

CHAPTER II



LITERATURE REVIEW

2.1 The Liver Flukes

Several trematodes are parasites of the biliary passages of humans. Three of them, *Clonorchis*, *Opisthorchis*, and *Dicrocoelium*, are relatively elongate and narrow-bodied worms that tend to localize in smaller, more distal parts of the biliary tree. Only in heavy infections are these worms found in the common bile duct or gallbladder. *Fasciola*, a much larger worm, is confined by its size to the larger passages.

2.2 Biology and Life Cycle of Liver Flukes

The adult worms are hermaphroditic trematodes, dorso-ventrally flattened body armed with two muscular suckers, the oral sucker situated anteriorly and the ventral sucker at mid-body of the ventral surface. Differentiation of species of the adult worms is based on the shape of testicular lobes and the arrangement of the vitelline gland. The size of adult flukes varies according to species, *O.viverrini* is the smallest measuring 5.5-10 x 0.77-1.65 mm while *C.sinensis* is relatively large measuring 10-25 x 3-5 mm, *O.felineus* is smaller measuring 7-12 x 2-3 mm (Beaver *et al*, 1984). The small yellowish-brown eggs excreted in faeces measuring 25-35 μm in length and 15-17 μm in width for all three species of the liver flukes each has a prominent shoulder with an operculum at one end and a small knob at the other. The surface morphology

observed by scanning electron microscope appeared as a mesh melon pattern. The egg contains a fully formed embryonic stage, a miracidium. The morphology of the eggs are difficult to distinguish between species of liver flukes thus the eggs may be identified with the aid of the information on the geographical distribution.

The life cycle of liver fluke is complicate compared with other parasite. It consists of snail and fish intermediate host and human as a definitive host. Several fish eating mammals particularly dog and cat serve as the natural reservoir hosts. Adult worms live mainly in intrahepatic bile ducts and less frequently in extrahepatic, pancreatic ducts and gall-bladder (Tansurat, 1971, Sithithaworn *et al*, 1991b). Eggs released from the flukes pass from the bile duct into intestine and are excreted into external environment with faeces. After the eggs reach water in ponds, streams or rivers, they are ingested by *Bithynia* snail (small fresh water snail measuring 6-10 mm). The miracidia hatch and develop into sporocysts, rediae and cercariae are produced within 21-30 days after infection (Chanawong and Waikagul, 1991). Although the infection rates in *Bithynia* snails were low (0.05-0.07%) (Harinasuta 1969; Brockelman *et al*, 1986) each infected snail shed numerous cercariae daily into water and the free-swimming cercariae seek for cyprinoid fish to encyst as metacercariae. At least there are 7 genera of the family Cyprinidae (carp) have been reported to be the intermediate host of *O.viverrini*, for example *Cyclocheilichthys apagon*, *C. armatus*, *C. represson*, *Puntius leiacanthus* and *Hampala dispa* (Vichasri *et al*, 1982; Komalamisra and Setasuban, 1989; WHO 1995, Sithithaworn *et al*, 1997). For *C.sinensis*, numerous species of cyprinidae and other family served as the intermediate host (WHO, 1995, Rim 1986). The metacercariae become fully mature and infective at 3 weeks later. In

spite of the low level of infection in snail, the infection rate in fish is several folds higher reflecting the efficient mean for host finding of the free- swimming cercaria by using several chemical attractants released from fish. When undercooked or raw infected fish is eaten, the metacercariae excyst in the duodenum and within 30 minutes they migrate into intrahepatic bile ducts via ampulla of Vater. The juvenile worms travel against the bile flow along the biliary tree and attach themselves to the bile duct epithelium using the suckers. Four weeks after ingestion of the metacercariae, the adult worms start producing eggs at 15-180 egg/gm feces/worm in man depending on the worm burden (Sithithaworn *et al*, 1991a). The worms are believed to survive for several years with the life span as recorded in *C.sinensis* may be over 25 years (Attwood & Chou, 1978).

2.3 Consequence of Infection

Infection by the live fluke is not only causing significant morbidity in infected individuals in terms of hepatobiliary abnormalities but it is also widely accepted that liver fluke infection plays critical roles in induction of cholangiocarcinoma (Haswell-Elkins *et al*, 1992; Sithithaworn *et al*, 1994). The epidemiological evidence is particularly strong and well documented in case of *O.viverrini* in Thailand as well as in case of *C.sinensis* in Korea (Upatham *et al*, 1982, Rim 1986, Elkins *et al*, 1996). The problem is obviously severe especially in Thailand where the incidence of CHCA is approximately 90 per 100,000, the highest in the world (Vatanasapt *et al*, 1993).

