Bernoullis Tafelrunde

Graduate Student Seminar

Thursday, 4 May 2017, 12:05-12:50
Seminarraum 00.003, Spiegelgasse 1

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Swiss TPH

Mathematical modelling of transmission dynamics of *Opisthorchis viverrini*

Abstract

This is a joint work with H. Harbrecht, P. Odermatt, S. Sayasone and N. Chitnis.

The liver fluke, caused by *Opisthorchis viverrini*, is highly endemic in Southeast Asia, particularly in Lao PDR, Thailand, Cambodia and Vietnam. An estimated 10 million people are currently infected. Chronic infection may lead to severe morbidity including the fatal bile duct cancer (cholangiocarcinoma). The life cycle of *O. viverrini* includes two intermediate hosts, namely molluscs and Cyprinoid fish; and definitive mammalian hosts including humans and reservoir hosts, such as cats and dogs, who acquire infection by consuming raw or undercooked infected fish. Public health interventions focus on regular treatment of infected individuals, behavioural communication change and improved sanitation. The importance of the reservoir hosts for the transmission of *O. viverrini* is poorly understood.

We developed and analysed three population-based models of the transmission dynamics of *O. viverrini* that include the worm burden in reservoir hosts and age-dependent worm burden in human hosts to assess the importance of the reservoir hosts in maintaining transmission and the impact of different intervention strategies on the transmission of *O. viverrini*. We used prevalence data of the hosts and data on infection intensity in humans from two islands in Southern Laos to estimate the likely distributions of parameter values for these models; we defined threshold conditions such as the basic reproduction number to identify transmission potential of the different host types, and simulated the models to determine the impact of intervention strategies.

Our analysis indicates that in Laos humans maintain the transmission cycle through snails and fish, and that interventions which increase the mortality rate of worms in humans, and of snails and of fish lead to the largest reductions in the intensity of infection in humans.

Our results suggest that it is possible to eliminate transmission of *O. viverrini* with interventions that only target humans. Therefore, although interventions targeting reservoir hosts can reduce transmission in humans, they are not necessary to eliminate transmission. Furthermore, interventions targeting the parasite in humans, such as treatment interventions, and those targeting intermediate hosts, such as snail control and safe fish production, lead to the largest decrease of worm burden in humans.