

## **7.1 Schistosomes causing swimmer's itch**

### **Description**

Swimmer's itch (cercarial dermatitis) is caused by human reaction to dermal penetration by parasitic flatworms or "schistosomes" that infect certain waterfowl and aquatic rodent species (Manitoba Water Stewardship, 2007). These schistosomes belong to the family Schistosomatidae, and species implicated as causes of swimmer's itch include members of the genera *Austrobilharzia* and *Trichobilharzia* (Levesque et al., 2002; CDC, 2004a). Cercarial dermatitis should be clearly distinguished from human schistosomiasis, a far more serious human infection that is caused by species of the genus *Schistosoma* and is typically restricted to tropical regions of the world (WHO, 2003a).

The schistosomes that cause swimmer's itch have a two-host life cycle, consisting of a primary host (waterfowl or aquatic rodents) and an intermediate host (certain species of aquatic snails). The adult parasite lives in the bloodstream of infected geese, swans, ducks, gulls, muskrats and beavers and produces eggs, which are passed in the faeces of these animals. These eggs hatch in the water, releasing small free-swimming larvae called miracidia. These larvae then seek out a suitable snail host to infect in order to continue their life cycle. Within the snail, the parasite further develops into a different type of larva called cercariae, which are released into the water when conditions are appropriate. The free-swimming cercariae once again seek out a suitable bird or animal host to begin their life cycle all over again. Humans are an accidental or dead-end host for these organisms. If the cercariae accidentally encounter humans in the water, they may penetrate the outer layer of the skin, but quickly die, as they cannot develop any further. The presence of the cercariae beneath the skin causes an allergic reaction to develop (i.e., cercarial dermatitis), which accounts for the symptoms observed in infected swimmers. *Guidelines for Canadian Recreational Water Quality: Third Edition 89*

### **Health effects**

The effects of swimmer's itch may be felt shortly after swimming, in some cases in as little as a few minutes. Swimmers usually first experience a tingling, itching or burning sensation. Small, reddish pimples typically may appear within 12 hours after infection, and these can progress to larger secondary blisters or rashes, which can be accompanied by an even stronger itching sensation. The infection is self-limiting, typically lasting from 2 to 5 days; however, symptoms can persist for as long as 2 weeks. Swimmer's itch is not contagious and cannot spread from person to person. However, because swimmer's itch is caused by an allergic reaction, individuals can develop an increased sensitivity to subsequent infections. The symptoms become more intense and develop much more rapidly in these instances (British Columbia Ministry of Health, 2005). Sensitivity can vary considerably between different individuals; some may strongly show the effects of infection, whereas others may not show any signs of illness.

Although affected individuals are advised to seek medical treatment from a health professional, treatments that may be effective in combatting itching include the application of cold compresses; the use of anti-itch medications such as corticosteroid creams or calamine lotion; and the taking of oral antihistamines or bathing in baths

containing Epsom salts, baking soda or colloidal oatmeal (British Columbia Ministry of Health, 2005; Manitoba Water Stewardship, 2007). It is recommended that affected individuals refrain from scratching, as it increases the potential for secondary bacterial infection (CDC, 2004b).

### **Occurrence in the environment**

These schistosomes can be encountered in fresh waters and at coastal beaches throughout Canada and the northern United States. Indeed, swimmer's itch has been reported in virtually every Canadian province. Accidental introductions of host snail species are reported to have spread this parasite from the Atlantic coast of North America to British Columbia coastal waters (Leighton et al., 2004). Bird species (ducks and gulls) that play host to the parasite may also be expanding in geographic range (Verbrugge et al., 2004). Reports of incidents appear to be increasing in the United States and Canada, possibly reflecting increasing use of recreational water bodies.

The presence of the organisms in natural waters is dependent upon a number of factors, both biological and environmental. As a result, it is very difficult to predict when and where swimmer's itch might become a problem. Propagation of the organisms requires that both the primary and intermediate host be present in sufficient numbers. As well, the species involved do not all follow the same timetable in terms of infection of, and release from, their primary and secondary hosts. Thus, the organisms can be encountered at different times during a recreational water season (Michigan Department of Environmental Quality, 2005).

The cercariae are encountered in areas where the snail beds are the densest. These are typically shallow waters, particularly those with large numbers of aquatic plants. Water temperature is also thought to have a significant effect on the release of mature cercariae by infected snails. Cercarial production and concentrations are thought to increase in warmer waters (Verbrugge et al., 2004), which may partially explain why infections are encountered more frequently during the summer months. The organisms can be carried significant distances by wind and wave action. Persistent onshore winds may drive them to accumulate at the shoreline, whereas sheltered bays may act to retain the organisms within a localized area.

### **Related epidemiology**

Much of the information on swimmer's itch infection has come from case reports of human illness. For most recreational waters in Canada, the risk of contracting swimmer's itch through recreational activity is considered to be quite low. However, many cases go unreported, as the symptoms are typically benign and thus users may not seek out medical attention.