2.4 *Opisthorchis Viverrini*

A third species of liver fluke, *O. viverrini*, has been reported only from northern Thailand, where it is a major health problem. The overall prevalence is about 80 per cent in rural people and 55 per cent among urban dwellers, increasing with age up to 10 years. After which it remains constant. Acquisition of the infection seems related to the consumption of koi-pla, a dish prepared from uncooked fresh-water fish (Kurathong et al., 1987). Moderate infections are not associated with significant morbidity, but upper quadrant pain and weakness or malaise were found to bear a significant correlation to intensity of infection (Upatham et al., 1982). Kurathong and coworkers (1985) discussed the relationship between *O. viverrini* infection and cholangiocarcinoma and included, as have others, that the fluke infection is but one of several etiologic factors. It is quite possible that *O. felinus* infections, reported from neighboring areas such as North Vietnam may in reality be caused by *O. viverrini*.

The adult *O. viverrini* differs only slightly in structure from the other two opisthorchis. The eggs are relatively short and broad, with an average length of 26.7 μm and breadth of 15 μm (Plate X)

The only treatment of proven efficacy is praziquantel, administered as for clonorchiasis.

2.4.1 General description

This liver fluke is endemic to northeast Thailand and surrounding regions, where it is estimated that 7 million people are infected. Adult *O. viverrini* are 7-12mm

long and 1.5-3 mm wide, transparent, and elongate. They typically have a rounded posterior, a tapered anterior, and oral and ventral suckers. The digestive system consists of the oral sucker that leads to a small pharynx and esophagus and then two ceca. *O. viverrini* is hermaphroditic and has an extensive reproductive system for its size. This is suggested by the name Opisthorchis (opis=behind, orchis=testis). The pair of testes is lobated and near the posterior end. The uterus is a highly coiled tubule and transverse compressed follicles lie laterally¹¹.

2.4.2 Association with disease and malignancy

O. viverrini is the etiologic agent of opisthorchis and is strongly correlated with cholangio-carcinoma in Thailand. People, particularly males, with heavy liver fluke infection have a significantly increased risk of cholangiocarcinoma, a normally rare form of liver cancer. Diverse studies have been done about this relationship: case studies in hospitals, population-based ecologic studies, and case-control studies. A study by Bhamarapavati and Viranuvatti in the 1960s of 9694 autopsies showed the ratio of hepatocellular carcinoma to cholangiocarcinoma in uninfected patients was 5:1 and 1:2 in patients with liver fluke infection. Numerous other studies have supported the dramatic increase in the occurrence of cholangiocarcinoma associated with infection by *O. viverrini*. Bunyaratvej and his associates later found cholangiocarcinoma was 2.4 times more common in males. In the 1970s, Hitanant found 29% of *O. viverrini* infected patients had cholangiocarcinoma. Vatanasapt found in 1988 that clusters of cancer correlated with the prevalence and intensity of *O. viverrini* infection in Khon Kaen and a 1991 hospital study showed that infection with *O. viverrini* increased the risk of cholangiocarcinoma fivefold¹¹.

2.4.3 Lifecycle

The embryonated eggs pass out in the faeces are ingested by the snail intermediate hosts, which may belong to a number of genera belonging to the subfamily Buliminae (e.g. *Parafossarulus manchouricus*, *Bulimus fuchsiana*, *Alocima longicornis*) and *Hua ningpoensis* of the Thiariidae. Here the eggs hatch in the rectum of the snail to release the miracidium, which penetrates the gut wall to invade the snail tissues. There is one generation of sporocysts in this parasite, followed by numerous redia (of a single generation) appearing ~ 17 days post infection, then numerous cercaria 21 to 30 days post infection. Morphologically the cercaria lophocercous (i.e. have "keeled" tails). The cercaria leave the snail hosts then penetrate the cyprinid fish intermediate hosts, where they migrate to the subcutaneous connective tissues and muscle (often near the caudal fin). The body of the cercaria then round up to form the highly resistant metacercaria, which may be seen as black spots on the fins of the fish. These metacercaria are infective after ~ 23 days. To continue the lifecycle the raw or undercooked fish must be eaten, and the most effective means of control of this parasite is to cook the fish, although for cultural reasons this may not be feasible. As well as man most fish eating mammals may also be infected, acting as reservoir hosts for the parasite. Of these reservoir hosts dogs are probably the most important, but cats and rats are also commonly infected as well. In these definitive hosts the metacercaria excyst in the duodenum, from where they crawl into the bile duct where they mature in 3 to 4 weeks to complete the lifecycle. The parasites themselves live up to 25 years. Note that as well as the bile duct, the parasites may also be present in the pancreatic duct and gall bladder as well, particularly in heavy infections.

