Dental caries is a bacterial disease characterized by de­
mineralization and dissolution of the dental hard tissues. It arises in the crown of the tooth, or the root if this has become exposed to oral fluids, and usually starts in areas of stagnation such as the deep grooves and pits that are normally present in the occlusal surfaces of the molars and premolars and around the areas of contact of adjacent teeth (the interproximal surfaces). It is at these sites that dental or bacterial plaque accumulates.

Dental plaque, the sticky film that forms on the surface of the teeth in the absence of adequate cleaning, consists of micro-organisms in a matrix of polysaccharides and protein. The matrix is derived partly from bacterial metabolism and partly from saliva. The exact composition of plaque varies according to whether it is situated above or below the gingival margin and it is now regarded as the principle etiological factor in both caries and periodontal disease. Initially, plaque consists mainly of streptococci, especially *Strep. mutans*, but as it matures filamentous organisms become much more numerous and often seem to form the bulk of the organisms seen in histological sections. Other less conspicuous organisms in plaque include lactobacilli, actinomyces and gram negative anaerobes. Plaque micro-organisms metabolize carbohydrates in the diet, particularly sucrose, and form lactic acid which can cause demineralization of dental hard tissues. The extracellular polysaccharides produced by plaque organisms such as *Strep. mutans* appear to be of considerable importance in the pathogenesis of caries, not only by contributing to the bulk and adhesiveness of the plaque, but also by retaining close to the tooth surface the acid produced by bacterial metabolism and by inhibiting the diffusion of salivary buffers.

The earliest macroscopic indication of dental caries is a white spot or opacity in the enamel of a tooth in a stagnation area such as a pit or fissure or below an interstitial contact point. A ground section of the tooth at this stage shows an arc-shaped area of demineralization extending from the enamel surface towards the enamel-dentine junction (Figures 3.1 and 3.2). The process spreads rapidly...
and in a lateral direction once it reaches the junction and a relatively large area of enamel thus becomes undermined (Figure 3.3). This causes the weakened enamel to fracture and bacteria can then invade the underlying, and now exposed, dentinal tubules (Figure 3.4). So-called pioneer organisms invade the tubules and can often be seen at a considerable distance from the main carious lesion (Figure 3.5). The tubules then become packed with microorganisms, which may be cocci, bacilli or filamentous types, and eventually they become grossly distended and liquefaction foci form (Figures 3.6 and 3.7). A particularly characteristic feature of advanced dentine caries is the formation of transverse clefts (Figure 3.8).

Unlike enamel, which is an essentially inert substance,