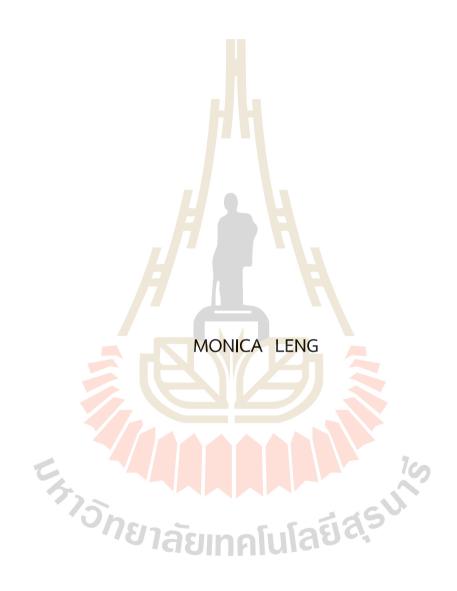
DIAGNOSTIC METHODS FOR THE DETECTION OF *OPISTHORCHIS*VIVERRINI IN KRATIE PROVINCE, CAMBODIA



A Thesis Submitted in Partial Fulfillment of the Requirements for the

Degree of Master of Science in Translational Medicine

Suranaree University of Technology

Academic Year 2023

วิธีตรวจหาการติดเชื้อพยาธิใบไม้ตับ Opisthorchis viverrini ในจังหวัดกระแจะ ประเทศกัมพูชา



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต สาขาวิชาเวชศาสตร์ปริวรรต มหาวิทยาลัยเทคโนโลยีสุรนารี ปีการศึกษา 2566

DIAGNOSTIC METHODS FOR THE DETECTION OF *OPISTHORCHIS*VIVERRINI IN KRATIE PROVINCE, CAMBODIA

Suranaree University of Technology has approved this thesis submitted in partial fulfillment of the requirements for a Master's Degree.

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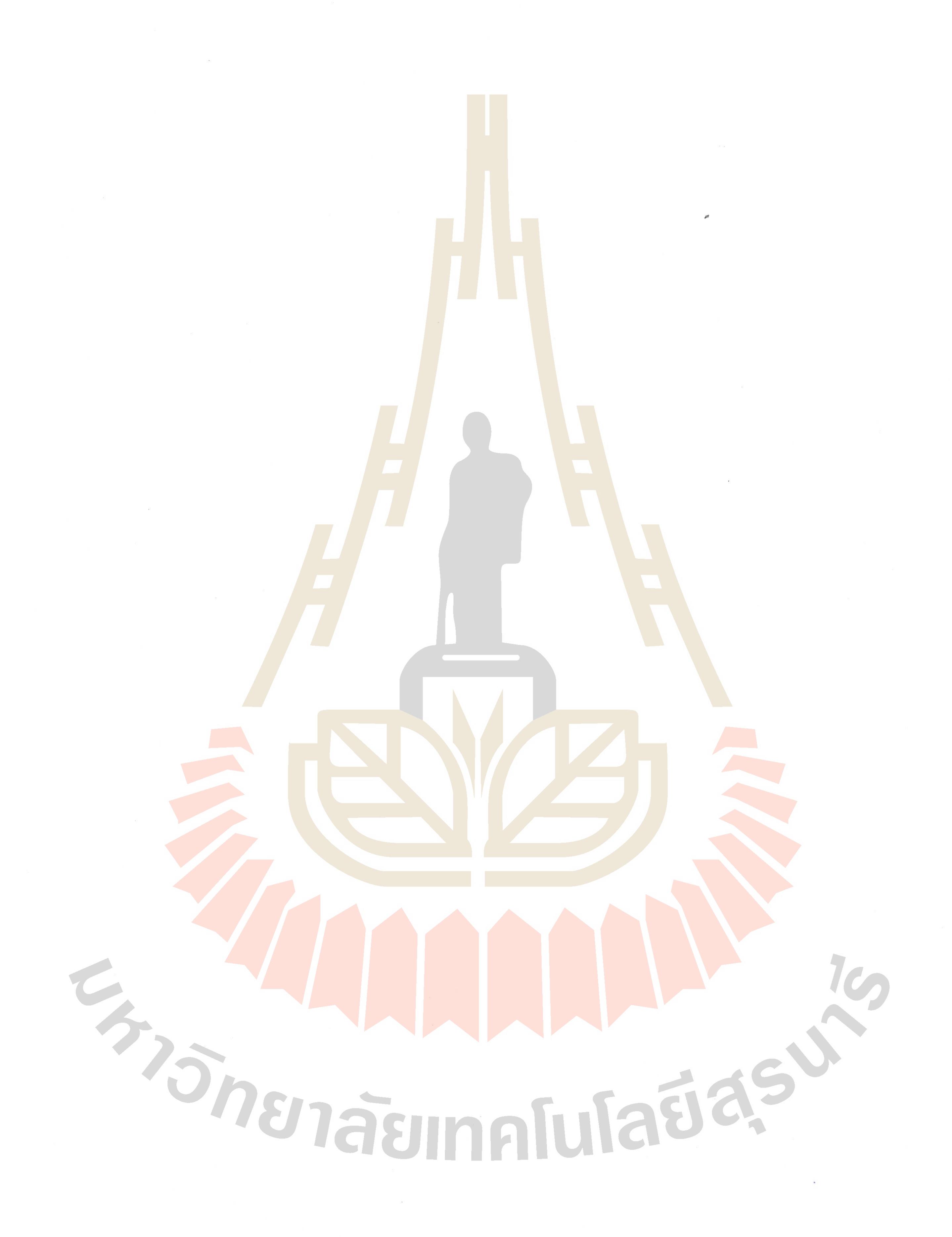
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โมนิก้า เล่ง : วิธีตรวจหาการติดเชื้อพยาธิใบไม้ตับ *Opisthorchis viverrini* ในจังหวัด กระแจะ ประเทศกัมพูชา (DIAGNOSTIC METHODS FOR THE DETECTION OF *OPISTHORCHIS VIVERRINI* IN KRATIE PROVINCE, CAMBODIA) อาจารย์ที่ปรึกษา : รองศาสตราจารย์ แพทย์หญิงชวัลญ์ญา รัตนพิทูลย์, 102 หน้า.

คำสำคัญ: ออร์พิสทอร์คิส วิเวอร์รินิ มะเร็งท่อน้ำดี/วิธีการตรวจปรสิตในอุจจาระแบบเข้มข้นวิธี ตกตะกอนด้วยฟอร์มาลิน-อะซีเตต โพลีเมอเรซเชนรีแอคชั่น กัมพูชา

พยาธิใบไม้ตับชนิด Opisthorchis viverrini เป็นปัญหาสุขภาพที่สำคัญในภูมิภาคเอเชีย ตะวันออกเฉียงใต้ การติดเชื้อมีความสัมพันธ์กับโรคมะเร็งท่อน้ำดีในท่อน้ำดี (CCA) อย่างไรก็ตาม ้อัตราการติดเชื้อปัจจุบันในจังหวัดกระแจะ ประ<mark>เ</mark>ทศกัมพูชา ยังไม่พบรายงานการศึกษา ดังนั้น งานวิจัยนี้จึงมีวัตถุประสงค์เพื่อตรวจหา<mark>ก</mark>ารติดเชื้อ<mark>พ</mark>ยาธิใบไม้ตับ *O. viverrini* ในตัวอย่างประชากร ้ จ**ังห**วัดกระแจะ ประเทศกัมพูชา <mark>จาก</mark>จำนวนตัว<mark>อย่า</mark>งอุจจาระทั้งหมด 380 ตัวอย่าง ศึกษา ณ ห้องปฏิบัติการศูนย์วิจัยโรคปรสิต <mark>มห</mark>าวิทยาลัยเทคโนโล<mark>ยี</mark>สุรนารี จังหวัดนครราชสีมา ประเทศไทย ้เริ่มศึกษาในช่วงเดือนพฤศจิก<mark>ายน</mark> พ.ศ. 2561 โดยใช้ 2 <mark>วิธีก</mark>ารตรวจหาเชื้อปรสิต ประกอบด้วย วิธีการตรวจปรสิตในอุจจาระ<mark>แบบ</mark>เข้มข้น Fecal parasite co<mark>ncent</mark>rator kit (FPCK) และวิธีตกตะกอน ด้วยฟอร์มาลิน-อะซีเตต Formalin-ethly acetate concentration (FECT) และยืนยันการติดเชื้อพยาธิ ใบไม้ตับ *O. viverrini* <mark>ด้</mark>วยวิธีโ<mark>พลีเมอเรซเชนรีแอคชั่น (PCR) ผลกา</mark>รศึกษาพบว่า 25 ตัวอย่าง (6.57 %) มีการติดเ<mark>ชื้อป</mark>รสิตใ<mark>นระบบทางเดินอาหาร โดยป</mark>รสิตที่พบ<mark>ตรวจ</mark>พบมากที่สุด คือ โปรโตซัว Entamoeba coli 1.84 % รองลงมาคือ พยาธิในไม้ตับ O. viverrini 1.31 % พยาธิปากขอ Hookworm spp 1.05 %, พยาธิสตรองจีลอยด์ Strongyloides stercoralis 1.05 % พยาธิใส้เดือน Ascaris lumbricoides 0.52 % พย<mark>าธิตีดแคระ Hymenolepis nana 0.26</mark> % และ พยาธิแส้ม้า Trichuis trichiura 0.26 % ตามลำดับ เมื่อเป<mark>รียบเทียบความไว</mark>และความจำเพาะในการตรวจหาการติดเชื้อของ พยาธิใบไม้ตับ O. viverini ของ 2 วิธี (FPCK และ FECT) พบว่า วิธี FPCK มีความไวเท่ากับ 50.00 % วิธี FECT มีความไวเท่ากับ 66.67 % ซึ่งทั้ง 2 วิธีมีความจำเพาะเท่ากับ 99.74 % ความหนาแน่นของการ ติดเชื้อพยาธิใบไม้ตับ *O. viverrini* (วิธี FPCK=144 และ วิธี FECT=84.83 ผลการยืนยันการติดเชื้อ พยาธิใบไม้ตับ *O. viverrini* ด้วยวิธี PCR พบว่า 2 ตัวอย่าง จาก 4 ตัวอย่าง ใน ทั้งหมด 380 ตัวอย่าง ยืนยันว่าเป็นสารพันธุ์กรรมของพยาธิใบไม้ตับ O. viverrini งานวิจัยนี้เป็นรายงานครั้งแรกเกี่ยวกับการ ติดเชื้อพยาธิใบไม้ตับ O. viverrini ในจังหวัดกระแจะ ประเทศกัมพูชา โดยใช้วิธีวิธี FPCK และ วิธี FECT และยืนยันการติดเชื้อพยาธิใบไม้ตับด้วยวิธี PCR ข้อมูลจากงานวิจัยนี้ ชี้ให้เห็นความสำคัญในการ เฝ้าระวังการติดเชื้อการควบคุมการติดเชื้อปรสิต ที่มากับอาหารรวมถึงการป้องกันโรคมะเร็งท่อน้ำดีที่ สัมพันธ์กับพยาธิใบไม้ตับ O. viverrini ใน ประเทศกัมพูชา