2.4.4 Pathology of infection

For this parasite, as for many other helminth diseases, the severity of disease is dependent on the number flukes the individual host harbors. Most infections consist of less than 100 parasites and the majority of these are asymptomatic. When infections consist of up to 1000 flukes non-specific symptoms such as diarrhoea, abdominal pain and splenomegaly may be seen. More severe symptoms may be seen in heavier infection, which may consist of many thousands of parasites (up to 21 000 flukes have been observed in a single infection). Here symptoms may include fever acute pain in the upper right quadrant of the liver and enlargement of the liver (which may become cirrhotic resulting in portal hypertension). There may also be jaundice, tachycardia and loss of weight, and in the circulatory system eosinophilia is often seen. The presence of the parasites in the bile duct leads to inflammation and fibrosis of the bile duct, this may be followed by metaplasia often leading to cancer. The disease itself is rarely fatal. However changes in the bile duct favour highly pathogenic bacteria such as *Salmonella*, which flourish in bile ducts containing *Opisthorchis*.

2.5 Treatment and Prevention of Liver Flukes

2.5.1 Treatment

For the last ten years, the antihelminthic drug praziquantel (Biltricide, EMBAY 8440) has been successfully used to treat liver fluke infection. Praziquantel was introduced in 1975 to treat schistosomes, a parasite that can lead to urinary bladder cancer. This drug is a pyrazinoisoquinole that has proven safe and effective against trematode and cestode infection in humans and other animals. The suggested dosage is 25 mg/kg of body weight, three times a day or two days. This dosage has demonstrated

a 100% cure rate for eliminating liver flukes¹¹. However, the removal of liver flukes from the body has not prevented cholangiocarcinoma.

Despite the introduction and usage of praziquantel, the prevalence of cholangiocarcinoma in high-risk areas, such as northeast Thailand, have not decreased substantially. This suggests that some irreversible changes must occur early on in infection because cancer still results, even though the liver fluke is no longer present. This information has serious implications for the efficacy of treatment programs and suggests that prevention of fluke infection may be a much more effective strategy.

2.5.2 Prevention

Efforts to prevent liver fluke infection have focused on interrupting its lifecycle. This involves preventing fecal parasites from reaching the water supplies, decreasing snail hosts, and promoting adequate cooking methods for cyprinoid fish. There is a program in effect by the National Public Health Development Plans to attempt to control liver fluke infection. This program involves attempting to decrease the human host reservoir by testing stool and treating *O. viverrini* infections with praziquantel, education and promotion of cooking fish, and improvement of hygienic defecation. Between 1981 and 1991, infection rates in north and central regions increased while infections in the northeastern regions decreased⁷.

Much of this involves educating the local people about the risks associated with liver fluke infection and what they can do to minimize them. The National Public Health Development Plans is currently operating a national liver fluke control program

in Thailand. The program involves stool examination and treatment with praziquantel, health education for infection prevention, and improvement of hygienic defecation⁷.

Currently, most of the indigenous people have latrines, which greatly decrease the risk of fecal parasite ova contaminating the water supplies, in which snails reside. Contamination still takes place during the rainy season when flooding occurs and infected dogs and cats can also cause contamination. Elimination of either this snail or fish host is not feasible, as the chemicals required to kill the snails would wipe out many other organisms and the cyprinoid fish are the major protein source for the region. Nonetheless, the percentage of infected fish has decreased dramatically.

The most probably route for interrupting the liver fluke lifecycle is preventing infection of the human host. Simply eliminating the consumption of raw or improperly cooked fish can do this. However, there is a tradition of eating raw fish and since the effects of infection are not immediate, the warnings may be ignored. In many regions, such as Japan, economic growth has had to occur before the problem of liver fluke could be eradicated¹¹.

