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section 8 Infectious diseases 1550 and oesophageal varices. Previous episodes of haematemesis indi- cate a 70% risk of rebleeding. Urogenital schistosomiasis caused by S. haematobium may have an impact on the reproductive health of people and genital schis- tosomiasis has been associated with infertility. Eggs are deposited during active infections in childhood but when the infection levels decrease in adults many egg calcify in the tissue, so called sandy patches. Sandy patches can cause contact bleeding and disruption of the mucosal surface which may increase the risk of HIV transmis- sion. Calcified eggs are dead and treatment with praziquantel has no impact on these lesions. Prevention and control Despite the substantial risk of reinfection, chemotherapy is usu- ally highly beneficial at both the individual and population levels, as those suffering high intensities of infection are at greatest risk of the more severe forms of schistosomiasis. Furthermore, even low- intensity infections may lead to anaemia and have a negative im- pact on the well-being of the infected individual. This is important especially among vulnerable groups such as children and pregnant women. Various chemotherapy-based control strategies can be em- ployed depending on intensity of transmission and the available re- sources. In the Nile Delta region of Egypt, injections of tartar emetic were used for mass treatment from the 1960s to the 1980s. Tragically, the needles were not adequately sterilized and, as a result, hepatitis C virus was widely spread in this population to reach its highest re- corded prevalence. In areas of high transmission, population-based mass drug ad- ministration can avoid the time and expense required for diagnosis and reduce the prevalence and severity of morbidity. Alternatively, schoolchildren can be targeted for treatment, as they invariably have the heaviest worm burdens and contribute most to ongoing transmission. In areas of less intense transmission, treatment can be restricted to diagnosed cases. While the mass drug treatment of school-age children in endemic areas is a very important and promising development, recent studies indicate that many infants and preschool-aged children have schistosomiasis and they are not presently targeted to receive praziquantel within current mass drug administration. The provision of safe water supplies and

sanitation, where it can be achieved, will make an important additional contribution. Mortality can be prevented and morbidity best controlled by a combination of health education, chemotherapy, provision of safe water sup- plies and sanitation, and, where appropriate, snail control. Health education should be aimed at improving practices of water use and preventing indiscriminate urination and defecation. The role of molluscicides in control programmes depends on the local epidemiological and ecological circumstances and the re- sources available. Within the context of a larger concerted interven- tion, focal molluscicide of major transmission sites can be useful. Eradication of host snail species is not usually feasible, although modification of the environment to eliminate snails has been suc- cessful in parts of China. In general, it has only been through sus- tained effort with integrated control strategies that disease control has been achieved. In May 2001 the World Health Assembly passed Resolution 54.19, which called for efforts to reduce morbidity caused by schistosom- iasis and soil-transmitted helminths in school-age children. As a re- sponse to this call, the Schistosomiasis Control Initiative, supported by the Bill and Melinda Gates Foundation, with the objective of encouraging the development of sustainable schistosomiasis con- trol programmes throughout sub-Saharan Africa, was launched in Uganda in March 2003. In the World Health Assembly Resolution 65.21 from May 2012 countries were urged to intensify interventions to control schistosomiasis and to strengthen surveillance of schistosom- iasis transmission and it is recommended that endemic countries embark on elimination programmes where appropriate with the aim of eliminating schistosomiasis as a public health problem by 2025. A long-term solution for schistosomiasis control could be pro- vided by a protective vaccine. Although more than 100 schisto- some vaccine candidates have been identified only three vaccine antigens, S. mansoni fatty acid binding protein (Sm14), S. man- soni tetraspanin (Sm-TSP-2) and S. haematobium glutathione S-transferase (Sh28GST; Bilhvax), have entered human clinical trials. Both Sm14 and Sm-TSP-2 have been tested in phase I clinical trials and further safety and immunogenicity phase II clinical trials in Brazil and Africa are scheduled for Sm14. Bilhvax (Sh28GST) was tested in phase III clinical trials in Senegal in 2012 but the results from the trial have not yet been released. FURTHER READING Andrade G, et al. (2017). Decline in infection-related morbidities fol- lowing drug-mediated reductions in the intensity of Schistosoma in- fection: a systematic review and meta-analysis. PLoS Negl Trop Dis, 11, e0005372. Clerinx J, Van Gompel A (2011). Schistosomiasis in travellers and mi- grants. Travel Med Infect Dis, 9, 6–24. Danso-Appiah A, et al. (2013). Drugs for treating Schistosoma mansoni infection. Cochrane Database Syst Rev, 2, CD000528. Fairley J (1991). Bilharzia: a history of imperial tropical medicine. Cambridge University Press, Cambridge. Ferrari TC, Moreira PR (2011). Neuroschistosomiasis: clinical symp- toms and pathogenesis. Lancet Neurol, 10, 853–64. Gavilanes F, Fernandes CJ, Souza R (2016). Pulmonary arterial hyper- tension in schistosomiasis. Curr Opin Pulm Med, 5, 408–14. Gryseels B, et al. (2006). Human schistosomiasis. Lancet, 368, 1106–18. Jordan P, Webbe G, Sturrock RF (eds) (1993). Human schistosomiasis. CAB International, Wallingford. King CH, Dickman K, Tisch DJ (2005). Reassessment of the cost of chronic helmintic infection: a meta-analysis of disability-related outcomes in endemic schistosomiasis. Lancet, 365, 1561–9. Kramer CV, et al. (2014). Drugs for treating urinary schistosomiasis. Cochrane Database Syst Rev, 8, CD000053. Magnussen P, Vennervald BJ, Aagaard-Hansen J (2011). Schistosomiasis. In: Selendy JMH (ed) Water and sanitation-related diseases and the environment: challenges, interventions, and preventive measures, Chapter 13: pp. 167–74. Wiley-Blackwell, Chichester. Olds GR (2003). Administration of praziquantel to pregnant and lactating women. Acta Tropica, 86, 185–95.

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