สาขาวิชา <u>เวชศาสตร์ปริวรรต</u> ปีการศึกษา <u>2566</u>

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ลายมือชื่ออาจารย์ที่ปรึกษาร่วม	
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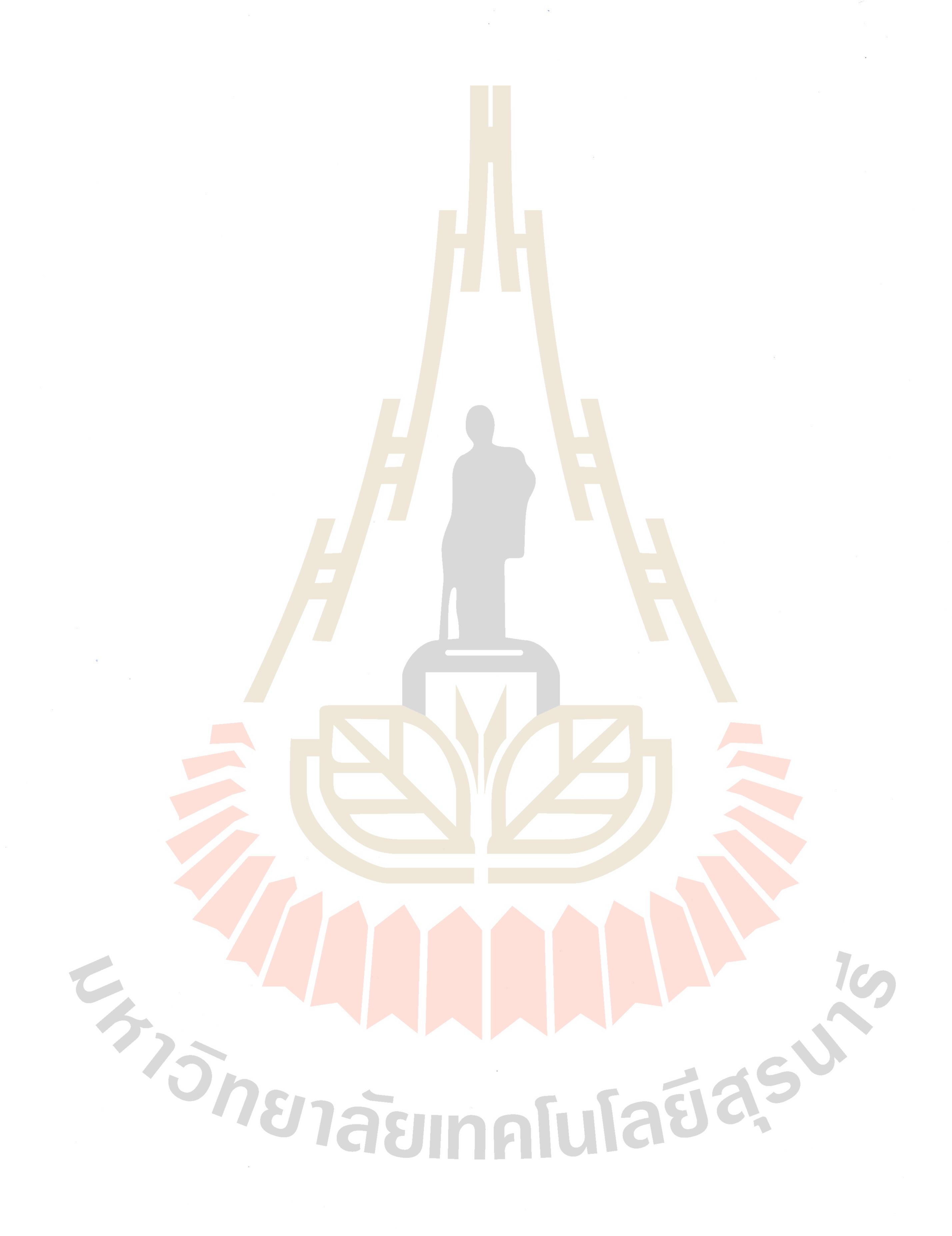
MONICA LENG: DIAGNOSTIC METHODS FOR THE DETECTION OF *OPISTHORCHIS VIVERRINI* IN KRATIE PROVINCE, CAMBODIA. THESIS ADVISOR: ASSOC. PROF.

SCHAWANYA RATTANAPITOON, MD., 102 PP.

Keywords: *Opisthorchis viverrini*/Cholangiocarcinoma (CCA)/fecal parasite concentrator kit (FPCK)/Formalin-ethyl acetate concentration technique (FECT)/Polymerase chain reaction (PCR), Cambodia.

Opisthorchis viverrini is still a serious health problem causing organism in Southeast Asia. The infection associated with cholangiocarcinoma (CCA). However, the current infection rate in Kratie, Cambodia is unknown. Therefore, this study aimed to detect O. viverrini infections among Cambodian samples. A total of 380 fecal samples obtained from Cambodia was prepared at the Parasitic Disease Research Center (PDRC) laboratory of Suranaree University of technology, Nakhon Ratchasima province, Thailand, in November 2018. Stool samples were examined for parasite infection using fecal parasite concentrator kit (FPCK) and formalin-ethyl acetate concentration (FECT) and confirmed the O. viverrini infection with polymerase chain reaction (PCR) technique. Out of all samples examined were examined with FPCK and FECT and the positive cases with intestinal parasitic infections were 25 cases (6.57 %). The prevalence was calculated and revealed that 2 diagnose techniques had Entamoeba coli infection of 1.84 %, followed by O. viverrini of 1.31 %, Hookworm spp of 1.05 %, Strongyloides stercoralis of 1.05 %, Ascaris lumbricoides of 0.52 %, Hymenolepis nana of 0.26 %, and Trichuis trichiura of 0.26 %, respectively. The diagnostic sensitivity of Opisthorchaiasis was unveiled with FPCK (50.00 %) and FECT (66.67 %) and specificity was presented of FPCK (99.74 %) with FECT (99.74%). The intensity of O. viverrini infection was found different (FPCK=144 and FECT=84.83), which showed a significant positive correlation with FECT and FPCK (P<0.05). The PCR method had confirmed the present of O. viverrini eggs (2 out of 380 samples). This study is the first report of O. viverrini infection among the Cambodian population that used FPCK, FECT, and

PCR methods. The information from this study was crucial for effective surveillance, controlling of this food borne parasite, and the prevention of OV-inducible bile duct cancer or CCA.



School of <u>Translational Medicine</u> Academic Year 2023

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้าวักยาลัยเทคโนโลยีสุรุ่น

Monica Leng

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LIST OF ABBREVIATIONS

Al Albendazole

CCA Cholangiocarcinoma

Cm Centimeter

DNA Deoxyribonucleic acid

DW Distilled water.

EPG Eggs per gram

FECT Formalin-ethyl acetate concentration technique

FPCT Fecal parasite concentration kit

g Gram

h Hour

ITS Internal transcribed spacer

NDC National disease control

mg Milligram

ml Milliliter

mm Millimeter

MPH Ministry disease control

PCR Polymerase chain reaction

PDRC Parasite disease research center

µg Microgram

µm Micrometer

% Percent

CHAPTER I

INTRODUCTION

1.1 Background and problem

The bile duct is an essential organ in the human body which can be infected by the Opisthorchis viverrini (together with opisthorchis felineus and Clonorchis sinensis) which was derived from Opithorchiidae family. This infection is obtained by eating raw cyprinoid fish. Not only that these infections can cause inflammation of the bile duct which results in cholangitis and cirrhosis of the liver. Cholangitis and cirrhosis are the primary activators for cholangiocarcinoma. O. viverrini infection is wide prevalence in Southeast Asia. It is highly essential in clinical and public health aspects. The southern provinces of Vietnam are also included among the list of endemic areas, whereas its northern regions are known as endemic of C. sinensis, another liver fluke species. From the research conducted in Cambodia previously has shown that trematode is among of the parasites that threatening peoples' life. In addition, it has been shown that in the Takeo Province is highly infected with the O. viverrini while in another area there is no such type of infection (Yong et al., 2012). The internal transcribed spacer (ITS) cytochrome c oxidase (cox) and nicotinamide adenine dinucleotide dehydrogenase (NAD) has validated various targeting genes O. viverrini eggs in fecal specimens using PCR-based methods (Duenngai et al., 2008; Buathong et al., 2015; Sithaworn et al., 2003). However, the PCR inhibitors present in stool are a main problem and the sensitivity in the case of light infection and was limited. The ITS is available to analyses of *O. viverrini* eggs from stool specimens. Therefore, this study detected O. viverrini eggs using PCR-based nuclear DNA targeting ribosomal DNA ITS regions. The current evidence reveals that O. viverrini infection remains under-reported in Cambodia. The transmission could be further increased with potentially serious illness. Previously, the small trematode eggs of 25–30 µm in length, suggestive of O. viverrini, have been discovered in the faeces of Cambodian residents (Sohn et al., 2012). Currently, accurate diagnoses of O. viverrini infection, in mammalian, snail, and

fish intermediate hosts, are essential for achieving these studies to compare the other methods for detection *O. viverrini* infection in Kratie province (Sohn et al., 2012). The finding of sanctity and specificity Opisthorchiasis diagnosis are robust and straightforward diagnostic method that still required (Sohn et al., 2012). We were development and searched for new diagnoses for Opisthorchiasis with practical applications in the research at parasite disease research center laboratory of Suranaree University of Technology, Nakhon Ratchasima province, Thailand. We used the fecal parasite concentrator kit (FPCK), formalin-ethyl acetate concentration technique (FECT), and polymerase chain reaction (PCR) methods, for detection the stool examination techniques.

1.2 Research hypothesis

- 1.2.1 Current status of *O. viverrini* infection is required in many areas of Cambodia.
- 1.2.2 The *O. viverrini* like eggs are needed to confirm by sensitivity and specificity methods, particularly polymerase chain reaction (PCR).

1.3 Research objectives

- 1.3.1 To detect *O. viverrini* in Kratie Province using fecal parasite concentrator kit (FPCK) and formalin-ethyl acetate concentration technique (FECT).
- 1.3.2 To confirm *O. viverrini* in Kratie Province using polymerases chain reaction (PCR).
- 1.3.3 To analyze the prevalence, sensitivity and specificity of positive predictive value and negative predictive value between parasitological technique.

1.4 Scope and limitation of study

The population period of this study at Kratie province were collected the stool samples due to the cholangiocarcinoma (CCA) is crucial which led study to focus on comparing (stool per gram) the methods for active surveillance and prevention the *O. viverrini* infection.

