Extracellular signal

Communication by extracellular signals usually involves six steps: (1) synthesis and (2) release of the signaling molecule by the signaling cell; (3) transport of the signal to the target cell; (4) detection of the signal by a specific receptor protein; (5) a change in cellular metabolism, function, or development triggered by the receptor-signal complex; and (6) removal of the signal, which often terminates the cellular response.

In many eukaryotic microorganisms (e.g., yeast, slime molds, and protozoans), secreted molecules coordinate the aggregation of free-living cells for sexual mating or differentiation under certain environmental conditions. Chemicals released by one organism that can alter the behavior or gene expression of other organisms of the same species are called pheromones. Yeast mating-type factors discussed later in this chapter are a well-understood example of pheromonemediated cell-to-cell signaling. Some algae and animals also release pheromones, usually dispersing them into the air or water, to attract members of the opposite sex. More important in plants and animals are extracellular signaling molecules that function within an organism to control metabolic processes within cells, the growth of tissues, the synthesis and secretion of proteins, and the composition of intracellular and extracellular fluids. This chapter focuses on such cell-to-cell signaling in single-celled eukaryotes and in a variety of higher eukaryotes, particularly mammals.