Transmission of fishborne zoonotic parasites in livestock-fish production systems in Vietnam

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Introduction

Foodborne trematode infections affect more than 40 million people out of 750 milion people at risk throughout the world, and are most prevalent in South-East Asia and Western Pacific regions. The liver flukes *Clonorchis sinensis* and *Opistorchis viverrini* are the most important zoonotic trematodes in Vietnam. Both parasites are characterized by a complex life-cycle involving several developmental stages in three different hosts: snail, fish and final hosts like human, pigs and poultry (Figure below). Transmission of these flukes to final hosts occurs by consumption of raw fish. Clinical symptoms in final hosts vary from fever, weight loss, diarrhea, anemia, and abdominal discomfort to carcinoma of the bile duct or pancreas and result in death in severe cases.
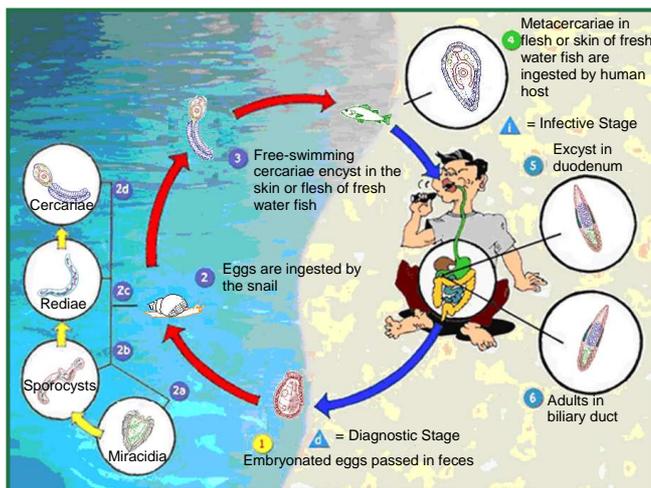
Life cycle (after www.fibozopa.ria1.org)

Goal of the PhD project

Obtaining quantitative data on the prevalence of the fishborne zoonotic parasites (FZP's) in livestock-fish production systems in Vietnam and to identify and quantify key risk factors with the ultimate goal to enable science based recommendations and prioritizations for control measures. These measures should lead to a reduced incidence of human infection with FZP's.

Model

To quantify transmission of the flukes in small scale livestock-fish farms in Vietnam we derived a mathematical model. This model describes parasite-hosts dynamics, and helps us to understand how transmission in this complicated life-cycle depends quantitatively on underlying factors. The model consists of a set of partial differential equations. Transmission is quantified by the basic reproduction ratio R_0.

| R_0 | = | **basic reproduction ratio** |
| | = | average number of susceptible animals that will be infected by one infectious animal |

$R_0 < 1$ infection eventually evades
$R_0 > 1$ stable endemic state

R_0 will be compared for different farming systems or management practices.

Preliminary results

By varying values of parameters like snail density, number of fish and mortality of the developmental stages and hosts, conditions of the system are shown which lead towards a stable endemic state ($R_0 > 1$), while other conditions tend to a state in which the infection eventually evades ($R_0 < 1$).

Field studies

Based on hypotheses generated with the model, important transmission parameters will be investigated in more detail in epidemiological (field) studies within the Fibozopa project in Vietnam.

Pig farming in Vietnam.

Waste from the pigs floats directly into the fish pond.

Typical integrated livestock-fish production system in Vietnam. Pig farming above fish pond.

A Vietnamese family in the countryside. Traditional food can contain raw fish from their own pond.

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