1.5 Conceptual Framework

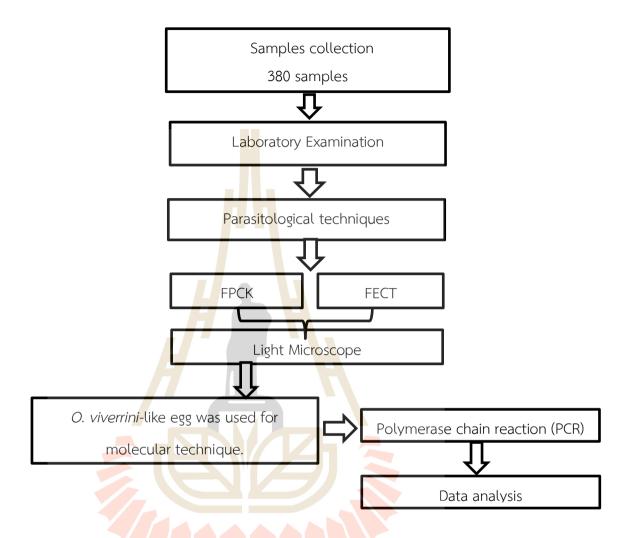


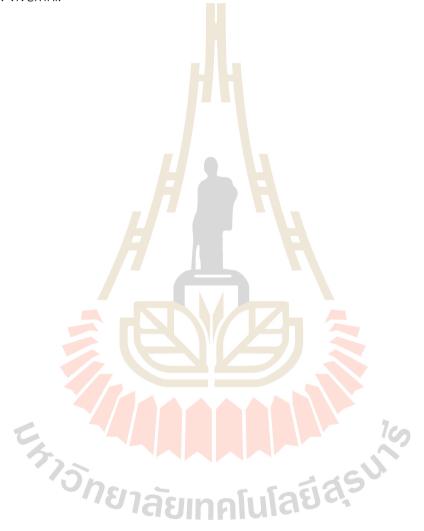
Figure 1.1 The conceptual framework of this study.

1.6 Contribution

This study was approved by the ethics committee for research involving human subjects (NRPH-013) ethical approval from the Ministry of Health of Cambodia, the national Disease Control (NDC) of the Ministry of Public health (MPH) of Cambodia, provincial referent hospital and health center.

1.7 Expected Results

The prevalence of *O. viverrini* infection in Cambodia was obtained by FPCK and FECT. Moreover, *O. viverrini* infection was confirm by PCR method. In addition, the associated risk factor of *O. viverrini* infection was based on home healthcare education programs in further treatment and prevention for community people which infected with *O. viverrini*.



CHAPTER II

LITERATURE REVIEW

2.1 The Opisthorchis viverrini

O. viverrini or common call name liver fluke of Southeast Asian, is the parasite that can be ingested through cyprinoid fish raw. Due to most of the Asian people are customized by eating either partial cooked or raw. This habit of taking in raw fish or snail make them to be vulnerable to being infected by the parasites called Opisthorchiasis. The impacts of these infections are leading to the cholangiocarcinoma that brings bile duct pancreatic duct and the gall bladder cancer (Sripa et al., 2007). These parasites are in Opisthorchiidae family which resides on both snails species, and fish which are belongs to Cyprinidae family that all are intermediate host. The Opisthorchiasis can be detected easily without severe clinical analysis such by considering the following symptoms such as abdominal pain, dyspepsia and diarrhea or constipation. However, severe infection can lead to enlargement of the liver (hepatomegaly) and malnutrition (Sripa et al., 2007). Human and mammal such as cat and dog rats are the definitive host. M.J Poirier is the person who discovered that cat could be infected by these parasites through eating fish infected with O. viverrini in 1886. In 1915 Robert Thomson Leiper investigated that human can also be affected by O. viverrini (together with C. sinensis, O. felineus and Clonorchis sincesis) as it has been pronounced by International Agency for research on cancer that the three species in the family Opisthorchiidae, C. sinensis and O. viverrini are most causing agent of human cancer such as biological carcinogen. In Thailand, Laos, Cambodia, and Vietnam are prominent places where O. viverini can be found. In Thailand researchers found that northern (16.6%) part is highly infected with O. viverrini preceded by northeast (10.0%), central (1.3%), and southeast (0.01%) regions (Sithithaworn et al., 2012; Rangsin et al., 2009; Suwannahitatorn et al., 2013; Sithiworn et al., 2007). Also, it has been found that in Laos and Thailand lost manifold income about US\$120 million annually for wage and medical expenditure (Sripa et al., 2007). Even though the government spends a lot of money to treat those infected people, there is no clear way of treating it. Nevertheless, the Swiss researchers discover tribendimidine which can cure by 70% only. Praziquantel is commonly used the way of treating infection but not technically recommended. Since it utilises anthelmintic such as albendazole, artesunate, and miltefosine are found to be active on the cercariae but not on the metacercaria and it can also initiate cancer. (Sithithaworn et al., 2012).

The method they used to detect *O. viverrini* infection was by using urine and stool detection (Worasith et al., 2015). The urine antigen detection assay becomes more efficacious, realizable and specific. The stool diagnosis is an effective method for detecting various parasitic infections, including helminth and protozoa in society. Further studies are yet required to evaluate the performance and application of this novel technique (Worasith et al., 2015).

2.2 The morphology of *O. viverrini*

The *O. viverrini* adult it is dorso-ventrally flattened, lancet-shaped, thin, and transparent. *C. sinensis* shaped is average 8-19 mm in length and 1.5-4.0 mm in length (figure 2A). However, its morphological is like *O. viverrini* and the main difference is structure between these parasites. The metacercaria is round to oval, measuring 0.13-0.14 X 0.09-0.10 mm (Chai et al., 2007; Rim et al., 1990). *O. viverrini* is generally 5.5-10 mm in length and 0.8-1.6 mm wide. The metacercaria is round to oval 0.19-0.25 x 0.15-0.22 mm in size (figure 2B). *O. felineus* is generally -12 mm in length and 1.5-2.5 mm wide, whereas metacercaria is oval, measuring 0.25-0.30 x 0.19-0.23 mm in size (figure 2C) (Prueksapanich et al., 2018).

Its suckers consisted of both oral and ventral suckers with approximately one-fifth of body length at anterior. The deeply lobed and diagonal consisted of two testes located at posterior extremity (figure: 2B) (Chai et al., 2007). The slightly coiled seminal vesicle is long, and an end bound in the ejaculatory duct, genital pore in front of ventral sucker and cirrus sac but the cirrus is absent. Moreover, the multilobate of the ovary is situated in front of the anterior testes and next to the seminal receptacle and Lauer's canal. The vitellaria comprised a lot of follicles. In addition, the eggs are

yellowish-brown, oval, and have a tubercle-like knob at the opercular end. Therefore, the eggs are containing miracidium average 28 μ m by 16 μ m in size when it laid.



Figure 2.1 Human liver flukes' structures, (A) *O. f*elineus, scale bar 2 mm (B) *O. viverini*, scale bar 1 mm; and (C) *C. sinensis* scale bar 2 mm. There is no proportion between worm size (Kaewpitoon et al., 2008).



2.3 Life cycle of *O. viverrini*

A mature adult worm lay egg which can be inhabited in freshwater such as dams' wells and rivers rice field occupies by stagnant water and reservoirs. Thus, these mature worms or eggs can be absorbed by the snails which are acting as intermediate host. Then snails start to release the thousands of cercariae. After 1-2 months since the snail got the infection, they tend to free release cercariae though free swim to the freshwater fish which act as the second intermediate host. After twenty-one days the infections grow stronger into the host fish, thus when humans consume that fish without proper cooking or undercooked, the infection will be transferred to human. Hence, after one-month metacercaria grows to maturation and starts to cause problems to the infected human (Kim et al., 2017).

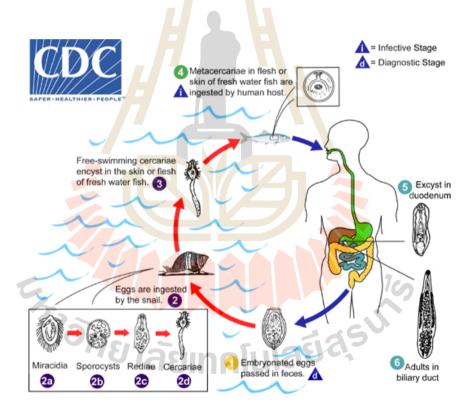


Figure 2.2 The life cycle of Opisthorchis viverrini (CDC et al., 2018).

2.4 Pathology and pathogenesis of *O. viverrini*

The *O. viverrini* in the human body tend to inhabit in the intra- and extrahepatic bile ducts mostly when compared to the gall bladder and pancreatic duct. As time elapsed, infection introduced many pathologic alterations in the liver, gall bladder and pancreatic duct. Owing to infection, liver gain more weight than usual which is 3000-3500g. Seriously infection may induce to inflammation, epithelial desquamation, goblet cell metaplasia, epithelial and adenomatous hyperplasia, and periductal fibrosis (Kaewpitoon et al., 2008).

2.5 The epidemiology of *O. viverrini*

Opisthorchis species are liver fluke parasites (worms or trematodes).

O. viverrini is liver fluke known as the Southeast Asian and O. felineus is known as the liver infections of cat liver fluke occur mostly in people living in some areas where the parasites are found O. viverrini is found mainly in northeast Thailand, Laos, Cambodia, and central and southern Vietnam. O. felineus is principally found in Italy, Germany, Belarus, Russia, Kazakhstan, and Ukraine. Travellers to Asia or Europe were consumed undercooked, or raw fish are at risk for liver fluke infection. People may become adulterated by eating undercooked or raw freshwater fish attaining the larvae. Lightly salted, pickled, or smoked fish may carry infectious parasites. Drinking river water or other nonportable water would not lead to infection with Opisthorchis. It has deeply analyzed that Thailand has widespread of the Opisthorchiasis which is related to cholangiocarcinoma (CCA). This is owing to the habit of eating row food as it has been stipulated earlier (Aung et al., 2017).

2.6 Diagnosis of *O. viverrini* infection previous study

2.6.1 Prevalence and Intensity of O. viverrini in Cambodia

Prevalence and Intensity of *O. viverrini* infection in Cambodia, a previous study of Kazuko focused on *O. viverrini* infection in 5 provinces of Cambodia, by stool sample collection in 55 villages using the Kato–Katz thick-smear technique and PCR for identifies. The studies found that a total of 16,082 stool samples have 1232 egg positive in 55 communities. And 998 of 3585 stool samples were presented with a

positive egg rate of 27.8% in 15 villages. The PCR analysis showed that 30 of 33 samples were positive for *O. viverrini* DNA from 5 villages in Kampong Cham and Kampong Thom province (Kulthida et al., 2022).

Prevalence and Intensity of O. viverrini infection in Kratie Province, Cambodia have been previously studied. In their work found that people were infected through eating raw fish which act carrier of O. viverrini. In this study, they investigated the prevalence of O. viverrini infection among people in 7 riparian villages along the Mekong River, Kratie province. Also, the Kato-Katz method applied to 101 samples of the stool collected from residents and school children. Besides that, research has been conducted in two villages. They analyzed that 4.6% of residents were positively diagnosed with O. viverrini. Parasites were highly infected in comparison to school children. Fish from freshwater were taken for experimenting and found that most of them were positively infected by O. viverrini metacercariae. The praziquantel treatment found positive impacts since by destroying the lifecycle of adult O. viverrini (Sohn et al., 2012). Prevalence and intensity of O. viverrini infection from Phnom Penh and Pursat in Cambodia. The research was done using the artificial digestion method to probe the infection of survey freshwater fish with zoonotic trematode metacercariae. They investigated that in fresh fish, two types of metacercariae were detected O. viverrini metacercariae were positive in 37 of 74 fishes in 11 species, and H.yokogawai metacercariae were detected in 23 of 40 fishes in 5 species. In fishes from Pursat Province, five kinds of metacercariae were detected,

O. viverrini metacercariae in 2 fishes' species, C. formosanus metacercariae in 1 species, and procerovum sp. The result indicated that freshwater fishes were eminently prone to be good host for zoonotic trematodes in Cambodia (Chai et al., 2014).