Levesque et al. (2002) conducted an investigation of an outbreak of cercarial dermatitis that occurred on Lac Beauport, a recreational lake in the Quebec City region in the summer of 1999. A case reporting form was sent to 450 families likely to have activities

that would bring them into contact with the lake's water. Snails were characterized, and the prevalence of their infestation by schistosomes was investigated. In total, 63 episodes consistent with cercarial dermatitis were reported, with the symptoms affecting mainly children under 10 years of age. Sixty-nine percent of the cases occurred from swimming at the same beach. This location was the one where the only population of snails in the lake was identified. The people most affected were those who bathed in shallow water along the shoreline. Mallard ducks were observed to be present in high numbers during the 1999 summer season. Concentrations of faecal coliforms, faecal streptococci and other bacteriological water quality indicators at the beaches were low. Based on all of the available evidence, the authors confirmed that the cases were indeed due to schistosomes. Shoreline residents were informed that they should not feed waterfowl, and snail populations were reduced by removing organic wastes found within the main snail habitat. The control mechanisms were thought to have been effective, as there were no reported instances of cercarial dermatitis at this location during the following season.

Another study by Leighton et al. (2004) looked at case reports and the biological factors contributing to two outbreaks of dermatitis at Crescent Beach near Surrey, B.C. Thirty-six cases of dermatitis were reported in the summer of 2001, and 44 more cases were reported in the summer of 2002. The clinical presentation was consistent with schistosome dermatitis or swimmer's itch. The causative agent was identified as the schistosome cercaria, *Austrobilharzia variglandis*, carried by the introduced host snail, *Ilyanassa obsoleta*. Many of the cases of swimmer's itch appear to have occurred after exposure to the parasite in the shallow tide pools of the upper beach where there are large aggregations of the snails and frequent human use of the beach for wading. A survey of schistosome infections in snails demonstrated that infected snails were present in most areas of the beach. The reasons for the sudden outbreak were unclear. Both the snail host and the schistosome species had been known to be present at this location for several years. Factors attributed to the sudden outbreak included increased beach use by recreational users, seasonal environmental factors (temperature, weather), the age of the snail population and the size of the host population.

Verbrugge et al. (2004) conducted a prospective epidemiological study to assess the incidence and severity of swimmer's itch among recreational water users at Douglas Lake, Michigan, in July 2000. In total, 301 subjects were included in the analysis. Data were collected on 1300 water exposure days for the 301 swimmers, and 89 episodes of swimmer's itch were recorded (corresponding to an incidence of 6.8% per water exposure day). A total of 52 people

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(17.3%) experienced swimmer's itch, with 58% of these having only one episode, 25% having two episodes and 17% having three or more episodes. There was a highly significant association of swimmer's itch with shallow water use. Risk was also shown to increase with the number of days of exposure reported. Higher incidences were observed in the southern and eastern zones of the lake, and it was reasoned this was at least partially due to persistent onshore winds and the existence of sheltered bays in these areas.

Managing health risks.

The schistosomes responsible for causing swimmer's itch are considered to occur naturally in Canadian surface waters. They are not related to faecal pollution; as a result, their presence is not indicated during standard water quality testing for the recommended indicators of faecal contamination. The factors that are necessary for swimmer's itch to become a problem in recreational areas are subject to constant change. Certain areas may report a problem where none appeared to exist previously. Similarly, areas in which swimmer's itch has been reported will not necessarily always remain a problem.

A management strategy combining both actions to control the extent of the water quality hazard and steps to limit exposure during periods or in areas perceived to be of increased risk is recommended to reduce the risk of human exposure to these schistosomes in recreational waters.

Warning signs that clearly notify the public of the risk of exposure should be posted at recreational water areas where cases of swimmer's itch have been reported.

Additionally, a swimming advisory may be issued at the discretion of the responsible authority. Further details on the posting of information at recreational water areas can be found in Part I (Management of Recreational Waters).

Another approach to risk reduction can include the provision of educational materials outlining steps the public may take to reduce their personal risk of exposure as well as to potentially reduce the severity of the symptoms of infection. Guidance provided in materials for public communication may include the following recommendations:

- Recreational water users should avoid areas where swimmer's itch has been reported or where signs have been posted warning users of a potential risk of infection.
- At locations where swimmer's itch may be suspected, users should particularly avoid areas where schistosomes are more likely to be encountered, such as shallow waters with large quantities of aquatic plants.
- Users should towel down briskly upon leaving the water. Showering as soon as is practical after recreational water activity is also recommended to help minimize the risk of infection.

- Any user experiencing adverse health effects from recreational water activity should consult a medical professional and, if necessary, alert the appropriate authorities.
- Users are also reminded not to feed any waterfowl that may be present, as these animals can harbour the organisms responsible for causing swimmer's itch.

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