Swimmer's Itch (Avian Schistosomes): Expanded Range to Lake Aleknagik, Alaska

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Abstract

Swimmer's Itch (cercarial dermatitis) is caused by a common parasitic flatworms (*schistosome*) that has two hosts in their lifecycle, migratory waterfowl and snails (genus *Lymnaea*). However, in warm water, the parasite can infect the skin of humans causing an itchy rash. The highest incidence of schistosomes are mostly found in the summer months of late July and August in shore waters. This poster asks if the waters of Lake Aleknagik in southwestern Alaska are warm enough to allow the life cycle of the schistosomes persist. In this study we searched Lake Aleknagik, a large freshwater lake in Southwestern Alaska where the conditions for parasite is likely, but has not been isolated. In the Late July 2019 5 sites were surveyed for the parasite indicators was isolated from snails on the shoreline of the lake. Segments of shoreline of Lake Aleknagik were surveyed for the schistosome using indicators of this parasite (i.e. snails and aquatic vegetation). At the boat landing we crush snails to isolate and was able to isolate the schistosome. This suggests the other waters bodies near this lake may also be susceptible to cercarial dermatitis.

Introduction

In the 1950s researchers surveyed 76 shallow bodies of water in the interior of Alaska to identified the distribution of the parasite that causes Swimmer's Itch (cercarial dermatitis) and they found it occurred in only 16 interior lakes (Gabrielson 1952), Chu 1957). So the itch has been in Alaska, but can we also find it in the larger and cooler lakes found in southwest Alaska (Fig 1)?

The parasite that causes swimmers' itch has two hosts, waterfowl and aquatic snails. The adult flat worm parasite (schistosomes) live in the blood vessels of infected birds, who then deposit their eggs in bird's feces. The eggs are cluster into a miracidium that can be eaten by snails where they grow into a free-swimming larval stage or cercaria (Fig 2), that passes to an intermediate host (snail) where they then swim for find the final waterfowl host (Fig 3). This lifecycle should allow distribution of schistosomes to reach lakes in southwest Alaska if the water temperature are high enough.

The itchy rash associated with swimmer's itch looks like reddish pimples or blisters (Fig 4). It may appear after swimming in infested water. Swimmer's itch usually affects only exposed skin as the cercariae is trying burrow into the skin of humans but they are the wrong host.

Numerous studies have been conducted on swimmer's itch, but very few have been done in Alaska and none on Lake Aleknagak. We conducted a study to determine the prevalence of snails transmitting cercariae causing swimmer's itch in this lake. Gastropod hosts for this life cycle were determined by direct observation of gut material for the presence of cercariae.

Since climate change is affecting geographical patterns of organism in SW Alaska and because we are at the southern end of many waterfowl breeding grounds, we may see more of this in the future.

Methods

Macroalgae and snails were used as indicator species for cercaria at 5 shoreline location in Lake Aleknagik — Bear Creek, Camp Polaris, Icy Creek, Aleknagik boat ramp and Hanson Creek (Fig, 1.).

- We searched each site for snails and algae (Fig 2).
- Once we found snails and algae in shallow water we used a one meter square to estimate abundances of each.
- Repeating this procedure at three areas at each site.

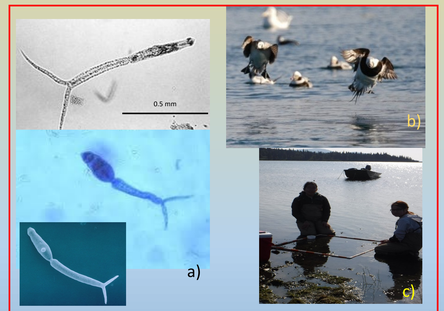

Figure 2. a) microscopic images of cercariae sporecytes that causes swimmers' itch , b) migratory birds., and c. students a 1meter plot to survey the Bear Creek site for snails and macroalgae

Study Site

We searched for snails at 5 shoreline location in Lake Aleknagik in southwest Alaska. Shoreline locations include Bear Creek, Icy Creek, eastern boat launch Hanson Creek, and Camp Polaris (Fig, 1).