2.6 Tribal People : The Yao Nationality

2.6.1 Affiliation

The Yao, together with the Meo, form two groups of the Yao – Meo – Pateng people, whose wider linguistic affiliations yet needs study. Their origin is roughly in Kweichow Province of china, from whence the Meo also came. They are as ancient a people as the Meo and the Lo – Lo, or forefathers of the Lisu and Akha, becoming

more or less established into their ethnic divisions some 2500 years ago. They are perhaps the same as the Yao – Ren, mentioned in ancient Chinese chronicles, being at that time, very barbaric people called “ dog “ by the Chinese. They remain in southern China in large numbers, especially in Kwangsi Province, and have been migrating for centuries into southern Yunnan, Tongking , Laos and Thailand. They have undergone the same strong exposure to Chinese influences as the Meo, perhaps having intermarried to great extents with the conquering Chinese soldiers since the time of the earliest kings of the Chow dynasty. The Yao of today has strong “ Chinese “ features, and in Thailand, they represent a single homogeneous tribe which is well separated linguistically from all other hilltribes.

2.6.2 Location

Earlier reports have placed the main concentrations of Yao in northern Nan Province, but they are today more numerous in eastern and northern Chiangrai Province. Only about 7 % of the total Yao population remain in northern Nan. They are found only in these two Provinces of Thailand in significant numbers with only a few villages in Amphur Fang, Chiangmai.

2.6.3 Populations

There are 74 villages known, with an average of 15 houses per village and 8.5 per household. The total population for 1960 is estimated at 10,200 Yao in Thailand.

2.6.4 Language

The Yao language is more closely related to the Meo language than any other, but the two are completely different as far as mutual inter – intelligence is concerned. It is a tonal language, strongly influence by Chinese. Actual affiliations of the Yao language have yet to be definitely established. They have no alphabet of their own, but some of the men use Chinese characters to write their own language.

The Yao in the northern areas of Chiengrai (Amphur Mae Chan) have almost all come from the Nam Tha district of Laos where the were closely associated with the Lahu Na. They are therefore all quite fluent in Lahu, as well Yunnanese and Lao – Thai. This group of Yao have remarkable linguistic abilities, so that it is strange that the Yao in Nan and western Chiengrai do not show the same affinity for language. The Yao of Nan speak the Lao – Thai poorly, as compared to their northern brothers, and most of them do not understand Yunnanese (This is also true for the Meo in Nan). Ther are individuals in north who can speak Akha and Lisu, and a few have learned Thai. There is a missionary English and Thai script being taught to the Yao and a few of them have become literate in it. Very few of them can use Chinese characters

2.6.5 Religion

The yao are animists, who, like the Meo, practice various rituals with have been adopted from the Chinese. They place importance on ancestor reverence and make sacrifices to them, although these sprites are not worshipped. The only other religion to have reached the Yao is Christianity, but there are less more than 200 Yao who are now professing Christians.

The Yao, by a large, are not a involved with their various religion customs as are the Meo, but have similar rituals concerning departing souls, an exorcistic practices which are designed to remove bad spirits from the dying as well as the living. There are family altars at which routine offering are made to guardian spirits and joss – sticks are burned there. Sacrifices of pigs and chickens are made to the spirits of ancestors once a year as well as at the time of a death or sickness. There are no images or temples.

2.6.6 Villages

The Yao live on the lower elevations than the Meo or Lisu. Their villages are often located along stream heads at elevation of 3000 to 3500 feet and average about 15 houses. They have become more permanent in recent years and have been know to remain in one general area for 10-15 years. The smaller villages and hamlets move more frequently.

The houses are built on the ground like thosr of the Meo, and have thatch grass roofs, with bamboo slat or split wood walls. They are large and roomy dwellings with two or more partitioned sections. The font sections of the houses are use for working and quartering guests, with a fire hearth in the middle of each section.

The men dress very plainly in comparison, wearing a loose jacket which fastens to one side at the neck, and loose trousers of blue – black material. They may have a few sliver buttons and embroidered hems. The head is usually bare, but those men who have acquired felt berets from the towns will wear them constantly. They have a cloth skull cap, but these are worn more by the younger boys than by the men.

2.6.7 Economy

The Yao are industrious hill farmers who have a constant agricultural program going on the year round. Their principal cash crop is opium, with considerable yearly sales of hogs and cattle to add to this. Their earning ability is higher than all other hill tribes with the exception of the few Yunnanese Haw, who earn more from trading. The Yao on the whole, plant more poppies and know more about the cultivation of opium than other hill tribes. They put in the same enthusiasm in their animal husbandry as do the Meo. In addition, they are shrewd businessmen.

