COMMENTARY

Development of a Community-Based Approach to Opisthorchiasis Control

Rujira Duangsong[1], Supannee Promthet[2]*, Kesorn Thaewnongiew[3]

Abstract

A liver fluke, *Opisthorchis viverrrini* (OV), is the major cause of the high incidence of cholangiocarcinoma in North-eastern Thailand. The prevalence of OV infection remains high in various parts of the country, especially in wetland rural areas where a large proportion of the community work in agriculture and continue the traditional practice of eating raw or uncooked cyprinoid fish products. The national control program seems to have had little impact in many of these areas, and it has been difficult to make precise assessments of the overall effectiveness of the program. Therefore there is a need for a community-based approach to prevent infection with the parasite, ideally involving as many players as possible. Here we document an attempt to assess the best means to prevention on the basis of a community intervention in three villages in north-east Thailand, with participation of representatives of Health Promotion Hospitals of the Ministry of Public Health with dedicated staff, but also school teachers, independent government sponsored village health volunteers, and housewives responsible for cooking and diet selection. An action plan was followed, allowing detailed discussions of practical proposals, their introduction and then repeated reflection and further proposals at the individual village level.

Keywords: *Opisthorchis viverrini* - infection control programs - rural Thailand - community-based action plans

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Introduction

The liver fluke, *Opisthorchis viverrini* (OV), continues to be a serious public health problem in north and north-east Thailand, associated with a very high incidence of cholangiocellular carcinoma (Shin et al., 2010). Over six million Thai people are estimated to be infected, and the highest prevalence rates are found in Issan and to a lesser extent in the North. A survey of information in the literature for actual prevalence rates is given in Table 1 (after Sripa et al., 2011). The geographic pattern of OV infection rates in Thailand is very uneven, but high rates are more likely in rural than urban environments, especially in wetlands and agricultural areas (Wattanayingcharoenchai et al., 2011) where there are rivers, lakes, man-made watercourses for irrigation, ponds for aquaculture and rice-fields and where the food-culture of the local people includes the consumption of raw or undercooked fish (Grundy-Warr et al., 2012). 4.6% to 60.8% (Sithithaworn et al., 2012. High variability has also been reported between the different districts within a province; for example, the age and gender adjusted proportion of the population infected in the 20 districts of Khon Kaen Province varied between 10.0% and 70.9% (Sriamporn et al 2004). Over the period

Table 1. Overview of Publications regarding Prevalence Rates of Opisthorchiasis Infection

Reference	Region/ place	Study type	Method	% OV positive
Jongsuksuntigul et al., 1998	Thailand	Survey	Kato's[1]	21.5%
Jongsuksuntigul et al., 2003	Thailand	Survey	Kato's[1]	1984 and 1987, 63.6% 1988, 35.6%
Sriamporn et al., 2005	Khon Kaen	Cohort	Kato's[1]	Male, 27.9%; Female, 21.3%
Sayasone et al., 2007	Lao PDR	Cross-sectional	Kato-Katz[2]	58.5%.
Poomphakwaen et al., 2009	Khon Kaen	Case-control		24.6%
Wattanayingcharoenchai et al., 2011	Northeast Thailand	Cross-sectional	Kato-Katz[2]	20.4%
Saengsawang et al., 2012	Yasothon	Cross-sectional	Kato's[1]	20-65 Male, 40.1%; Female, 37.5%
Sohn et al., 2012	Kratie, Cambodia	Cross-sectional	Kato-Katz[2]	5-86, 4.6%,
Yong et al., 2012	Takeo, Cambodia	Cross-sectional	Kato-Katz[2]	1,799 villagers, 47.5%
Suwannahitatorn et al., 2013	Thailand	Cohort	Kato and F-EA[3]	2002-2004 = 21.6% 2007-2009 = 21.4%

[1]Kato's thick smear; Kato-Katz thick smear; Kato and formalin-ethyl acetate

*[1]Department of Health Education, [2]Department of Epidemiology, Faculty of Public Health, Khon Kaen University, [3]Office of Disease Prevention and Control, Region 6, Khon Kaen Province, Thailand *For correspondence: supannee@kku.ac.th*

1981-2001 a variety of different surveys indicated that the national prevalence of OV infection had fallen from 63.6% to 9.6%, but the most recent a data indicate the prevalence rate in the Northeast region remains high at 16.6% and had not decreased over the previous decade (Sithithaworn et al., 2012).