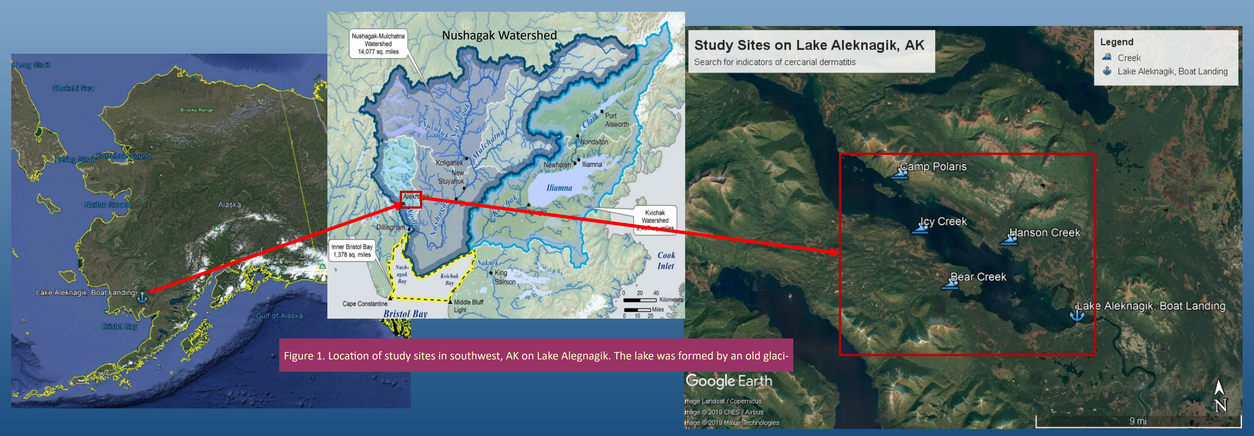

Figure 1. Location of study sites in southwest, AK on Lake Alegnagik. The lake was formed by an old glaci-

Chistosomes/Cercariae Life Cycle

Chistosomes infects waterfowl (mostly though their feet) then pass through blood to their feces. Snails then ingest the Cercariae eggs, which grow into the sporocysts . The free living sporocysts then search for a bird to infect (Fig 3). The snails belonging to Lymnaeidae and (to a lesser extent Planorbidae) and were collected on the shoreline of Lake Aleknagak to test for cercaria.

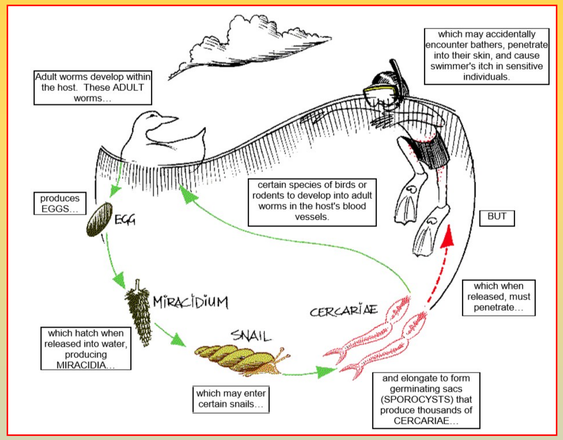

Figure 3. Lifecycle of schistosome that causes swimmers' itch

Swimmer's Itch

The cercariae parasite come from sporocysts that passes from the snail to the human host in shallow warm water. The parasite does not like the taste of humans and backs out of the skin leaving the red welts or Swimmer's Itch. There are patchy red skin rash associated with cercariae that —so skin of humans will itch on the parts of the body that have been in the water and exposed to cercariae (Fig 4).

