.

There are several common terms used in microbial death kinetic studies—initial microbial population or bioburden, *D* value, *Z* value, and *F* value.

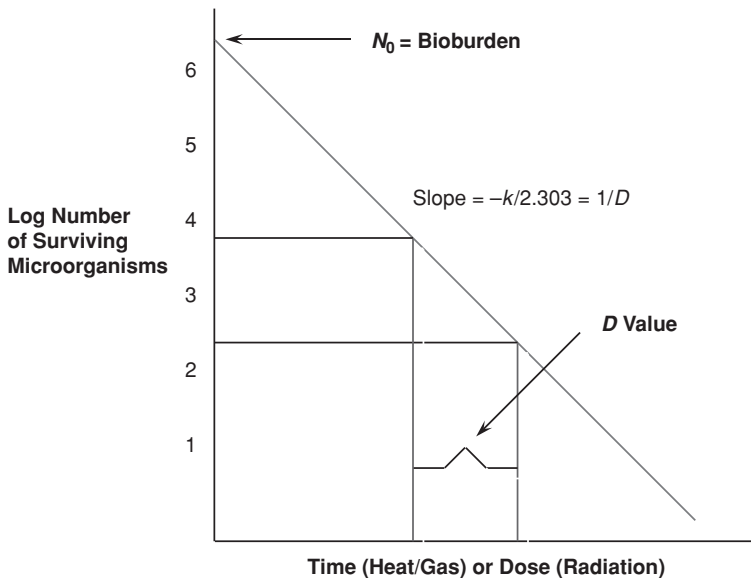


Figure 17-2 Microbial death kinetics. *D* value is defined as the time in minutes required for a one-log cycle or 90% reduction of a microbial population under specified lethal conditions. It is a fundamental biological parameter in sterilization process analysis and can be determined by the survivor curve method or the fraction-negative method.