Whereas OV infection is usually asymptomatic, the organism has been classified as a type-1 carcinogen for many years (IARC, 1994) and is a major risk factor for the subsequent development of cholangiocarcinoma (Watana and Watana, 2002; Poomphakwaen et al., 2009; Songserm et al., 2012), which is a usually fatal form of liver cancer (Khan et al., 2005).

Conceivable Intervention Routes

The life cycle of OV is well-known (see Figure 1), but briefly the definitive hosts are man and other animals, such as dogs, rats and especially cats (Enes et al., 2010; Aunpromma et al., 2012) who eat raw, uncooked or under-fermented freshwater cyprinoid fish. Eggs of the liver fluke are shed in faeces and are ingested by the *Bythinia* snail. The eggs encyst, reproduce asexually and are then released into water as free-swimming cercariae which penetrate cyprinoid fish and encyst to become metacercariae. When the raw, uncooked or under-fermented infected fish are eaten by definitive hosts, the metacercariae excyst and develop as adult liver flukes in the bile duct. .

Clearly, given the nature of the environment in the endemic area, as well as the non-human hosts, it is not feasible to completely prevent eggs reaching the aquatic environment (see Figure 1). Therefore, attention must be concentrated on avoiding infestation by refraining from eating raw fish infected with metacercariae and possibly by effective use of the antihelminthic drug praziquantel. Otherwise attention must be focused on early detection and screening so that clinical treatment is more effective.

Development of a Community-based Approach to Opisthorchiasis Control

Clearly the most effective interventions are in communities which are most effected and have the highest incidence rates. The present commentary is based on experience gained with three villages, chosen for their location near rivers and wetlands. Within each community, there is a Health Promotion Hospital of the Ministry of Public Health with dedicated staff, but also school teachers, independent government sponsored village health volunteers, representative housewives responsible for cooking and diet selection. The schedule of the the program developed is illustrated in Figure 2.

Strategies for the control of OV infection have involved identification by stool examination and treatment of infected cases with praziquantel, health education campaigns to encourage the consumption of only properly cooked fish, and the improvement of sanitation and discouragement of defaecation in wetland areas to prevent transmission by human hosts (Jongsuksuntigul and Imsomboon, 1998; Wattanayingcharoenchai et al., 2011). A concise history of opisthiorchiasis control programs in Thailand and their apparent effectiveness has been detailed by Jongsuksuntigul and Imsomboon (2003) and Sripa et al. (2011). The demonstrated effectiveness of praziquantel in 1980 and its use on a community basis was to prove a major step forward in subsequent control strategies, and region-wide control programs were established from 1987 onwards under the Five-year National Development Plan for 1987-1991. By 1992 a national control program was operating in 42 provinces. The control program is now integrated with the rural health services, which cover all provinces, and the Ministry of Public Health has set a target prevalence of 5% by 2016.

In order to assist in control of infection a community project was initiated at Khon Kaen University, Faculty of Public Health, which is the subject of the present Commentary. This aimed to establish groups of important players at the village level, with a series of phases of discussions and interventions (see Figure 2) .

Phase 1: Situation Analysis

In all three villages the initial action was an analyisis of the enviornment and culture, as well as risk behaviour for OV infection.

