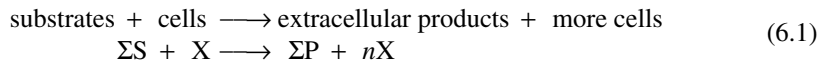


6

How Cells Grow

6.1. INTRODUCTION

For microbes, growth is their most essential response to their physiochemical environment. Growth is a result of both replication and change in cell size. Microorganisms can grow under a variety of physical, chemical, and nutritional conditions. In a suitable nutrient medium, organisms extract nutrients from the medium and convert them into biological compounds. Part of these nutrients are used for energy production and part are used for biosynthesis and product formation. As a result of nutrient utilization, microbial mass increases with time and can be described simply by



Microbial growth is a good example of an autocatalytic reaction. The rate of growth is directly related to cell concentration, and cellular reproduction is the normal outcome of this reaction.

The rate of microbial growth is characterized by the net *specific growth rate*, defined as

$$\mu_{\text{net}} \equiv \frac{1}{X} \frac{dX}{dt} \quad (6.2a)$$