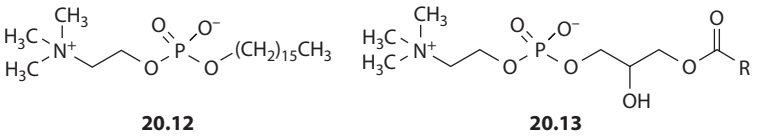

FIGURE 20.5 Miltefosine (**20.12**) and lysophosphatidylcholine (**20.13**).

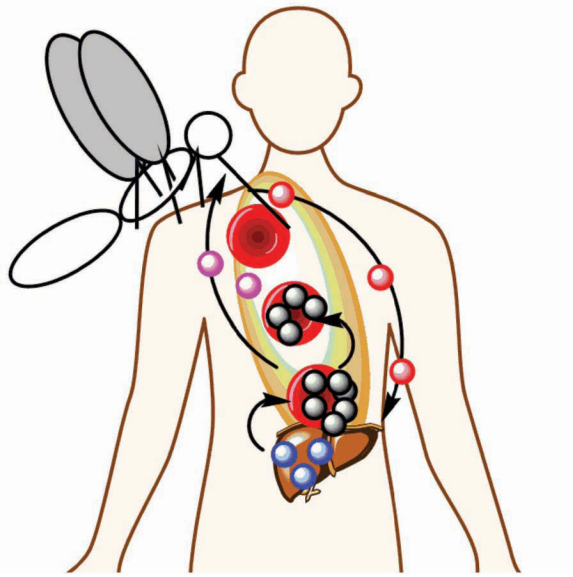

FIGURE 20.6 When an infected female Anopheles mosquito takes a blood meal, it regurgitates approximately 10 parasites as sporozoites (red spheres) into the blood. The sporozoites invade the liver where they proliferate asexually. After between 5 and 15 days, many thousand parasites return to the blood as merozoites which invade the erythrocytes. In the erythrocytes, the parasites (black spheres) go through the stages of rings, trophozoites, and schizonts. Finally, the parasites after 48 hours (*P. falciparum, P. ovale*, and *P. vivax*), tertian malaria, or 72 hours (*P. malaria*), quartan malaria, rupture the cell, and between 6 and 36 schizonts are liberated to the blood. These schizonts break down into merozoites which reinvade erythrocytes, and the life cycle inside the blood cells is repeated. The proliferation induces lysis of the erythrocytes and the clinical symptoms of malaria: chills with rising temperatures, followed by fever and intense sweating appear. In addition, there might be severe headache, fatigue, dizziness, nausea, lack of appetite, and vomiting. Since the trophozoites' major demand of amino acids is covered by catabolizing the hemoglobin, a heavy infection also will induce anemia. After some series of asexual proliferation, some parasites develop into female and male gametocytes (magenta spheres).

glands ready for being transferred into the human host. The falciparum parasites cause the erythrocytes to express a strain-specific protein which may adhere to the infected erythrocyte or to the walls of capillaries, resulting in reduced blood flow to vital organs. Reduced circulation to the brain contributes to the effects of cerebral malaria which can be fatal. Because of the symptoms of malaria, i.e., lack of blood (anemia) and fatigue, some persons chronically infected, such as many African school children, perform poorly. Studies suggest that national income in some African countries was suppressed as much as 18% because of malaria.

Today, the major burden of malaria is restricted to the tropical world: India, South East Asia, Central and South America, and, in particular, sub-Saharan Africa, but the endemic