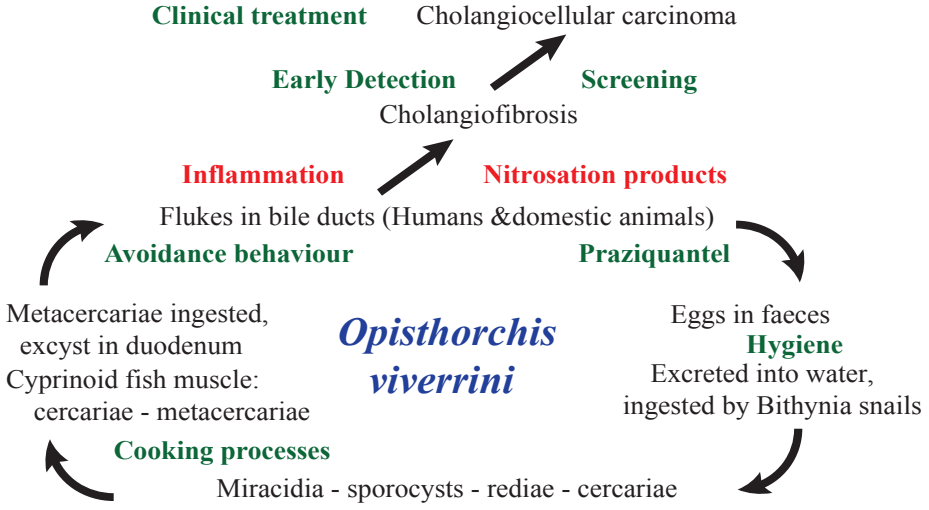

Figure 1. *Opisthorchisis viverrini* Life Cycle and Intervention Strategies for Control in Northeast Thailand

Phase 2: Action - First Loop

This first involved selection of the community leaders,as shown in Figure 2. The facilitator in each case was a staff member of the Department of Education at Khon Kaeun University, Faculty of Public Health. The essential memebrs were professionals from the HPH, and in addition volunteers, cooks, and a teacher to provided inpt from education services, as well as local NGO. reason for inclusion .