High prevalence of *O. viverrini* infection in a riparian population in Prey Kabas district, Takeo province, Cambodia, was observed by Kato-Katz thick smear that technique was to analyze the stool sample from 3 villages, 51.7 to 59.0% of infection in 1,799 villagers were infected with helminths. The helminths captured were Hookworms, *Echinostomes*, *Trichuris trichiura*, *Ascaris lumbricoides*, and *Taenia spp*. The investigators found that the adult population were more vulnerable to infection than younger (Yong et al., 2012). Discovery of *O. viverrini* metacercariae in freshwater

fish in southern Cambodia. In these findings, they found that small liver fluke likes to reside in freshwater fish. Again, they observed that small liver fluke has similar morphology as adult worm of *O. viverrini*. This study was assured by particle Cytochrome Oxidase Subunit I (COI) sequencing of the metacercariae (Touch et al., 2009).

2.6.2 Detection of *O. viverrini* infection by stool examination

Detection of *O. viverrini* infection was by observed stool examination. The method of the closed concentration system was called the mini parasep SF faecal parasite and can be adopted in clinical pathology laboratory of Suranaree University of Technology Hospital since it gives good results. The stool sample collection 199 from August to October 2015 (Kaewpitoon et al., 2016). Beside that it has been observed that 10 (5.03%) were positive with intestinal parasites which comprises O. viverrini (2.01%), preceded by Strongyloided stercoralis (1.51%), Hookworm (0.5%), Taenia spp (0.5%), and Entamoeba coli (0.5%) all investigations were done using the direct smear and mini parasep. By using two the direct wet smear method to detect intestinal parasites indicated that four samples were positive while by using parasep SF method and ten samples were positive this signify that the parasep SF method is excellent method. In comparison to the processing rate, it has been found that using the parasep system was 6.03 min/sample which is higher than that of the conventional method that which is direct wet smear method has 0.3 min/ sample. In economic sense (cost per test) for the paresep method is USA 1.47/ sample while conventional direct wet smear method is USA 0.74/ sample (Kaewpitoon et al., 2016).

A previous study of Charoensuk, they study at Kanam Chai Khet district in Chachoengsao province and Khao Chakan district in Sa Kaeo province, using performance of formalin-ethyl acetate concentration technique, kato-katz technique, direct simple smear, and parasite concentrator kit technique for detection *O. viverrini* egg examination in stool. They found that FECT provides the highest sensitivity in comparison of Kato-Katz, FPCK and direct simple smear techniques. Again, the FPCK and direct simple smear technique have better sensitivity in EPG≥ 50 groups compared with EPG< 50 groups. Nevertheless, the FPCK has the sensitivity same as simple direct smear statistically that are in EPG around 50 group (Charoensuk et al., 2019). The

O. viverrini infection has been studied the border areas of three. provinces which are in the northeast part of Thailand. They consider at Kaeng Sanam Nang district of Nakhon Ratchasima Province, Waeng Noi district of Khon Kaen province, and Khon Sawan district of Chaiyaphum province, Thailand. The stool sample collection of 978 participants was screened using a modified Kato-Katz Thick smear technique. They found that in 1.74%, most of the affected group are being male, age group 51-60 years old, educated at primary school, occupied with agriculture, and having an income < 4,000 baht per month who were living in Khon Sawan district (Kaewpitoon et al., 2016).

2.6.3 Detection of *O. viverrini* infection using PCR method

The previous study in countryside of lower Myanmar were conducted between June 2015 to March 2016. The stool collection was 364 that using modified formalin-ether concentration technique and make polymerase chain reaction (PCR). They found 34 positive samples out of 364 participants. The eggs O. viverrini were used the molecular technique. The DNA sequences to identify from other species were showed that 99.7% identity with O. viverrini mitochondrial cox1, but 95%, 88.7%, 82.6%, and 81.4 % were identitied with those of O. lobatus from Lao people's Democratic Republic, Metorchis Orientalis from China, C. sinensis from China and O. felineus from Russia, respectively. When alignment with other Opisthorchiidae trematodes, 81% similarity with Metorchis bilis from Czech Republic and Slovakia, 84.6%, similarity with Metorchis xanthosomus from Czech Republic, 78.6% similarity with M. xanthosomus from Poland and 82.2% similarity with Euamphimerus pancreaticus from Czech Republic were revealed (Aung et al., 2017). The sample collection of 1,2000 snails and 754 fish from Binh Dinh province in Vietnam. They were examined with molecular analysis. They found that of 1,2000 snails belonging to six families, of which 1616 Bithynia snails representing Bithynia siamensis gonimphalos and Bithynia funiculate as well as 754 fish representing 12 species were examined. The O. viverrini metacercariae were found ten fish species representing both *Cyprinidae* and *non-Cyprinidae* families. The prevalence of *O. viverrini* infection in fish was significantly associated with species. Sharing of the same snail and fish intermediate host species was found for O. viverrini and O. viverrini duck- a genotype that is sympatric in the study region (Dao et al., 2017). The study in the Vientiane province, Lao PDR, the stool was collected 85 samples and

using the kato katz technique, formalin ethyl acetate concentration technique, and PCR analysis for the distinction between *O. viverrini* and other FBT eggs, and a single KK reading was characterized by a sensitivity of 85% when compared to two FECT readings. The PCR tested positive only in cases where eggs had been demonstrated by parasitological examination. The PCR tested negative in some samples with very high egg counts. Demonstrating a PCR sensitivity of approximately 50% in samples with faecal egg counts > 1,000. The previously reported PCR sensitivity based on *in vitro* studies was not supported (Steensvold et al., 2006).

The higher specificity of PCR fails to be negative if there is a PCR inhibitor in stool (Duenngai et al., 2008). Therefore, DNA extraction protocol using cetyltrimethylammonium bromide to remove inhibitors was applied to the better sensitivities of diagnosis (Duenngai et al., 2008). PCR-based method testing is higher sensitive if the specimens contained more than 200 eggs per gram of feces according to *O. viverrini* infection intensity (Wongratanacheewin et al., 2002). Liver fluke's genetic material *O. viverrini* antigens might detected in stool (coproantigen). Thus, PCR-based methods have not fully succeeded for light *O. viverrini* eggs in fecal specimen's ribosomal rDNA ITS-2 was required.



CHAPTER III

MATERIALS AND METHODS

3.1 Study area and population

The Kratie is a province of Cambodia located in the northeast, Mondulkiri to the east, Kampong Thom and Kompong Cham to the west and Tboung Khmun and the country of Vietnam to the south. Land area covered by 11,094 square kilometers that subdivided into 5 districts, and 1 municipality further divided into 47 communes. In the kratie province the Mekong River flows from the north to south of province, approximately 140 km of the river (Figure 3.1).

The contacting and requesting permission from the heads of health and hospital by informing the purpose of the study map the village and survey the sample. The questionnaires in this study were risk screening questionnaire for liver fluke disease SUT-OV-001, which consists of 2 parts, which were respondent information and screening questions for the risk of liver fluke infection. The survey about knowledge, attitude, and practices for liver fluke infection.



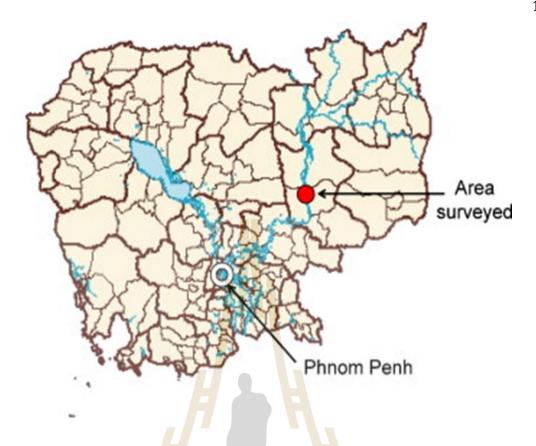


Figure 3.1 Administration map of Kratie province, Cambodia (Miyamoto et al., 2014).

3.2 Sample Size calculation

During the study period from the selection of samples according to the formula can be used:

$$n = \frac{N}{1+Ne^2}$$
 $n = \text{sample size},$
 $N = \text{Population of Kratie province (372,825),}$
 $e = error, 0.05$
 $\frac{372,825}{1+(372,825 \times 0.05^2)}$
 $= 380.57$ (Naing et al., 2006).

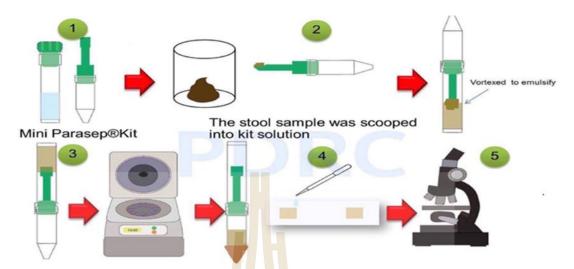
3.3 Sample collection

The stool samples were collected in November 2018 from Snuol districts, Kratie Province, Cambodia, male and female aged 18-70 years old were invited to participate in this research. This study performed a total of 380 cases among the target population that living in risk areas in snoul distick, Kratie province. The fecal specimens were contained in clean, wide-mouth containers with fitting lids with amounts 20 g and placed in leakproof bags when transported to laboratory of PDRC, Suranaree University of Technology.

3.4 Parasitology Technique

3.4.1 Fecal parasite concentrator kit (FPCK)

The stool sample was scooped using the spoon at the end of the FPCK (miniparasep® kit). Faeces were filtered and vortexed to emulsify with the sedimentation cone pointing upwards. The tube was inserted and centrifuged at 2000 rpm for 5 min, and then the top layers of the supernatant were decanted. Three drops of 0.85% saline were added, and the suspension was measured under a light microscope.



The supernatant was decanted and the sediment was mixed with of 0.85% saline on microscope centrifugated at 2000 rpm for 5min slide to examined under a light microscope.

Figure 3.2 The fecal parasite concentrator kit (FPCK) (PDRC et al., 2019).

3.4.2 Formalin-ethyl acetate concentration technique (FECT)

Three grams of stool were dissolved in 10 ml of 0.85% saline, and the debris were strained on the veil to bring the volume in the centrifuge tube to 15 ml and then centrifuged at 2500 rpm for 5 min. After that, 7 ml of 10% formalin and 3 ml of ethyl acetate were added to the sediment and mixed thoroughly. The sample was centrifuged at 2,500 rpm for 5min, and then the top layers of the supernatant were decanted. A cotton-tipped applicator was used to remove the debris from the sides of the centrifuge tube. Then three drops of 0.85% saline were added to resuspend the real specimen and inspected under a light microscope utilizing ×10 and ×40 objectives.