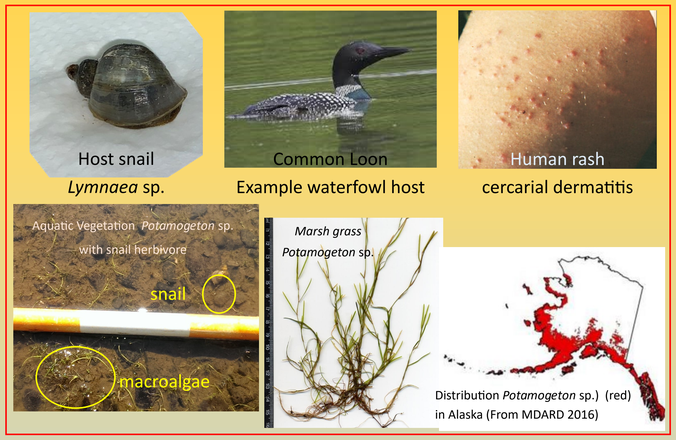

Figure 4. Host and required species to allow humans to get swimmer itch

Results

For cercarial dermatitis to be present both snails and their main food, Potamogeton sp., are needed (Fig 4). We also found that temperature and water depth is also important. Table1 and 2 shows that the coolest site, icy creek, was the only location that did not have the necessary shoreline conditions in that it was cooler and there were few snails not aquatic vegetation. All other sites had the conditions for swimmers' itch.

Thus, we proposed that warmer water, abundant snails and present of Potamogeton sp. are the conditions necessary for the presents of cercariae (Table 1 and 2).

The four sites (Bear Creek, Boat Landing Camp Polaris and Hanson Creek) (Fig 1), with snails and algae, could possibly support swimmers' itch but snails and vegetation were most abundant at the boat landing, so it was this location were we collected snails and looked for definitive for the schistosome parasite. Microscopic analysis showed that there was sporocysts living as this site.

Table 1. The of snails, macroalgae, and Chistosmes at the five study sites on the shores of Lake Aleknagak, AK

Site 22–23 July 2019	Abundance of Biota		
	Snails	Macroalgae	Chistosomes
Bear Creek	Abundant	Abundant	Possible
Boat Landing	Abundant	Abundant	Abundant
Camp Polaris	Common	Common	Abundant
Icy Creek	Rare	None	Not Found
Hanson Creek	Abundant	Abundant	Possible

Table 2. Shore water temperatures at five study sites on the shores of Lake Aleknagak, Alaska

Site 22-23 July 2019	Shore Water Temp during day light			
	>1 cm	4 cm	1 m	< 3 m
Bear Creek	18°C	16°C	15°C	12°C
Boat Landing	20°C	18°C	15°C	12°C
Camp Polaris	18°C	17°C	15°C	13°C
Icy Creek	15°C	14°C	12°C	11°C
Hanson Creek	20°C	18°C	16°C	14°C

Figure 5. The swimmers' itch team: Jeri Diederich, Monica Christopher, and Mayla Golia

Conclusions

Swimmers' itch (cercarial dermatitis) has probably has been in Alaska for a long time, but restricted to the summer and the small ponds and shallow lakes of the interior. Reports of swimmer's itch have been on the increase. This study confirms that cercarial can live on the warmer shores of a deep glacially formed lake in southwest Alaska. Shoreline temperatures have warmed enough to allow for the completion of the life cycle of these flatworms. But is climate change having an influence on the distribution of schistosomes with warming shore waters? Warmer temperatures increase the number snail and their main food macroalgae, this with more lake developments, and adding more nutrients may be increasing the eutrophic processes of once clean and deep SW lakes causing more parasites in along the shoreline.

With warming temperatures and growing urban areas, cercarial may allow expanding on Alaska watersheds. Future studies should need to identify how schistosome range is expanding in lakes as snails and migratory birds continue to use the resources of Alaska watersheds. An important question now become "What will happen when to our society temperatures continue to increase

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