Then using media such as video power point, flipchart,

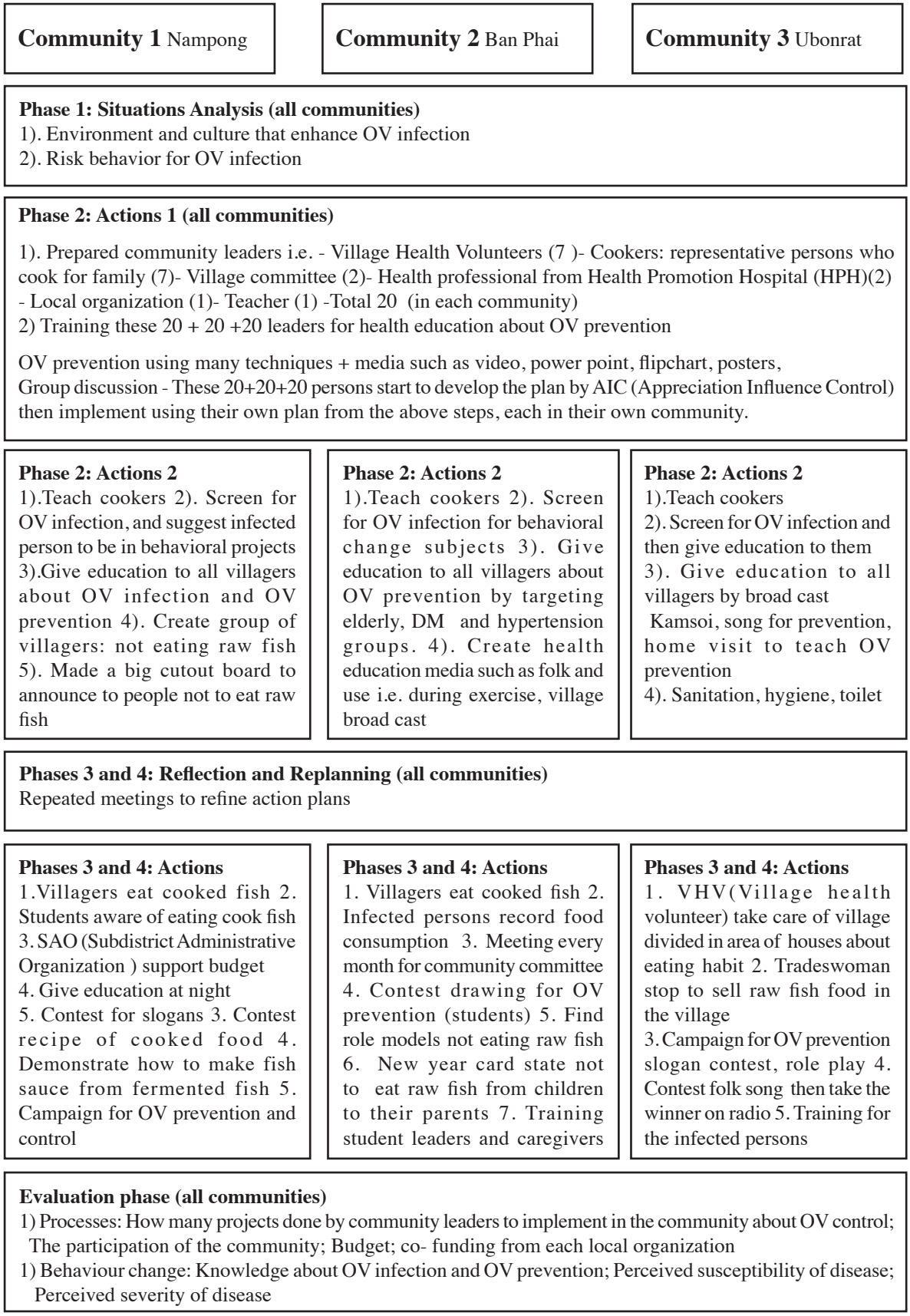

Figure 2. Development of a Community-Based Approach to Opisthorchiasis Control in Northeast Thailand

posters, group discussions were held and these 20+20+20 persons start to develop the plan by AIC (Appreciation Influence Control)

Phase 2: Action - Practical Measures Chosen

In all three villages teaching of those responsible for cooking was a high priority, as well as screening for OV infection and suggesting behavioural change projects. In addition separate plans were adopted at the village level.

Phases 3 and 4: Reflection on Results and New Plans

Approximately four months later, the project members from all three villages gathered for discussion of the results, indicated again in Figure 2. This generated new plans for the three communities and was followed by further reflection and generation of new plans.

Evaluation

This is for basically for future reference to detemine the long-term efficay of the measures taken.

Community-based Interventions in Thailand

Community-based approaches are well established in Thailand, examples of reports on reduction HIV stigma and discrimination (Jain et al., 2013), prevention of drowning (Sansiritaweeseek et al., 2013), stroke risk reduction (Suntayakorn and Rojjanasrirat, 2013), behaviour modification for type II diabetes sufferers (Ounnapiruk et al., 2013), risk behaviour for agrochemical exposure (Raksanam et al., 2012), all having appeared in the recent literature. One focused on use of lay health workers in a community-based chronic disease control program (Wiangnon et al., 2007) resulted in improvement in overall knowledge of all the diseases, except lung and cervical cancer (Promthet et al., 2012) and suggested that improving people's health requires cooperation of community people through fun activities and some initial external support (Saranrittichai et al., 2012).

Unfortunately one earlier *Opisthorchis viverrini* infection intervention after the implementation of control program in a rural community, central Thailand (Suwannahitatorn et al., 2013) resulted in no appreciable change in infection rates. Rangsin et al. (2009) completed a two-year prospective survey of villagers of Chachoengsao Province in the Central region east of Bangkok and reported that the prevalence rate of OV infection increased from 21.3% to 26.2%.Therefore continuing efforts like the present program remain necessary.

For sustainability, it is essential that there is a network of committed individuals be established and education and promotion targeting the main risk factor, Koi pla consumption, improving diagnosis and treatment, and promoting hygienic defecation should be used in the prevention and control program study program. Certainly, it is hard to avoid the conclusion that existing control programs are not working in rural areas due to underfunding and limited outreach, especially in the neglected Northeast and where people continue to eat raw, semi-cooked or fermented fish dishes such as *koi pla, lap pla,* and *pla som* (Grundy-Warr et al., 2012).

In the present intervention the individuals positive for *O viverrini* eggs were advised to take praziquantel, a very effective anti-helminthic drug (Soukhathammavong et al., 2011; Lovis et al., 2012), although it is unwise to depend on praziquantel as a primary element in a control programme as stressed earlier (Saengsawang et al., 2013). This has important implications in terms of evaluation of the efficacy of our present program since a simple comparison of before and after infection rates would not have meaning until the period typical for reinfection to occur has passed, which might stretch to many years. Alternative evaluation parameters might include consumption of foodstuffs possibly containing metacercariae, perceived susceptibility and severity of possible resultant disease, numbers and types of projects undertaken for prevention and the level of local participation. Attention also needs to be paid to the budgets available for ongoing community action.