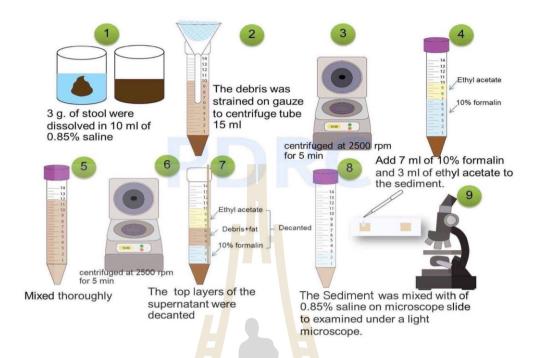


Figure 3.3 The formalin- ethyl acetate concentration technique (FECT) (PDRC et al., 2019).

3.5 Molecular method

3.5.1 DNA extraction from fecal specimens

DNA was extracted from the stool samples for *Opisthorchis-like* eggs using a QIAamp1 DNA stool mini kit (Qiagen, Hilden, Germany), according to the manufacturer's instructions. DNA was extracted from the stool, beginning with 180-220 mg stool in a 2 ml microcentrifuge tube and added 1 ml Inhibit EX Buffer to each stool specimen. Vortex continuously for one min or until the stool sample was thoroughly homogenized. Heat the suspension for five min at 70°C. The lysis temperature was increased to 95°C for cells that are difficult to lyse. Vortex for 15 s, then centrifuged (14,000 rpm for 1 min) to pellet the fecal particle, and the supernatant discarded. Add proteinase K (15 μ L) with new spindrift add supernatant (200 μ L) then add buffer AL (200 μ L) and the whole was incubated at 70°C for 10 min, then add Ethanol 95% (200 μ L) and vortex for 15 s.

The supernatant (600 μ L) was transferred to a new spin column and centrifuge (14,000 rpm for 1 min). The spin column was opened and added (500 μ L)

Buffer AW1, centrifuged (14,000 rpm for 1 min). Place the spin column in a new two ml collection tube and discard the collection tube containing the filtrate. Then (500 μ L) Buffer AW2 was added into samples and centrifuged (14,000 rpm for 3 min). After that, the spin column was placed in a new two ml collection tube and discarded the old collection tube with the filtrate. The sample tube was centrifuged (14,000 rpm for 3 min) and transferred the spin column into a new, labelled 1.5 ml microcentrifuge tube and pipetted 200 μ L TAE Buffer directly onto the QIAamp membrane. The sample was incubated for a min at room temperature and centrifuged for a min to elute DNA. The yield was quantified by UV absorbance and blanked the measuring device using Buffer TAE to avoid false results.

3.5.2 Primer design

The genomic DNA was extracted from a conserved portion of the *O. viverrini* mitochondrial. The specific primer based on internal transcribed spacer 2 (ITS2) gene in the mitochondrial protein-coding was used in this study. The ITS2- PCR sequence -Ov-6F 5'-CTG AAT CTC TCG TTT GTT CA-3' as a forward primer and sequence -Ov-6R 5 -GTT CCA GGT GAG TCT CTC TA-3 as a reverse primer that produced an amplicon was generated of fragment 330bp from target gene (Wongratanacheewin et al., 2001).

3.5.3 Polymerase chain reaction (PCR)

The PCR reaction was performed with total volume 25μ L including distilled water or molecular water 16.8μ L, 10X taq buffer with KCL 2.5μ L, dNTP (dGTP, dATP, dCTP, dTTP) 1μ L (2mM/each), forward primer 1μ L ($10~\mu$ M), reverse primer 1μ L ($10~\mu$ M), Taq DNA polymerase 0.2μ L (0.2~U), MgCl2 1.5μ L (0.67mM), and DNA sample (template) 1μ L. There were three steps of PCR that involve denaturation, annealing, and extension. The genetic material was denatured for converting the double stranded DNA molecules to single strands and then the primer annealed to complementary regions of the single stranded molecules. The samples were extended by action of the DNA polymerase in all steps and accompanied by temperature sensitive 94 °C for 5 min, followed by 35 cycles, 55 °C for 30 sec, and 72 °C for 30 sec, and postamplification extension for 10 min at 72 °C (Wongratanacheewin et al., 2002). The PCR product

was separated by 1.5% agarose gel electrophoresis electrophoresis and visualized under the gel documentation system.

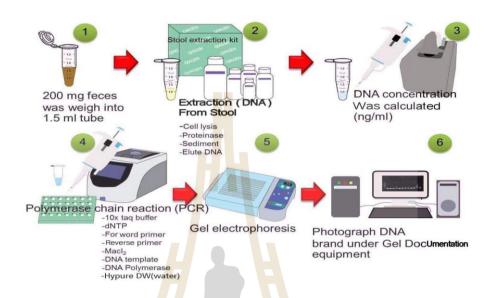


Figure 3.4 The polymerase chain reaction (PCR) (PDRC et al., 2019).

3.6 Statistical Analysis

The statistical analyses were performed using SPSS WIN 22.0 software. Descriptive statistics were applied to determine the rate of *O. viverrini* infection. The prevalence, sensitivity, specificity, positive predictive value, and negative predictive value of parasitology technique were analyzed, and the chi-square test was used for investigation the risk factor to associate with the *O. viverrini* infection. Moreover, unconditional multiple logistic regression was used to evaluate the confidence interval Chi-Square test for participants being egg positive according to various characteristics.

CHAPTER IV

RESULTS

4.1 Fecal parasite concentrator kit (FPCK)

The fecal specimens were investigated with FPCK and revealed the intestinal parasitic infections (18 cases, 4.73%), including *Entamoeba coli* (7 cases, 1.84%), followed by *Strongyloides stercoralis* (3 cases, 0.78%), Hookworm *spp*. (3 cases, 0.78%), *O. viverrini* (2 cases, 0.52%), *Ascaris lumbricoides* (2 cases, 0.52%), and *Hymenolepis nana* (1 case, 0.26%), respectively (Figure 4.1 and Table 4.1).

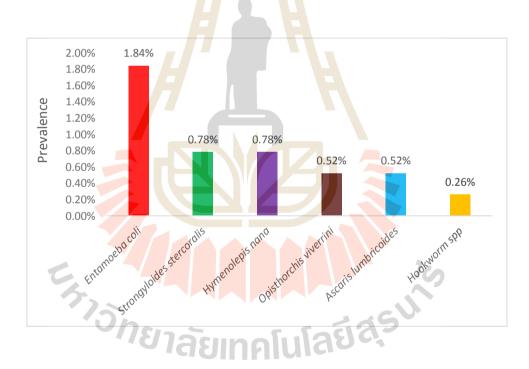


Figure 4.1 Prevalence of intestinal parasite infections (Mini parasep kit).

Moreover, the intensity of intestinal parasitic infections was observed with FPCK and mostly presented *O. viverrini* (144), followed by *Entamoeba coli* (80), *Strongyloides stercoralis* (67), Hookworm *spp*. (54), *Ascaris lumbricoides* (53), and *Hymenolepis nana* (26), respectively (Figure 4.2).

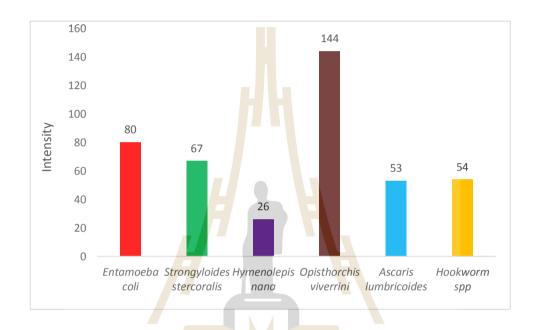


Figure 4.2 Intensity of intestinal parasite infections (Mini parasep kit).

4.2 Formalin-ethyl acetate concentration technique (FECT)

The samples were examined with FECT and presented the positive with intestinal parasitic infections (7 cases, 1.84 %), including *O. viverrini* (3 cases, 0.78%), followed by Hookworm *spp*. (2 cases, 0.52%), *Strongyloides stercoralis* (1 case, 0.26%) and *Trichuis trichiura* (1 case, 0.26%), respectively (Figure 4.3 and Table 4.1).

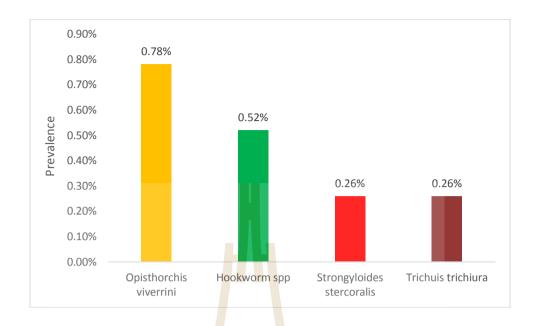


Figure 4.3 Prevalence of intestinal parasite infections (FECT).

Additionally, the intensity of intestinal parasitic infections was investigated with FECT and mostly presented *O. viverrini* (84.83), followed by Hookworm *spp.* (82.5), *Strongyloides stercoralis* (19), *Trichuis trichiura* (17), respectively (Figure 4.4).



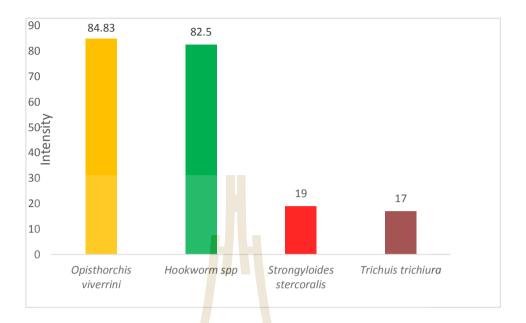


Figure 4.4 Intensity of intestinal parasite infections (FECT)

The stool samples were investigated using FPCK and FECT. The parasites were classified under a light microscope. These methods identified six species of helminths (O. viverrini, hookworm, Trichuris trichiura, Ascaris lumbricoides, Hymenolepis nana, and Entamoeba coli) (Figure 4.5).



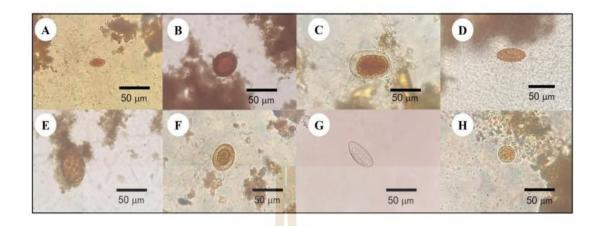


Figure 4.5 The morphology of intestinal parasites in stool sample. (A) *O. viverrini*, (B)

Taenia spp., (C) Hookworm, (D) Trichuris trichiura, (E) Ascaris lumbricoides,

(F) Hymenolepis nana, (G) Enterobius vermicularis, and (H) Entamoeba

coli. Scale bar: 50 µm (Nav et al., 2022).

4.3 The comparison of FPCK and FECT

Regarding the diagnosis of FPCK and FECT were 380 participants. The FECT mostly detected the positive cases of *O. viverrini* infection more than FPCK (Table 4.1).

Table 4.1 The intestinal parasitic infections among the population in Kratie provinces, Cambodia.

No.	Parasitic infection	FPCK	FECT
1	O. viverrini	2 (0.52%)	3(0.78%)
2	Strongyloides stercoralis	3 (0.78%)	1(0.26%)
3	Hookworm 71381119	3 (0.78%)	2(0.52%)
4	Hymenolepis nana	1 (0.26%)	0
5	Ascaris lumbricoides	2 (0.52%)	0
6	Trichuis trichiura	0	1(0.26%)
7	Entamoeba coli	7 (1.84%)	0
	Total	18 (4.73%)	7(1.84%)

The FECT was high sensitivity (66.67 %) when compared with FPCK (50 %). Moreover, PPV, NPV, and Accuracy were represented of FPCK (50.00 %, 99.74 %, and 99.48 %) and FECT (66.67 %, 99.74 %, and 99.48 %) (Table 4.2).

