Duck Itch Lecture Notes by Dr. Norm Davis

The "Duck Itch Season" runs from Spring to mid Fall, depending on ambient temperatures. Global warming and proliferation and migration of waterfowl will increase the availability of the parasites to swimmers and, most especially, children who tend to play all day in shallow waters.

Should you or anyone else be interested in checking on my background, just Google the ODT article 'The Farmer Who Flew in the Wars".

I am hoping that someone will become interested enough to carry on research where I have left off.

"Duck Itch" is Schistosomiasis of waterfowl. It is in the same family that causes the systemic disease "Bilharzia" or Schistosomiasis of humans. This disease is second in importance to the reigning number 1 disease of humans -Malaria.

Schistosomiasis can also invade the nervous system and cause symptoms that mimic Hysteria, loss of movement control (aphasia), "speaking in tongues". All of these symptoms depend upon the site in the nervous system where the parasite may be attacked by the immune system, are killed (Peripheral nerves - Brain). Once killed, they are then encysted to the point that they interfere with normal nerve signals. Where they are killed has an effect on type of nervous response which causes such symptoms

What I have discovered is:

1. There is a parasite of waterfowl, an Echinostome, that actually kills the snails that the Duck Itch parasite develops in before it is released to infect waterfowl. These parasites do not infect the snails until very late in the summer because their eggs do not embryonate until they experience a rise in lake water temperature. They, therefore, are not available to infect the snails until late Fall.

2. There is a chemical control method that can be used to control snails in selected swimming areas. It is expensive and would have to be used seasonally. It also requires preparation and glueing (water soluble glue) to pebbles in a dark room , dried, and then broadcast by helicopter in and near the selected area. This has been shown to be better than 95% effective in a portion of Bremner Bay.

3. The control parasites only fully develop in Canada Geese, which are unprotected. Getting sufficient numbers of Echinostome eggs would require equipment for storing, and then artificially incubating them to then broadcast them (embryonated) in and near swimming areas to seek out and infect snails in the Spring rather than late Fall. More research and effort would have to be done.

4. There is a chemical, phenoxyethanol, which is used to stabilise other chemical elements of sunscreens. The chemical has been used to anaesthetise fish by Fish and Game for fish counts in rivers and streams. It works well against penetration of skin by the parasite. This

was found out serendipitously when I conducted a double blind exposure experiment at Bremner Bay with 17 human subjects over two years.

A sunscreen with DEET also worked well. However DEET is not recommended for use on children. And it probably lasts for only 2 hours and must be reused if any person spends more than 2 hours in the water.

It may be possible to use a lotion that has LipoDEET in it. Reports indicate that it can last possibly up to 12 hours. Something for deep water swimmers.

5. In humans, there are schistosomes which invade the blood vessels AND, there are schistosomes which invade the nervous system. They are all debilitating and can cause serious illnesses.

Nervous system diseases are very difficult to diagnose. And many such diseases are "Idiopathic", meaning the medical experts don't know what causes the disease.

Similar problems have been observed in waterfowl. Similar parasites of the same family may be responsible.

There is a research group in Prague, Czech Republic that has completed some elegant research in this field, working with laboratory ducks and mice. Their Professor is Libor Mikes. They discovered and reported on a schistosome which they named *Trichobilharzia regenti.*

They noticed that this parasite, which they used to infect their lab animals did not use the blood vessels, in their hosts. Instead, they penetrated the skin, entered the peripheral nervous system, migrated to the brain, became dioecious (male and female) adults in the brain, copulated, then migrated to the nasal tissue where they produced embryonated eggs. These eggs hatched each time the duck placed its head in the water. The miracidiae would then swim in the water to find a secondary snail host, penetrate it and then produce several asexual life forms, mother sporocyst, sporocyst, and finally, thousands of forked tailed and eye spotted at OU furcocercariae, which would then leave the snail to swim to the surface of the water to find their primary host. a waterfowl.

Another researcher, Dr. Sara Brant, University of New Mexico.USA contacted me about my research and advised me about the Czech group.

She then asked me if I had come across a similar parasite in New Zealand.

I had had to originally get permission to work with the NZ Scaup, an absolutely protected "diving duck". When I had finished with some of them, I kept 4 of their heads in the freezer.

I told Sara about the 4 heads. She suggested I get advice from Libor Mikes about dissecting the heads to look for the parasites. I contacted him and he sent me detailed directions which I followed.

And, in each head, I found adult schistosomes and eggs. They were in the brain, the nerves and in the nasal tissue between the eyes and along the length of the bill. I preserved the specimens in Ethyl Alcohol (EtOH) and sent some of them to Sara for DNA analysis.

Her initial analysis indicated that it might, by comparison with the DNA analysis done by the Czechs, be the same or very close relative to *Trichobilharzia regenti.*

She then suggested that she come to New Zealand and work with me to determine if we could establish the life cycle from the NZ Scaup through the snail to properly identify the parasite and report its discovery in New Zealand.

This she did. I applied for and got permission to get more scaup. I also suggested to Sara that she spend some time at Otago University to meet with the Zoology Department and find out about me. This she did.

A Post Doc student , whom she knows, accompanied her to work with me at Bremner Bay for ten days.

Several years later, we published a paper that named the new New Zealand parasite *Trichobilharzia novaeseelandiae.*

Subsequent literature studies have shown that this parasite and the Czech parasite use the same or very similar chemicals to penetrate human skin and select the nerve path to the brain that human schistosomes use.

This fact should be enough information to justify further research.

An observation:

Humans do not develop a patent immune system until about the age of eight years.

When Duck Itch parasites attack. the evidence of an immune response is seen in the skin.

The first exposure, and exposures of of any host, must gain entry beyond the skin to activate the immune system.

The intensity of the attack, in numbers of furcocercariae can be quite high.

The first exposure then, and any subsequent exposure with high numbers can:

1. Go further than the skin in the first instance or

2. Overwhelm the immune system with sheer numbers

The question then becomes,

Where do they go?