Conclusions

Develop of networks with participation of the group stakeholders to share experiences, should facilitate the participants similar perceptions of the problem and allow the best methods to be chosen for effective control. Learning processes with team work will help development of skills to cooperate and coordinate villagers, knowing the work done by other groups. Social movement is an important aspect for spread of information. Stress should continue to be placed on improvement of networking suitable for each community, to guarantee that progammes are sustainable.

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References

Aunpromma S, Tangkawattana P, Papirom P, et al (2012). High prevalence of *Opisthorchis viverrini* infection in reservoir hosts in four districts of Khon Kaen Province, an opisthorchiasis endemic area of Thailand. *Parasitol Int,* **61**, 60-4.

Enes JE, Wages AJ, Malone JB, Tesana S (2010). Prevalence of *Opisthorchis viverrini* infection in the canine and feline hosts in three villages, Khon Kaen Province, northeastern Thailand. *Southeast Asian J Trop Med Publ Health*, **41**, 36-42.

Grundy-Warr C, Andrews RH, Sithithaworn P, et al (2012). Raw attitudes, wetland cultures, life-styles: Socio-cultural dynamics relating to *Opisthorchis viverrini* in the Mekong basin. *Parasitology Int*, **61**, 65-70.

IARC (1994). Schistosomes, liver flukes and *Helicobacter pylori*. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Lyon, 7-14 June 1994. *IARC Monogr Eval Carcinog Risks Hum*, **61**, 1-241.

Jain A, Nuankaew R, Mongkholwiboolphol N, et al (2013).

Community-based interventions that work to reduce HIV stigma and discrimination: results of an evaluation study in Thailand. *J Int AIDS Soc*, **16 (Suppl 2)**, 18711.

Jongsuksuntigul P, Imsomboon T (1998). Epidemiology of Opisthorchiasis and national control program in Thailand. *Southeast Asian J Trop Med Public Health*, **29**, 327-32.

Jongsuksuntigul P, Imsomboon T (2003). Opisthorchiasis control in Thailand. *Acta Tropica*, **88**, 229-32.

Khan SA, Thomas HC, Davidson BR, Taylor-Robinson SD (2005). Cholangiocarcinoma. *Lancet*, **366**, 1303-14.

Lovis L, Mak TK, Phongluxa K, et aql (2012). Efficacy of praziquantel against *Schistosoma mekongi* and *Opisthorchis viverrini*: a randomized, single-blinded dose-comparison trial. *PLoS Negl Trop Dis*, **6**, e1726.

Ounnapiruk L, Wirojratana V, Meehatchai N, Turale S (2013). Effectiveness of a behavior modification program for older people with uncontrolled type 2 diabetes. *Nurs Health Sci* [Epub ahead of print].

Poomphakwaen K, Promthet S, Kamsa-ard S, et al (2009). Risk factors for cholangiocarcinoma in Khon Kaen, Thailand: a nested case-control study. *Asian Pac J Cancer Prev*, **10**, 251-7.

Promthet S, Wiangnon S, Senarak W, et al (2012). Evaluation of health education in the Multi-professional Intervention and Training for Ongoing Volunteer-based Community Health Programme in the North-east of Thailand. *Asian Pac J Cancer Prev*, **13**, 1753-5.

Rabello AL.(1992). Parasitological diagnosis of Schistosomiasis mansoni: fecal and rectal biopsy. *Mem Inst Oswado Cruz*, **87 Suppl 4**, 325 -31.

Raksanam B, Taneepanichskul S, Robson MG, Siriwong W (2012). Health risk behaviors associated with agrochemical exposure among rice farmers in a rural community, Thailand: A community-based ethnography. *Asia Pac J Public Health*. [Epub ahead of print]

Rhongbutsri P, Kitvatanachai S (2002). Survey of the fluke infection rate in Ban Kok Yai village, Khon Kaen, Thailand. *J Trop Med Parasitol*, **25**, 76-8.

Saengsawang P, Promthet S, Bradshaw P (2013). Infection with *Opisthorchis viverrini* and use of praziquantel among a working-age population in Northeast Thailand. *Asian Pac J Cancer Prev*, **14**, 2963-6.