Table 4.2 The comparison of sensitivity, specificity, PPV, NPV, and accuracy of parasitology techniques.

No.	Parameter		FPCK	FECT
1	Sensitivity		50.00 %	66.67 %
2	Specificity		99.74 %	99.74 %
3	PPV		50.00 %	66.67 %
4	NPV		99.74 %	99.74 %
5	Accuracy	2	99.48 %	99.48 %

Positive predictive value (PPV), Negative predictive value (NPV).

4.4 The risk factor of intestinal parasitic infections

The general data of participants were used to determine their association with intestinal parasitic infections. Twenty-three total helminthiasis and liver fluke infections were analyzed using Pearson Chi-Square test, and p-values (P) to compare statistically significant differences (p= 00.5) as shown in Table 4.3. The O. viverrini infection was highly presented in males (12 cases) more than females (11 cases) that were infected total 23 cases (Chi-Square test =0.995 and P=0.318). Participants were infected in the ranges of 10-20 years, 21-30 years, 31-40 years, 41-50 years, and 61-80 with helminths (Chi-Square test =4.883 and P=0.430). Moreover, the intestinal parasitic infections were conducted by questioning participants in the illiterate 10 cases, primary school 9 cases, secondary school 4 cases (Chi-Square test =5.428 and P=0.143). The participants were mostly infected with liver fluke in the employed, followed by famer, shopkeeper, housewife, and other, respectively (Chi-Square test = 8.547 and P=0.129). Following the location of the helminth infection among the participants in Snoul districts, it was presented in 5 villages (Trapeang Srae, Chrab, Cheung Khie, Pravanh, and Cheung Khlu found that in the Trapeang) and was highly infected in Trapeang Srae (Chi-Square test=5.106 and P=0.277). These were indicated that the gender, age, education,

occupation, and location were not significantly different and not associated with the intestinal parasite infections (Table 4.3).

Table 4.3 The Chi- square test of the prevalence of intestinal parasitic infections in Kratie province, Cambodia.

	Variables	No. positive	infection rate (%)	P- value	Chi- square test
<u>Sex</u>	Male	12	3.17	0.318	0.995
	Female	11	2.90		
Age	10-20 years old	8	2.11		
	21-30 years old	7	1.85		
	31-40 years old	2	0.53	0.430	4.883
	41-50 years old	4	1.05		
	51-60 years old	0	0		
	61-80 years old	2	0.53	100	
Education	Illiterate	10	2.64		
<u>Education</u> V	Primary school	0	46	90	
	Secondary	ยู่เทคโ	2.37 1.05	0.143	5.428
	school	7	1.03	0.145	5.420
	Academic	0	0		
	Other	0	0		

Table 4.3 The Chi- square test of the prevalence of intestinal parasitic infections in Kratie province, Cambodia. (continued)

	Variables	No. positive	e infection	P- value	Chi- square
	variables	n (%)	rate (%)	P- value	test
Occupation	Employed	2	0.53		
	Famer	11	2.90	0.129	8.547
	Shopkeeper	2	0.53		
	Housewife	2	0.53		
	Government	0	0		
	Other	6	1.58		
Location	Trapeang Srae	13	3.43		
	Chrab	3	0.79		
	Cheung Khie 4		1.05	0.277	5.106
	Pravanh	3	0.79		
	Cheung Khlu	0	0		

4.5 Confirmation of *O. viverrini* infection using polymerase chain reaction (PCR)

The *O. viverrini* was detected with FPCK and FECT and presented 4 cases (Case ID: Ck31, Ck05, Ck52 and Ck152) from these methods. The extracted DNA of *O. viverrini* in fecal specimens were amplified using forward primer and reverse primer that produced an amplicon the generated of fragment 330 bp from ITS2 gene to confirm the *O. viverrini* infection from the examination of parasitology techniques (FPCK and FECT). The result showed 2 positive cases from PCR technique, S1 and S7 (Case ID: Ck31 and Ck152). On the other hand, S2, S3, S4, S5, S6, S8, and S9 (Case ID: Ck05, Ck52, Ck07, Ck10, Ck25, Ck43 and Ck86) were negative cases from FPCK and FECT techniques that showed negative bands. The distilled water (DW) was served as the negative control. The positive control was the DNA from *O. viverrini* adult worm (Figure 4.6).

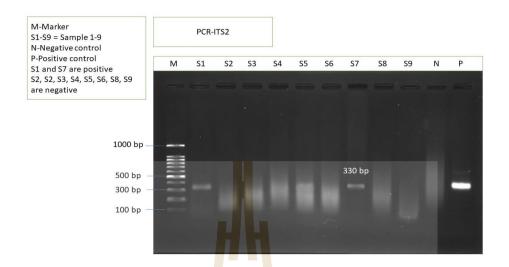


Figure 4.6 The *O. viverrini* amplifying based on internal transcribed spacer2 (ITS2) under 1.5% of agarose gel electrophoresis M- marker or ladder 100 bp, N-negative control (DW), P-positive control the primer ITS2 was set at 330 bp. Number S1 and S7 were sample products show that positive bands. However, S2, S3, S4, S5, S6, S8 and S9 were shown negative bands under gel electrophoresis in Gel documentary imaging.



CHAPTER IV

RESULTS

4.1 Fecal parasite concentrator kit (FPCK)

The fecal specimens were investigated with FPCK and revealed the intestinal parasitic infections (18 cases, 4.73%), including *Entamoeba coli* (7 cases, 1.84%), followed by *Strongyloides stercoralis* (3 cases, 0.78%), Hookworm *spp.* (3 cases, 0.78%), *O. viverrini* (2 cases, 0.52%), *Ascaris lumbricoides* (2 cases, 0.52%), and *Hymenolepis nana* (1 case, 0.26%), respectively (Figure 4.1 and Table 4.1).

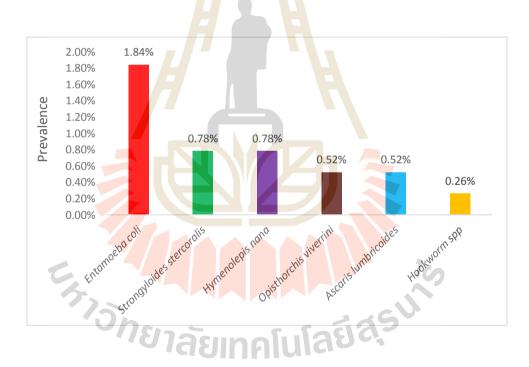


Figure 4.1 Prevalence of intestinal parasite infections (Mini parasep kit).

Moreover, the intensity of intestinal parasitic infections was observed with FPCK and mostly presented *O. viverrini* (144), followed by *Entamoeba coli* (80), *Strongyloides stercoralis* (67), Hookworm *spp*. (54), *Ascaris lumbricoides* (53), and *Hymenolepis nana* (26), respectively (Figure 4.2).

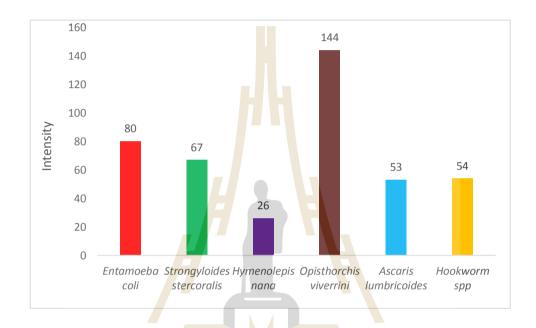


Figure 4.2 Intensity of intestinal parasite infections (Mini parasep kit).

4.2 Formalin-ethyl acetate concentration technique (FECT)

The samples were examined with FECT and presented the positive with intestinal parasitic infections (7 cases, 1.84 %), including *O. viverrini* (3 cases, 0.78%), followed by Hookworm *spp*. (2 cases, 0.52%), *Strongyloides stercoralis* (1 case, 0.26%) and *Trichuis trichiura* (1 case, 0.26%), respectively (Figure 4.3 and Table 4.1).

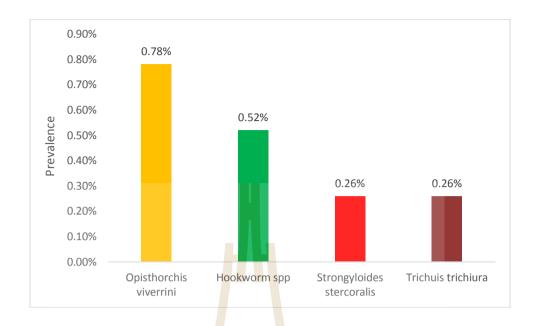


Figure 4.3 Prevalence of intestinal parasite infections (FECT).

Additionally, the intensity of intestinal parasitic infections was investigated with FECT and mostly presented *O. viverrini* (84.83), followed by Hookworm *spp.* (82.5), *Strongyloides stercoralis* (19), *Trichuis trichiura* (17), respectively (Figure 4.4).



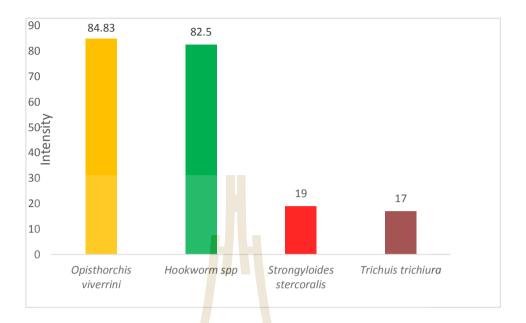


Figure 4.4 Intensity of intestinal parasite infections (FECT)

The stool samples were investigated using FPCK and FECT. The parasites were classified under a light microscope. These methods identified six species of helminths (O. viverrini, hookworm, Trichuris trichiura, Ascaris lumbricoides, Hymenolepis nana, and Entamoeba coli) (Figure 4.5).



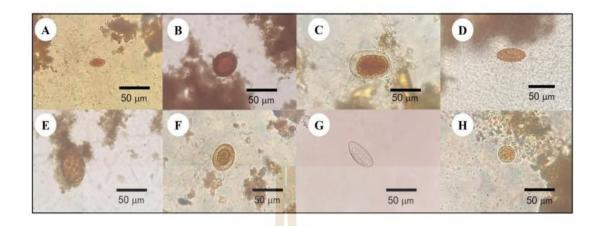


Figure 4.5 The morphology of intestinal parasites in stool sample. (A) *O. viverrini*, (B)

Taenia spp., (C) Hookworm, (D) Trichuris trichiura, (E) Ascaris lumbricoides,

(F) Hymenolepis nana, (G) Enterobius vermicularis, and (H) Entamoeba

coli. Scale bar: 50 µm (Nav et al., 2022).

4.3 The comparison of FPCK and FECT

Regarding the diagnosis of FPCK and FECT were 380 participants. The FECT mostly detected the positive cases of *O. viverrini* infection more than FPCK (Table 4.1).

