All living organisms are made up of basic structural and functional unit called cell. Barring the acellular organisms such as viruses, viroids, and prions, the simplest form of organization known as unicellular is exemplified by bacteria, protozoa and some lower algae. All other organisms consist of a large number of cells and are thus known as multicellular. A cell is a self-contained unit surrounded by a membrane, that separates it from its surrounding, and has the ability to obtain and process the energy and the material required for sustaining life. The organization and the metabolic capability is determined by the genetic information contained in the cell, that also allows it to reproduce its own organizational and functional pattern.

A cell is broadly classified into two types: (i) the prokaryotic cell lacks the membrane bound organelles particularly the genetic material is not contained within nucleus (the nuclear membrane is absent), and (ii) the eukaryotic cell is more complex containing well-defined organelles including nucleus. Other differences also exist between them. Both archaeabacteria (=archaea) and eubacteria have prokaryotic cell organization. In contrast, protozoa, algae, fungi, plants and animals, all consist of eukaryotic cells. Thus, the differences between prokaryotic and eukaryotic cells represent a fundamental division of living cells with distinct evolutionary implications.

4.1. Shape and Arrangement

The majority of bacteria exist in unicellular forms though assemblages of different kinds are also reported. Three general forms of cell shape, viz., spherical or ellipsoidal, rod-like or cylindrical and spiral or helicoidal are found.

The circular, spherical or ellipsoidal bacterial cell is commonly known as coccus (pl. cocci). These may exist singly (monococcus), or form various types of associations. An association of two such cells is known as diplococcus, a short chain as streptococcus and an irregular arrangement to give an appearance of a bunch is called staphylococcus. Sometimes, eight or more cells may form a cuboidal or packet arrangement called as sarcina (FigA.1).

The rod-shaped cylindrical cells are called bacilli (singular bacillus). These are normally found singly though small associations like a pair (diplobacilli) or streptobacilli with short chains can also be seen. Associations in bacillus type of bacteria may depend upon the culture conditions and stage of growth. Diphtheria bacterium may organize into a plate like or palisade arrangement and tubercle bacilli may occur in short chains of three giving an impression of short branched structures. Many rod-shaped bacteria may acquire very irregular shapes called pleomorphic and some very small rods look spherical and have been termed as coccobacillary type (FigA.1).

The helical bacteria (spirillum, pl. spirilla) consists of spirally twisted cells. The length, number and amplitude of turns in a spiral, however, vary from species to species. The short half-spiral is known as comma or vibrio. In some cases, the curvature may produce a ring-like structure (FigA.1).

Cell shape therefore has been a character of special consideration and many bacteria derive their generic names from such cellular arrangements.