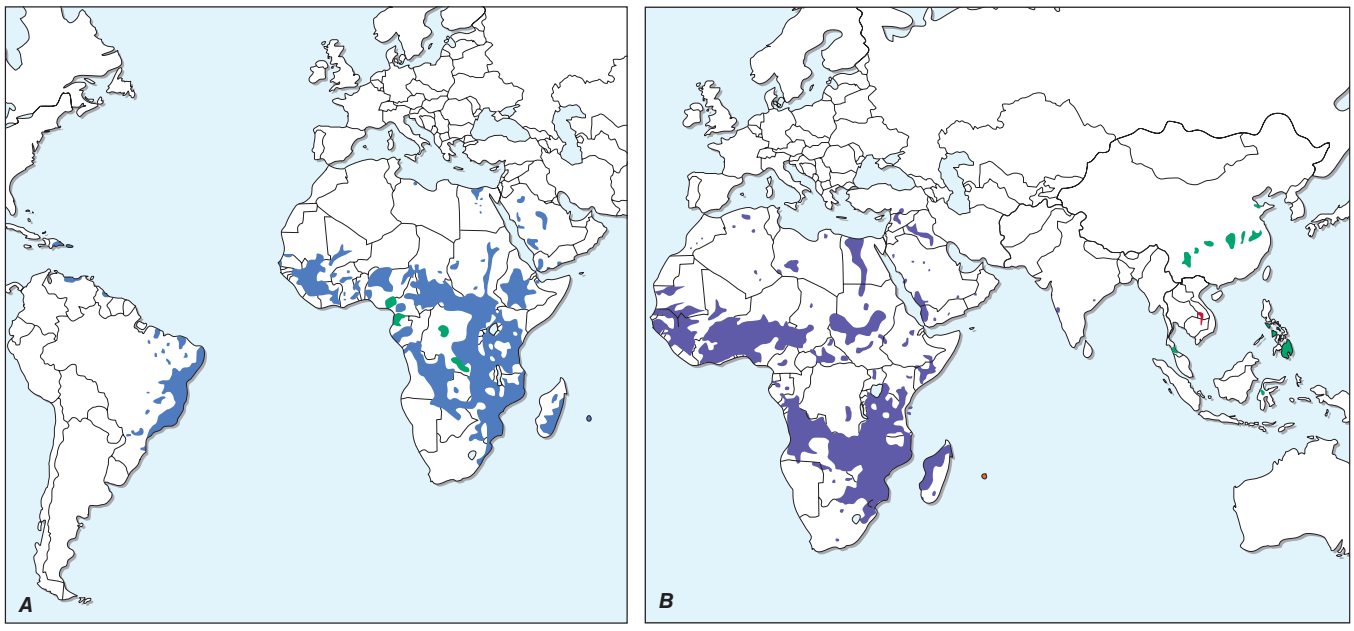

FIGURE 259-2 **Global distribution of schistosomiasis. *A.*** *Schistosoma mansoni* infection (*dark blue*) is endemic in Africa, the Middle East, South America, and a few Caribbean countries. *S. intercalatum* infection (*green*) is endemic in sporadic foci in West and Central Africa. ***B.*** *S. haematobium* infection (*purple*) is endemic in Africa and the Middle East. The major endemic countries for *S. japonicum* infection (*green*) are China, the Philippines, and Indonesia. *S. mekongi* infection (*red*) is endemic in sporadic foci in Southeast Asia.

discover new drug targets and to understand the molecular basis of pathogenesis.

EPIDEMIOLOGY

The global distribution of schistosome infection in human populations (Fig. 259-2) is dependent on both parasite and host factors. Information on prevalence and global distribution is inexact. At present, the five *Schistosoma* species are estimated to infect 200–300 million individuals (mostly children and young adults) in South America, the Caribbean, Africa, the Middle East, and Southeast Asia. Notably, parasite-related disease persists after active infection resolves, leaving a substantial health burden among adult populations. Thus, the overall number of humans likely to be affected by *Schistosoma*-related disease is now ~440 million. The total population living under conditions favoring transmission risk numbers ~700 million—a fact reflecting the global public health significance of schistosomiasis.

In endemic areas, the rate of yearly onset of new infection (incidence) is generally low. Prevalence, on the other hand, starts to be appreciable by the age of 3–4 years and builds to a maximum that varies by endemic region (up to 100%) in the 12- to 20-year age group. Prevalence then stabilizes or decreases slightly in older age groups (>40 years). Intensity of infection (as measured by fecal or urinary egg counts, which correlate with adult worm burdens in most circumstances) follows the increase in prevalence up to the age of 12–20 years and then declines markedly in older age groups. This decline may reflect acquisition of resistance or may be due to changes in water contact patterns, since older people have less exposure. Infection with schistosomes in human populations has a peculiar pattern. Most infected individuals harbor low worm burdens, and only a small proportion suffer from high-intensity infection. This pattern may be due to differences in worm infectivity or to a spectrum of genetic susceptibilities in human populations.

Disease due to schistosome infection is the consequence of parasitologic, host, and associated viral infections and of nutritional and environmental factors. Most disease syndromes relate to the presence of one or more of the parasite stages in humans. Disease manifestations in the populations of endemic areas correlate, in general, with intensity and duration of infection as well as with age and genetic susceptibility of the host. Overall, severe *Schistosoma*-specific disease manifestations are relatively rare among persons infected with any of the intestinal schistosomes. In contrast, symptoms of urogenital schistosomiasis manifest clinically in most *S. haematobium*–infected individuals. In addition, all forms of *Schistosoma* infection are associated with subclinical systemic morbidities that can significantly affect physical and cognitive performance, causing, for example, growth stunting, undernutrition, and anemia of chronic inflammation. New estimates of total morbidity due to chronic schistosomiasis indicate a significantly greater burden than was previously appreciated.

Schistosomiasis appears to be a cofactor in the spread and progression of HIV/AIDS in areas where both diseases are endemic. Increased emphasis should be placed on the treatment of schistosome infections in persons at risk of HIV/AIDS.

PATHOGENESIS AND IMMUNITY

Cercarial invasion is associated with dermatitis arising from dermal and subdermal inflammatory responses, both humoral and cell-mediated. As the parasites approach sexual maturity in the liver of infected individuals and as oviposition commences, acute schistosomiasis or Katayama syndrome (a serum sickness–like illness; see "Clinical Features," below) may occur. The associated antigen excess results in formation of soluble immune complexes, which may be deposited in several tissues, initiating multiple pathologic events. In chronic schistosomiasis, most disease manifestations are due to eggs retained in host tissues. The granulomatous response around these ova is cell-mediated and is regulated both positively and negatively by a cascade of cytokine, cellular, and humoral responses. Granuloma formation begins with recruitment of a host of inflammatory cells in response to antigens secreted by the living organism within the ova. Cells recruited initially include phagocytes, antigen-specific T cells, and eosinophils. Fibroblasts, giant cells, and B lymphocytes predominate later. Over time, these cumulative lesions reach a size many times that of parasite eggs, thus inducing organomegaly and obstruction. Immunomodulation or downregulation of host responses to schistosome eggs plays a significant role in limiting the extent of the granulomatous lesions—and consequently disease—in chronically infected experimental animals or humans. The underlying mechanisms involve another cascade of regulatory cytokines and idiotypic antibodies. Subsequent to the granulomatous response, fibrosis sets in, resulting in more permanent disease sequelae. Because schistosomiasis is also a