



Figure 2.7. Structure and asexual reproduction of molds. (With permission, from T. D. Brock, K. M. Brock, and D. M. Ward, *Basic Microbiology with Applications*, 3d ed., Pearson Education, Upper Saddle River, NJ, 1986, p. 35.)

4. The deuteromycetes (*Fungi imperfecti*) cannot reproduce by sexual means. Only asexually reproducing molds belong to this category. Some pathogenic fungi, such as *Trichophyton*, which causes athlete's foot, belong to the deuteromycetes.

Molds are used for the production of citric acid (*Aspergillus niger*) and many antibiotics, such as penicillin (*Penicillium chrysogenum*). Mold fermentations make up a large fraction of the fermentation industry.

Algae are usually unicellular organisms. However, some plantlike multicellular structures are present in marine waters. All algae are photosynthetic and contain chloroplasts, which normally impart a green color to the organisms. The chloroplasts are the sites of chlorophyll pigments and are responsible for photosynthesis. The size of a typical unicellular alga is 10 to 30 μm . Multicellular algae sometimes form a branched or unbranched filamentous structure. Some algae contain silica or calcium carbonate in their cell wall. Diatoms containing silica in their cell wall are used as filter aids in industry. Some algae, such as *Chlorella*, *Scenedesmus*, *Spirulina*, and *Dunaliella*, are used for waste-water treatment with simultaneous single-cell protein production. Certain gelling agents such as agar and alginic acid are obtained from marine algae and seaweeds. Some algae are brown or red because of the presence of other pigments.

Protozoa are unicellular, motile, relatively large (1 mm to 50 mm) eucaryotic cells that lack cell walls. Protozoa usually obtain food by ingesting other small organisms, such as bacteria, or other food particles. Protozoa are usually uninucleate and reproduce by sexual or asexual means. They are classified on the basis of their motion. The *amoebae* move by ameboid motion, whereby the cytoplasm of the cell flows forward to form a pseudopodium (false foot), and the rest of the cell flows toward this lobe. The *flagellates*