The Yao in the Chiengrai area have leaned specialize skills which they have acquired from the Thai people, such as ricepaper – making and sliversmithing. Their blacksmiths make excellent hoes, axes, and other implements and a type of muzzle – loading shotgun that has admirable power and accuracy. The women are skilled with the needle and produce beautiful embroidery work. These and other activities make brisk intra – village trade which is extended to neighboring villages. Payment are usually made in either cash or through trade of opium and foodstuffs.

They grow sufficient quantities of crop and vegetables to meet their needs, as well as having sufficient corn to feed their pigs. The Yao keep fine – looking cattle, hogs, chickens, ducks, ponies and in the some areas, buffaloes. Their hog herds are the most impressive, in terms of numbers and the selected breeding that is sometime practiced, so that more improved types of hogs are to be seen. Fences are built around the houses and substantial stalls and pen made for the livestock.

2.6.8 Contact

Through bold and aggressive contacts with other tribes and the Thai people. The Yao are more advanced as hill tribes go. Their men offer know their way around the towns and cities, dressing like the local people, and passing for such. They are very hospitable people and entertain visitors frequently in their villages. The villages are also within reasonable access to Thai traders and buyers being on elevations of 3000 feet or so. Their commerce includes contacts with people of very race living near them, and because they are, by and large, a friendly people, such contacts are continually encouraged.

Intermarriage with other races is very rare, despite the carefree attitudes many Yao circles have concerning courtship and marriage. It is quite common to see member of Lahu tribes who have sought refuge in Yao villages, living with Yao and working for them. The Yao keep a cautious but active trade relationship with Yunnanese, who travel in and out of their villages, but very rarely allow them to settle with them (as the Lisu quite often do).

2.6.9 Social Customs

The Yao of Thailand have an unusual custom in the courtship of their young people. An eligible young woman must keep two beds, one for herself and the other for a suitor, or her parents might be embarrassed that their child lacked training in etiquette. Should the young woman become pregnant, and yet the young man refuses marriage, the incident is not regretted, and the new child is gratefully received by the girl' s parents. According to custom, the young man than must to pay token fine (seven

silver rupee coins or the equivalent in Baht) and he is properly and quickly excused. He would need to pay much more if he decided to marry the girl. There are, however, modifications and exceptions taken in this very common case, and the influence of the parents has much to do with the final decisions when the man involved is one of the villagers. Most outsiders, especially the Chinese, are not eligible to court the Yao girl.

The Yao observe wedding, funerals and New Year's with great enthusiasm, dressing in their best fineries and doing much feasting and drinking. They are not given to song and dance, although they do have a casual form of dancing as well as song. They enjoy telling tales and folk stories, and the main event of each day is the time of visiting each other in their homes for this purpose. They drink great quantities of green tea (usually plucked from the wild trees) and smoke the water pipes (tobacco) at such times, as well as during the day when there is leisure time. They never chew the betel nut nor do they drink liquor frequently, and only the older men might become addicted to opium. Many men actually smoke opium, but few of them really become addicted to the drug.

2.6.10 Village Government

A Yao chieftain is selected by the elders of the village mainly for his intelligence, and usually out of respect for age and experience. They are a peaceful people but have a similar desire for litigations that the Meg have. At such times there are opportunities to make lengthy speeches, and the older men get a chance to show their greater knowledge and wisdom to the younger people. They do not maintain warriors or special men to enforce law and order, and generally settle disputes through the chief's

decisions through fines that he might impose. They are very polite to each other and seldom have serious quarrels, but occasionally more serious difficulties arise between the Yao and another tribal group. In such cases, the Yao are slow to anger, but will follow up with drastic justice and retaliation. Few legal ever reach the Amphurs, but very few cases involving death sentence by their own judgment have been reported.

2.6.11 Ends

While many Yao have come from Laos as recently as 1956, there are relatively few of them coming into Thailand today. Their settlements have become more permanent than in the past and there are no significant numbers of Yao people moving out of their main areas today. They tend to relocate a village every ten years, but do not move long distances. A few Yao in Amphur Mae Chan, Chiengrai, have moved into the valleys and taken up wet rice cultivation. But these are exceptions.

2.6.12 The Food of Yao People

Yao people had adopted tradition of food from some other groups such as Chinese and then adapted and created their own “unique” ethnic way.

Yao people in Thailand also adopted Laotian food while they were moving down from China through Laos into Thailand, for example the adoption of “Laab” from the “Tai” people, the “Lam” food processing from “Khamu” people.