Table 4.1 The intestinal parasitic infections among the population in Kratie provinces, Cambodia.

No.	Parasitic infection	FPCK	FECT
1	O. viverrini	2 (0.52%)	3(0.78%)
2	Strongyloides stercoralis	3 (0.78%)	1(0.26%)
3	Hookworm 71381119	3 (0.78%)	2(0.52%)
4	Hymenolepis nana	1 (0.26%)	0
5	Ascaris lumbricoides	2 (0.52%)	0
6	Trichuis trichiura	0	1(0.26%)
7	Entamoeba coli	7 (1.84%)	0
	Total	18 (4.73%)	7(1.84%)

The FECT was high sensitivity (66.67 %) when compared with FPCK (50 %). Moreover, PPV, NPV, and Accuracy were represented of FPCK (50.00 %, 99.74 %, and 99.48 %) and FECT (66.67 %, 99.74 %, and 99.48 %) (Table 4.2).

Table 4.2 The comparison of sensitivity, specificity, PPV, NPV, and accuracy of parasitology techniques.

No.	Parameter		FPCK	FECT
1	Sensitivity		50.00 %	66.67 %
2	Specificity		99.74 %	99.74 %
3	PPV		50.00 %	66.67 %
4	NPV		99.74 %	99.74 %
5	Accuracy		99.48 %	99.48 %

Positive predictive value (PPV), Negative predictive value (NPV).

4.4 The risk factor of intestinal parasitic infections

The general data of participants were used to determine their association with intestinal parasitic infections. Twenty-three total helminthiasis and liver fluke infections were analyzed using Pearson Chi-Square test, and p-values (P) to compare statistically significant differences (p= 00.5) as shown in Table 4.3. The O. viverrini infection was highly presented in males (12 cases) more than females (11 cases) that were infected total 23 cases (Chi-Square test =0.995 and P=0.318). Participants were infected in the ranges of 10-20 years, 21-30 years, 31-40 years, 41-50 years, and 61-80 with helminths (Chi-Square test =4.883 and P=0.430). Moreover, the intestinal parasitic infections were conducted by questioning participants in the illiterate 10 cases, primary school 9 cases, secondary school 4 cases (Chi-Square test =5.428 and P=0.143). The participants were mostly infected with liver fluke in the employed, followed by famer, shopkeeper, housewife, and other, respectively (Chi-Square test = 8.547 and P=0.129). Following the location of the helminth infection among the participants in Snoul districts, it was presented in 5 villages (Trapeang Srae, Chrab, Cheung Khie, Pravanh, and Cheung Khlu found that in the Trapeang) and was highly infected in Trapeang Srae (Chi-Square test=5.106 and P=0.277). These were indicated that the gender, age, education,

occupation, and location were not significantly different and not associated with the intestinal parasite infections (Table 4.3).

Table 4.3 The Chi- square test of the prevalence of intestinal parasitic infections in Kratie province, Cambodia.

	Variables	No. positive	infection rate (%)	P- value	Chi- square test
<u>Sex</u>	Male	12	3.17	0.318	0.995
	Female	11	2.90		
Age	10-20 years old	8	2.11		
	21-30 years old	7	1.85		
	31-40 years old	2	0.53	0.430	4.883
	41-50 years old	4	1.05		
	51-60 years old	0	0		
	61-80 years old	2	0.53	100	
Education	Illiterate	10	2.64		
<u>Education</u> V	Primary school	0	46	90	
	Secondary	ยู่เทคโ	2.37 1.05	0.143	5.428
	school	7	1.03	0.145	5.420
	Academic	0	0		
	Other	0	0		

Table 4.3 The Chi- square test of the prevalence of intestinal parasitic infections in Kratie province, Cambodia. (continued)

	V . 1.1.	No. pc	sitive	infection	D 1 -	Chi- square
	Variables	n (⁰	%)	rate (%)	P- value	test
Occupation	Employed	2		0.53		
	Famer	11		2.90	0.129	8.547
	Shopkeeper	2		0.53		
	Housewife	2		0.53		
	Government	0		0		
	Other	6		1.58		
Location	Trapeang Srae	13		3.43		
	Chrab	3		0.79		
	Cheung Khie	4		1.05	0.277	5.106
	Pravanh	3		0.79		
	Cheung Khlu	0		0		

4.5 Confirmation of *O. viverrini* infection using polymerase chain reaction (PCR)

The *O. viverrini* was detected with FPCK and FECT and presented 4 cases (Case ID: Ck31, Ck05, Ck52 and Ck152) from these methods. The extracted DNA of *O. viverrini* in fecal specimens were amplified using forward primer and reverse primer that produced an amplicon the generated of fragment 330 bp from ITS2 gene to confirm the *O. viverrini* infection from the examination of parasitology techniques (FPCK and FECT). The result showed 2 positive cases from PCR technique, S1 and S7 (Case ID: Ck31 and Ck152). On the other hand, S2, S3, S4, S5, S6, S8, and S9 (Case ID: Ck05, Ck52, Ck07, Ck10, Ck25, Ck43 and Ck86) were negative cases from FPCK and FECT techniques that showed negative bands. The distilled water (DW) was served as the negative control. The positive control was the DNA from *O. viverrini* adult worm (Figure 4.6).

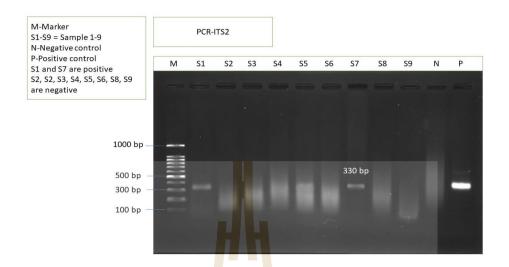


Figure 4.6 The *O. viverrini* amplifying based on internal transcribed spacer2 (ITS2) under 1.5% of agarose gel electrophoresis M- marker or ladder 100 bp, N-negative control (DW), P-positive control the primer ITS2 was set at 330 bp. Number S1 and S7 were sample products show that positive bands. However, S2, S3, S4, S5, S6, S8 and S9 were shown negative bands under gel electrophoresis in Gel documentary imaging.



CHAPTER V

DISCUSSION AND CONCLUSION

5.1 Discussion

The present study investigated the O. viverrini infection among the population in Snuol district, Kratie province, Cambodia. We studied in the community to help solve the problem of liver fluke infection. A total of 25 cases (6.57%) was found infected with intestinal parasites; Entamoeba coli (1.84 %), O. viverrini (1.31 %), Hookworm spp. (1.05 %), Strongyloides stercoralis (1.05 %), Ascaris lumbricoides (0.52 %), Hymenolepis nana (0.<mark>26 %</mark>), and Trichuis trichiura (0.26 %), respectively. The highest prevalence of *O. viverrini* infection in Roka Kandal A (19.4%) and Talous villages (9.0%) in Kratie Province, Cambodia was reported (Sohn et al., 2012). By the way, the fecal specimens were highest revealed O. viverrini, followed by hookworms in Kratie Province areas. The region of Kratie Province may have differences in geography, temperature, and atmospheric humidity that influence the growth and viability of egg and larval stages of parasites, especially soil-transmitted helminths (Sohn et al., 2012; Prueksapanich et al., 2018) and the Mekong River basin subregion includes several Southeast Asian countries (Kaewpitoon et al., 2008). Furthermore, the prevalence of O. viverrini was 23.8- 24.0 % in the central and southern areas of the Takeo and Kampong Cham Provinces, respectively. These regions should receive additional attention to reduce the prevalence of parasitic infection in Cambodia (Yong et al., 2012). In addition, O. viverrini was the most prevalent (1.31%) (Kaewpitoon et al., 2016).

The main factors underlying *O. viverrini* infection include the environment, demographic characteristics, geography, hygiene, health care, and history of *O. viverrini* infection. Also, the intestinal parasitic infection was highly presented in males (Kaewpitoon et al., 2016) that like this study, including the infection associated with certain cultural practices, such as drinking alcohol and consuming raw cyprinoid fish, which are more common in men than women in Cambodia (Chai et al., 2014).

In the study of a country in lower Myanmar the stool sample was examined

using FECT and PCR methods. They found 34 positive cases of *O. viverrini* that were examined by FECT while PCR was accomplished in a total of 18 cases (Aung et al., 2017). On the other hand, the present study found 4 positive cases of *O. viverrini* infection by stool examination with FPCK and FECT, and modified DNA amplification was accomplished 2 positive samples that were like previous research to found that the decreasing of the positive case when used the PCR detection. Presently, two positive cases of *O. viverrini* infection were false positive from investigation under light microscope for FPCK and FECT. Which, the molecular characterization is crucially required to discriminate species of *O. viverrini*-like egg of minute intestinal fluke (MIF) in fecal examination.

Additionally, this present research was a primary screening to observe the prevalence of intestinal parasitic infections among the population in Cambodia using the FECT and FPCK for determining the prevalence of intestinal parasitic infections that showed high sensitivity and precision (Miyamoto et al., 2013). Nevertheless, the FECT for examination of *O. viverrini* eggs in fecal specimens has a high sensitivity (91.0%), followed by the Kato-Katz technique, FPCK, and direct simple smear technique, respectively (Charoensuk et al., 2019). We compared the performance of FPCK, FECT, and PCR techniques to diagnose the O. viverrini infection and other helminths in Kratie province, Cambodia. The qualitative and quantitative diagnosis of O. viverrini of the three methods showed a comparable performance as evaluated by sensitivity, specificity, positive predictive value, and negative predictive value. The FECT and stool kit methods showed significantly higher sensitivity than the Kato-Katz technique for endemic parasitic infections (Kulthida et al., 2022). Presently, the sensitivity of Opisthorchaiasis by FPCK (50.00 %) was parallel with FECT (66.67 %) to perform the population screening of *O. viverrini* infection and suggest that these diagnostic methods are appropriate for surveillance of Opisthorchiasis and another helminthiasis.

5.2 Conclusion

This study was the first report of diagnostic methods for the *O. viverrini* detection in Kratie province, Cambodia. This is crucial for active surveillance and control of this foodborne parasite and the prevention of *OV*-induced CCA. To help

solve the problem of liver fluke infection in the community for the health of the population in the community and affect the quality of life of people in the country as well. The data of this study includes the collection of stool samples among the population in Kratie province. It was found that the results of stool sampling of all 380 participants were examined for helminth eggs infection with FPCK, FECT, and confirmed *O. viverrini* infection with PCR method. A total of 2 techniques were infected with intestinal parasites of 6.57 %(n=25). The prevalence was presented with *Entamoeba coli* of 1.84 %, *O. viverrini* of 1.31 %, Hookworm *spp* of 1.05 %, *Strongyloides stercoralis* of 1.05 %, Ascaris *lumbricoides* of 0.52 %, *Hymenolepis nana* of 0.26 %, and *Trichuis trichiura* of 0.26 %, respectively. Moreover, we found that the intensity of *O. viverrini* infection was 108.5. Furthermore, high densities per case may be due to the occupation of most people in the area. The most of them are famer and may be a risk that the infection is quite serious.



