

Environmental Determinants of Human Liver Fluke Transmission in Aquaculture Systems in China and Thailand

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Human liver flukes are important waterborne parasites that cause significant disease burdens, especially in Asia. The World Health Organization has recently classified infection with human liver flukes as an emerging infectious disease. *Opisthorchis viverrini* is prevalent in Southeast Asia, including Thailand, and *Clonorchis sinensis* is prevalent in East Asia, including China. Both are classified as Group 1 carcinogens by the International Agency for Research on Cancer and can cause cholangiocarcinoma, a liver cancer with a 95% fatality rate. Human infection with these fish-borne zoonotic trematodes is caused by consuming raw, undercooked, or fermented fish dishes, as the life cycle of the parasite involves fish as well as snails.

Recent increases in demand for fish protein due to population growth and development, pressure in the region to transfer from wild fisheries to aquaculture because of hydropower development, and other factors have resulted in a spike in the number of fish ponds and farms that are operating. The transition from wild-caught fish to farmed fish raises questions about impacts on the transmission cycle of liver flukes in Asia. Limited research has been done on this topic, and limited understanding exists with regards to the transmission dynamics of *Opisthorchis viverrini* and *Clonorchis sinensis*.

Research was conducted between May 2013 and January 2014 in Khon Kaen Province, Thailand, and Guangdong Province, China, on a number of fish ponds and lake sites. Water, snail, and fish samples were collected and analyzed for signs of infection with *Opisthorchis viverrini*, *Clonorchis sinensis*, or other parasites. Results identified widespread fecal contamination in the ponds and the presence of liver fluke and other metacercariae in the susceptible fish species sampled, although no liver fluke cercariae were found in the sampled snails. Other types of flukes were positively identified in both snails and fish, suggesting the high potential for fish ponds to serve as reservoirs of the parasite.

The findings demonstrate a high likelihood that human liver fluke infection via farmed fish is happening in both Thailand and China and could be a major contributor to disease burden as farmed fish replace wild-caught fish as the main source of fish protein in the region. Future research will focus on modeling the transmission dynamics of *Opisthorchis viverrini* and *Clonorchis sinensis* within the aquaculture system and assessing the impacts of environmental interventions to disrupt the transmission cycle.