2.6.13 Food Type

Among all of hilltribes in Thailand, the Yao have relatively more types of food than other hilltribes. This richness of food certainly connects to the richness of culture and tradition. The following is just some of the Yao's food.

2.6.14 Yao's food

1. Grill & Roast
2. Deep fry
3. Labb & Loo
4. Soup
5. "Lamm"
6. Steam
7. Stir-fry
8. Boiled
9. "Jay"
10. Quick boil
11. Food for post-delivery women
12. Chilli paste
13. "Mok"
14. Dessert

2.6.15 Labb & Loo

This type of food was adopted from other hilltribes such as the Tai, who lived in the south of China, in Vietnam and Laos, which was once a route of migration of the Yao. But Yao has made some adaptation of seasoning to be different from the Tai.

1. Pae-wang or Loo Yao

Ingredient: pork, pork's internal such as heart, liver, lung, spleen, kidney, colon, or stomach (if needed). Seasoning are salt, garlic, onion, pepper, lemon grass, Ho-ra-pa, E-leun, mint, dried ground chilli, Pa-lab, celery, pork's oil, and fresh pork's blood.

Instruction:

Chop the pork and keep in a bowl. Slice all the pork's internals very thin. Smash spice e.g. pepper, Pa-lab, Pa-khan. Chop seasoning leaves and split half the prepared ingredients.

Add a little salt into fresh pork blood and always stir not to let it clot by using chopsticks not lemon grass leaf due to the belief that it is against blood clotting. Keep in a bowl.

Stir-fry the internals and keep in a dish. Make it crispy if liked by deep fry.

Mix pork and seasoning by frying one half of ingredients in pork oil and keeping in a bowl. Let it cool. Pour fresh blood and add the second half of ingredient. Serve fresh or cook it again by frying in pan with a little oil.

This is called Pae-wang. But the Yao has more steps to make it different.

After mixing blood, add cool water for about two-third of the whole ingredient. The blood will clot. And this is called Sang-wang

To eat, separate the mixture into pieces and serve with chopsticks. Yao do not use lemon grass leaf because they want to eat Sang-wang.

2. Or-sern or Laab Yao

The Yao shares this dish with Moo-ser and Leesaw hilltribes. It is assumed the Yao adopted it from the Tai.

Ingredient: pork (red meat without fat) e.g. ham. Pork internals e.g heart, liver, lung, spleen, kidney, colon, intestine, and stomach. Pork skin with fat layer. Pork oil.

Seasoning: salt, garlic, onion, pepper, lemon grass, Ho-ra-pa, E-leun, mint, dried ground chilli, Pa-lab, celery, etc.

Instruction:

Chop pork and add (by scrapping) some of the bark of these plants:

Wild chestnut *Quercus kerrii* Craib. FAGACEAE family

Hog plum *Sapindus pinnata* (L.f.) Kurz. ANACARDIACEAE family

Emblic-myrobolan *Phyllanthus emblica* L. UEPHORBIACEAE family

Select to add only one of these barks at a time.

The addition will change the chopped pork from red to white. The Yao believe that it changes the pork to be sour and look tastier. Keep the chopped pork in a bowl.

Slice pork skin after boiled. Cut pork internals into small pieces and stir-fry in a pan or deep-fry to make it crispy.

Smash all seasonings e.g. salt, pepper, Pa-lab, Pa-khan and keep in a bowl.

Chop other leaf ingredients.

Mix all pork and ingredients in a big bowl, add salt, add dried chilli. This is called raw Laab.

Or-sern or Laab Yao has 3 varieties of cooking.

- Raw Laab as explained
- Cooked laab by cooking the raw Laab

- Mixing the raw Laab with fresh blood

3. Chicken or bird Laab

Ingredient: chicken or wild bird. For chicken, pick only chicken meat and chop it. For bird, chop the whole bird. Internals must be fried or boiled, cool, and cut into pieces.

Seasoning: use the same one to Or-ern

Instruction:

Stir fry the seasoned chicken meat or bird. Let cool. Add all seasoning leaves. One important ingredient is “Khao Khua” (dried ground rice grain)

This Laab can be added with grilled and peeled egg plant.

4. Or-laab or raw Laab

This dish is solely eaten by the Yao in Nan province, north of Thailand, not in other provinces. It was assumed to be adopted from other hilltribes in Nan or adjacent province. The ingredient is red meat pork without fat or connective tissue, fresh “Kha” (*Alpinia siamniensis*) root, chilli, and salt.