Sansiritaweesook G, Muangsom N, Kanato M, Ratanasiri A (2013). Effectiveness of community participation in a surveillance system initiative to prevent drowning in Thailand. *Asia Pac J Public Health*, [Epub ahead of print]

Saranrittichai K, Senarak W, Promthet S, et al (2012). Health behavior after a multiprofessional intervention and training for ongoing volunteer-based community health programme intervention in the North-East of Thailand: what changed and what not? *Asian Pac J Cancer Prev*, **13**, 4801-5.

Sayasone S, Odermatt P, Phoumindr N, et al (2012). Prevalence of OV infection in Yasothon Province, Northeast Thailand. *Asian Pac J Cancer Prev*, **13**, 3399-402

Shin H, Oh J, Masuyer E, Curado M, et al (2010). Epidemiology of cholangiocarcinoma: an update focusing on risk factors. *Cancer Sci*, **101**, 579-85

Sithithaworn P, Andrews RH, Van De N, et al (2012). The current status of opisthorchiasis and clonorchiasis in the Mekong Basin. *Parasitology Int*, **61**, 10-6.

Sohn WM, Yong TS, Eom KS, et al (2012). Prevalence of *Opisthorchis viverrini* infection in humans and fish in Kratie Province, Cambodia. *Acta Trop*, **124**, 215-20.

Songserm N, Promthet S, Sithithaworn P, et al (2012) Risk factors for cholangiocarcinoma in high-risk area of Thailand: role of lifestyle, diet and methylenetetrahydrofolate reductase polymmorhisms. *Cancer Epidemiology*, **36**, 89-94.

Soukhathammavong P.; Odermatt, P.; Sayasone, S.; et al (2011). Efficacy and safety of mefloquine, artesunate, mefloquine–artesunate, tribendimidine, and praziquantel in patients with *Opisthorchis viverrini*: A randomised, exploratory, open-label, phase 2 trial". *Lancet Infect Dis*, **11**, 110-8.

Sriamporn S, Parkin D, Pisani P, et al (2005). A prospective study of diet, lifestyle, and genetic factors and the risk of cancer in Khon Kaen Province, northeast Thailand: description of the cohort. *Asian Pac J Cancer Prev*, **6**, 295-303

Sriamporn S, Pisani P, Pipitgool V, et al (2004). Prevalence of *Opisthorchis viverrini* infection and incidence of cholangiocarcinoma in Khon Kaen, Northeast Thailand. *Trop Med Int Health*, **9**, 588-94.

Sripa B, Bethony JM, Sithithaworn P, et al (2011). Opisthorchiasis and *Opisthorchis*-associated cholangiocarcinoma in Thailand and Laos. *Acta Trop*, **120**, 158-68.

Sripa B, Kaewkes S, Sithithaworn P, et al (2007). Liver fluke induces cholangiocarcinoma. *PLoS Med*, **4**, 201.

Sripa B, Pairojkul C (2008). Cholangiocarcinoma: lessons from Thailand. *Curr Opin Gastroenterol*, **24**, 349-56.

Suntayakorn C, Rojjanasrirat W (2013). Effects of an empowerment program on health behaviors and stroke risk reduction of at-risk group in Thai rural community. *J Med Assoc Thai*, **96**, 1229-38.

Suwannahitatorn P, Klomjit S, Naaglor T, et al (2013). A follow-up study of *Opisthorchis viverrini* infection after the implementation of control program in a rural community, central Thailand. *Parasit Vectors*, **6**, 188

Watanapa P, Watanapa WB (2002). Liver fluke-associated cholangiocarcinoma. *Br J Surg*, **89**, 962-70.

Wattanayingcharoenchai S, Nithikathkul C, Wonsaroj T, Royal L, Reungsang P (2011). Geographic information system of *Opisthorchis viverrini* in northeast Thailand. *Asian Biomedicine*, **5**, 687-91

Wiangnon S, Sriamporn S, Senarak W, et al (2007). Use of lay health workers in a community-based chronic disease control program. *Asian Pac J Cancer Prev*, **8**, 457-61.

World Health Organization (1991). Basic laboratory methods in medical parasitology. World Health Organization, Geneva pp 25-8.

Yong T-S, Shin E-H, Chai J-Y, et al (2012). High prevalence of *Opisthorchis viverrini* infection in a Riparian population in Takeo Province, Cambodia. *Korean J Parasitol*, **50**, 173-6.