Chop the pork. Peel the “Kha” and cut into pieces.

Mix all ingredients in a big bowl. Add chilli and salt as needed. Lemon juice can also be added. When the taste is good enough, this dish is ready to serve.

Because this dish is totally raw, it is eaten with fresh vegetables e.g. young mango leaf, Ho-ra-pa, onion, young jackfruit, string bean, mint, penny wort, etc.

2.7 Related Research

A research of Pantipa Kaewmart (2531) on “Comparison of knowledge, belief, and dietary behavior of liver fluke cured and relapse patients” to study the knowledge of people about liver fluke and the association of knowledge, belief, and dietary behavior of liver fluke cured and relapse patients, by age, age, education level, income, family characteristic. Sample group was patient treated with Praziquantel 40 mg. Per kg.BW. at least 3 – 6 months and visited hospital in Khon Khan and Sakonnakorn, 200 in total: 100 cured and 100 relapse. Reseach tool was a questionnaire. It was found that the behavior of cured and relapse patients had significiant difference at 0.05 level. And the behavior of the two groups by sex, age, education level, income, and family characteristic had significiant difference at 0.05 level.

Dietary behavior related researches, there is a research of Rungwit Mas-ngam-muang and Wichit Fungladda (2530:113 – 128) on “Association of dietary behavior and liver fluke: a case study of Hua Dong, Khon Khan province” aiming to find relation of dietary behaviro and the liver fluke of people in Hua Dong village, Nam Pong district in Khon Khan province using in-depth interview, participatory and non-participatory observation, questionnaire, and stool examination from 250 samples. The liver fluke was found in 53.6% of them and the behavior of raw or half-cooked fish had significant relationship with liver fluke.

Suwipa Kosumwatcharaporn and Premchit Krapurit (2528: 41 – 50) studied some factors relating to liver fluke of the client of Liver fluke Treatment Center, Tuberculosis Center 6, Khon Khan, 100 client in total, aged 31 – 40, were interviewed,

for finding influential factors, source of information, and knowledge. The fluke was found 31% from stool examination. Knowledge about liver fluke, 34 had knowledge and 69 did not have. Among the first group, 70.59% of them gained knowledge from neighbour, 11.76% from health worker, and 8.82% from radio. Dietary habit, 100% of those who ate raw or half-cooked fish found liver fluke and 91.42% of those who sometimes ate found liver fluke. Reasons of eating, 66.33% ate because other people did, 33.67% concerned about taste that cooked fish tasted worse. In the meantime, 59.18% quitted and 40.82% did not quit.

Rungwit Mas-ngam-muang (2530) researched on “Belief, health practice, and social factors relating liver fluke” aiming to study knowledge, experience, belief, and behavior relating liver fluke and the local social factors supporting liver fluke. Target population was people in Hua Dong village, Nam Pong district, Khon Khan province. The tools were family questionnaire, questions for informants, participatory and non-participatory observation, and stool examination kits. The results were that supporting factors for liver fluke were abundant water resource, sufficient fish supply, on-going tradition of eating raw fish dishes, and the acceptance of its value in individual, family and community level. It was found that 53.6% of people found liver fluke. Knowledge and attitude related to the incidence. Behavior of raw or half-cooked fish consumption significantly related to the incidence.

Paiboon Sitthithaworn, Wichit Pipithkul, and Saman Thessana (2526: 71 – 78) had studied on “Preliminary study to find association between economic status, sanitation, dietary habit, and knowledge about Liver fluke” from 258 target

populations. It was found that the prevalence rate, 21.3%, and moderate level of density. Social and economic study found that income and economic status had no association with dietary habit of eat raw or half-cooked food. Dietary depends on age. The older they become, the more raw or half-cooked food they eat. Knowledge had no relation with dietary habit. And women liked to eat raw or half-cooked fish than man did. This is contradict with Wanchai Phatihattakorn et al. (2526: 93 –104) who studied “Epidemiology of liver fluke and the development of Pong river catchment area” for control of the liver fluke. It was found that from stool examination of 3,418 cases, 66% found parasitic and 53% were liver fluke. Men had more number and higher severity because men had more occasions e.g celebrative feast, post-harvest feast, to drink and eat such food. Udomporn Julareuk and Wongdeun Pandee (2531:11 - 20)convinced the finding. They studied “Epidemiology and behavior concerning liver fluke in Don Pom village, Muang Kao, Muang province, Khon Khan”. Target population of 692 were studied to find distribution, knowledge, attitude and behavior concerning liver fluke. It was found 3.5% of prevalence rate with men eating significantly more raw or half-cooked fish than women. Age significantly related to such behavior. Older age ate raw or half-cooked fish than the younger. Experiiece of eating, age, and occupation significantly related to the incidence of liver fluke ($P < 0.0001$, 0.0221, and 0.0072). Those eating raw or half-cooked fish had higer risk than the non-eater of 4 times.

Pichet Srimek (2531) studied on “Knowledge, perception, and health behavior concerning liver fluke of primary students in Petchaboon province”. Sample group was primary 6 students, selected from multiple sampling, 431 students in total. The tool was a questionnaire on personal data, bahavior, knowledge and perception. Results relating dietary behavior are:

1. Most of student experienced raw or half-cooked fish dishes
2. Sex associated dietary behavior
3. Economic status associated dietary behavior
4. Knowledge about liver fluke associated dietary behavior
5. Perception about liver fluke associated dietary behavior

A survey research of Kunjana Deeviset (2535) on epidemiology and risk factor of liver fluke in Wattana Nakorn district, Prachinburi province studied 416 targets by stool examination, carrier pest examination, and questionnaire. Chi-square test, t-test, Correlation coefficient and Odds ratio were used for statistical analysis. Age was associated with the liver fluke ($P < 0.001$) but the sex, education level, and occupation were not. Migration from the north-east was not associated with liver fluke. Knowledge and practice were associated with liver fluke ($P < 0.001$) but there was no relation between knowledge and practice. Moreover, the higher score of knowledge, the lower score of practice and attitude ($r = -.1448$ and $r = -.3357$) but if attitude score increased, practice score increased slightly ($r = +.0976$). Examination in carrier pest, in dogs and fish, found 1.1 and 3.1% prevalence rate but not in cat and mollusc. Direct factor of liver fluke was eating raw or half-cooked fish ($P < 0.001$), cooking raw fish ($P < 0.001$), and eating papaya salad with fermented fish paste ($P < 0.001$). The 3 behaviors was 14, 4 and 7 times riskier behavior to liver fluke. Indirect supporting factors were feeding left over to cats and dogs ($P < 0.0060$) and irregular toilet use ($P < 0.0160$).

Pramote Weeniyom et al. (2531:15 – 26) studied on “Knowledge, attitude, and practice concerning liver fluke: a case study of Klong Charern, Tumbon Huay Nam

Hom, Lad Yao district, Nakorn Sawan province”. The finding was knowledge and attitude had no association with liver fluke. Liver fluke patients all experienced raw fish dishes.

Supranee Changbumrung et al. (1989: 133 – 145) studied on “Pattern of food and fish consumption behavior of population in liver fluke epidemic area” asking the foods eaten by three different questions: food eaten within 24 hours, frequency of eating, and the weight of food. Target population were in Khon Khan province, 2,378 people in 416 families. Glutinous (sticky) rice was main carbohydrate source and fish or fermented fish were main protein sources. The findings: at the beginning of liver fluke control project, 60.9% of population consumed raw or half-cooked fish. That was a risk behavior. After 15 months, the population eating raw or half-cooked fish reduced to 7.6%.

Mayuree Pornpiboon et al. (2536:105 – 112) studied on prevalence of intestine worm and liver fluke of people in Muang and Ban Thi district of Lamphun province. Stool examination was done in 885 samples and 32.7% found worm. Liver fluke was found more than any other kind, 17.9%. The incidence varied from place to place. Two villages with similar topography and 10 kms in between had significant difference prevalence of liver fluke. Questionnaires were used to interview 183 and 146 villagers from 2 villages. Both villages, the raw fish consumption behavior had association with liver fluke incidence significantly ($P < 0.001$). Knowledge about liver fluke had no association. Important factor concerning a difference of prevalence was raw fish consumption behavior. The villager eating more raw fish had higher prevalence. The sources of fish were also different.

As mentioned above, raw fish consumption related to liver fluke. There are different factors influencing people's health behavior, not one single factor but all together. Dietary behavior is strongly affected by cultural, social, and economic characteristics, including physical and biological environment and knowledge of people about nutritions. Eating behavior is a life style, a way of life, and influenced by many related factors, which influence one another. These factors were parts of Decision Making Power and express as behavior.