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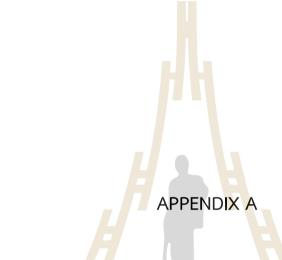
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THE COMPONENT OF EXAMINATION METHODS



1 μl

1.1 Fecal parasite concentrator kit (FPCT)

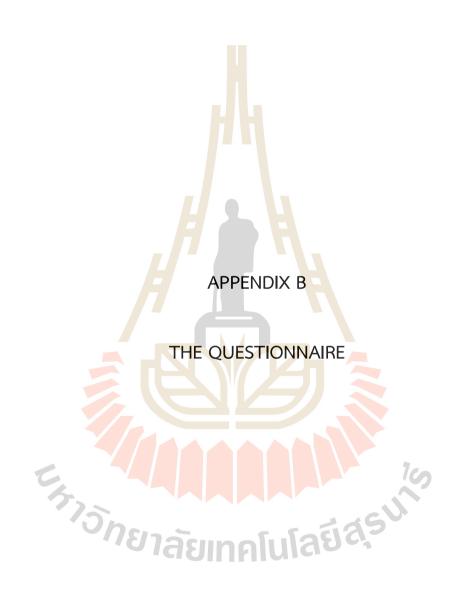
Miniparasep® kit

Mix with 0.85% saline solution

6x DNA loading (6x loading Dye)

1.2 Formalin-ethyl acetate	concentration	technique	(FECT)
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1.2 Fo	rmalin-ethyl acetate concentration technique (FECT)	
	10% Formalin	7 ml
	Ethyl acetate	3 ml
	Mix with 0.85% saline s <mark>olu</mark> tion	
1.3 M	olecular method	
	Inhibit Ex buffer	1 ml
	ATE	25 µl
	AW1	500 µl
	AW2	500 µl
	Ethanol (96-100 <mark>%)</mark>	200 µl
	Taq DNA po <mark>lym</mark> erase (0.2 U)	0.2 µl
	Reverse pr <mark>ime</mark> r (10 µM)	1 µl
	Forward primer (10 µM)	1 µl
	dNTP (2 mM/each)	1 μl
	10x taq buffer (10x taq buffer with KCl)	2.5 µl
5	DW 169	16.8 µl
	MgCl2 (0.67 mM) DNA extracted (sample)	1.5 µl
	DNA extracted (sample)	1 µl
	DNA ladder	1 μl
	Maestrosafe Nucleic acid stain (Loading dye)	1 µl



SUT-OV-001

ទំរង់ពត៌មានលំអិតពីព្រួនសំប៉ែតក្នុងថ្លើម

ភាគ	<u> </u>	<u>សុខភាព</u>						
ឈ្មោះ	_ នាមក្រកូល			ភេទ	អាយុ			
	ារការិក							
ផ្ទះលេ	ខេ ភូមិ	ឃុំ	ស្រុក	1	ខេត្ត	ប្រទេ	ទ ស	
ទងន	រាងកាយ	ួកឡូក្រាម - គិ វី រឺ –	BP(blood pressur	e)	mm/hg.			
	ទី _{2:} ការពិនិត្យមើលហ							
	ាសសញ្ញាសំគាល់ √ រ	ន្តាដ្ឋែងក្រអ	រខាងក្រោមរេ កម្រងស់នូ រ				ពិត	មិនពិត
N.	តើអ្នកធ្លាប់បរិភោគអាប	m ಚಲ್ಲಾ ನಲ್ಲ ಚ	U 14		의 흥구(됐(전	4ಕ್ಕರ್ ಕ್ಷ 19		
1	ទន្លេសាប គ្រីពណ៌សគ្រីទី			2011 118011010101	212261821	(6181108100		
2	តើអ្នកចូលចិត្តធ្វើម្ហូបនេ		ត្រឹមិនឆ្អិន ដែរីទេ	?				
-	(ពពួកហ្លួងគ្រី _{Cyprinid Fish} រ តើអ្នកត្តាប់ទទួលការព្យា	វាដេម) ភាពពីពេនសំរំ	"เร <mark>ร</mark> มเรียเราะ	กษษฐ์แต่จเเ็ย	រពីទេ			
3						. J a		
4	តើអ្នកមានសាច់ញាតិ (, 61	110					
5	ប្រសិនបើអ្នកបានចូលរួម អាហារនៅ ដូចជាគ្រីនៅ	១ក្នុងពេធបុណ្យ គូប់ប្រភេទ តើ	ឬពេធការ ហេយា អ្នកញ៉ាំដែររឺទេ?	្រែដួបដុំធ្វេងៗ	ទៀត ដោយម	מותונטווהטו		
6	កើក្រួសាររបស់អ្នកធ្លាប់ទ	រទួលការវិនិ <mark>ច្ច័យ</mark>	ររ <mark>ា</mark> គសញ្ញាព្រួនស់	ប់ភក្នុងថ្លើមឌែ	ររីទេ?			
7	តើក្រុមគ្រួសាររបស់អ្នក រ	និយមបរិភោគរ	អាហារនៅ គ្រីនៅវ	ង <mark>្គាប្រចាំ</mark> ដែររឺទេ?				
8	តើលំនៅដ្ឋានរបស់អ្នកនេ ស្ទ្រីងទន្លេមិនលើសពី 10 ខំ	នាជិតមាត់ទឹក កីឡូម៉ែត្រ)	ទន្លេរ ស្ទឹង ទឹកអូ	រ ទឹកព្រែក និងទ	ទឹកបឹង			
_	អាយពិន្ទុ			. 1	_		I.	ı
ចំនុច1	=0.2,ರೆ೯೧೦2=0.2,ರೆ೯೧೦3	5=0.2, ° \$\foots\f	0.2,☎≒☎5=0.05	, చిక్కడ6=0.05, భ	ទំនុច7= 0.05	5, దీక్గొ 6=0.05		
	តារាងចំណាត់ថ្នាក់ពិទ្ធ			ចំនុចវាយតម្លៃ	- នៃ៥លប៉ះពា	ល់		
គាន	នផលប៉ះពាល់ 0	ពិ	S			<u>ប៉ះពាល់ខ្លាំង</u>		
4	វប៉ះពាល់តិច <mark>0.01-</mark> 0.5					្ត ប៉ះពាល់មធ្យម	i	
			•			U		
	រប៉ះពាល់មធ្យ <mark>ម0.51</mark> -		C2		ង ជល់	ប៉ះពាល់ត <u>ិ</u> ច		
ផេព	ផលប៉េះពាល់នៅអាល 71-1 00 ពិន							
รัฐวักยาลัยเทคโนโลยีสุรมาร								
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		ยาล์	unal	เปลย	Ci			
		-616		Min-				

Suranaree University of Technology

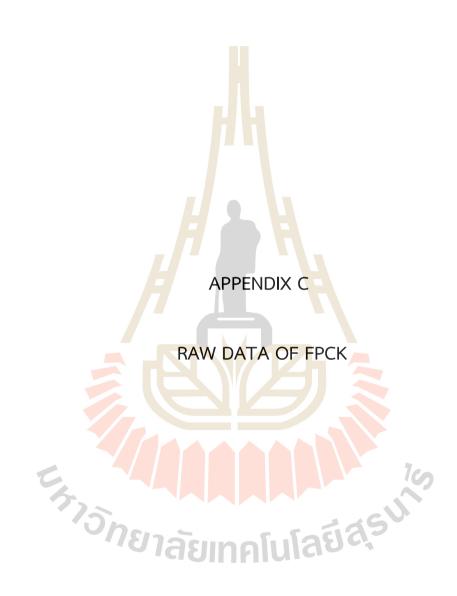
លិខិតអនុញ្ញាតលើកម្រោងស្រាវជ្រាវ



Institutional Review Board

(Informed Consent Form)

^{อัก} ลาสัยเทคโนโลยี ^{สั}			
គម្រោងស្រាវជ្រាវ ក	តារព្យា បាល ជម្ងឺ	ព្រួនសំប៉ែតក្នុងថ្លើម	
អនុម័ត្តនថ្ងៃទី	ខែ	ន្ទាំ២០១៨	
ខ្ញុំបាទ/ន	នាងខ្ញុំឈ្មោះ		ទឹកន្លែងស្នាក់នៅ ។
្រ	ឬ៣នីពល្យឯក	រចូលរួមដោយស្នំគ្រចិត្	មា <mark>ងស្រា</mark> វង្រាវដែលភ្ជាប់មកងាមួយកាលបរិច្ឆេទថ្ងៃទី ក្តុះខ្ញុំ បា ទ/នាងខ្ញុំបាន ទទួលច្បាប់ចម្លងនៃទំរង់ការព្រម ក្តុលេខានិងកាលបរិច្ឆេទរួមជាមួយព័ត៌មានសម្រាប់ការ
មុននឹងប ច្បាស់លាស់	ទុះហត្ថលខាលើ	ទម្រង់យល់ព្រមនេះ សូ	រុមធ្វើការអានពត៌មានលំអិតខាងក្រោមនេះអោយ បាន
សាស្ត្រស្រាវង្រាវ, ក្រេ ជាការប្រើអេកូសាច្រ ២. ខ្ញុំបាទ/នាងខ្ញុំ អ្នកស្រាវង្រាវបានរេ ៣. ខ្ញុំបាទ/នាងខ្ញុំវ	ាះថ្នាក់ឬរោកស ស្គូនៃការស្រាវជ្រ មានពេលវេលា ទ្លីយស់ណួរដោយ ឯនទទួលចំនេ	ញ្ញាដែលអាចកើតឡើង រវ និងវិធីសាស្ត្រ <mark>ផ្សេង</mark> ។ និងឱកាសគ្រ <mark>ប់គ្រា</mark> រ ស៊ីគ្រចិត្តមិនមែនលាវ ដើងពីអ្នកស្រាវជ្រាវ។	គោលប់ណ <mark>ង</mark> នៃការសិក្សា ដែលមានរយៈពេលស្រាវង្រាវ, វិធី ដក្កុងអំឡុង <mark>ខែកា</mark> រស្រាវង្រាវ មានដូចជាការប្រើថ្នាំ ក៍ដូច ទៀតនៃការព្យាបាលយ៉ាងហ្គត់ចត់របស់អ្នកស្រាវង្រាវ។ ន់ដើម្បីសួរសំណួររហូតដល់ខ្ញុំមានការយល់ដឹងច្បាស់លាស់។ ក់បាំងរហូតដល់ខ្ញុំពេញចិត្ត។ ខ្ញុំមានសិទ្ធិបដិសេធមិនចូលរួមក្នុងការស្រាវង្រាវនៅពេល ពាល់ដល់ការព្យាបា <mark>លនៃ</mark> ង់ដីឬសិទ្ធិផ្សេងៗទេ ខ្ញុំនឹងទទួល
៤ ខ្លុំបាទ/នាងថ្ ទិន្នន័យដែលបានវ	កំណត់ក្នុងកុំព្យូទ អាងថាព័ត៌មាន	ទ័រ ហើ <mark>យ</mark> ការតាមដានរ	វង្រាវរួមទាំងព័ត៌មា <mark>នវេដ្ឋស</mark> ាស្ត្រ មិនបង្ហាញឈ្មោះតាម របាយការណ៍ទិន្នន័យសម្រាប់គោលបំណងសិក្សា។ ⁄នាងខ្ញុំគីរក្សាការសម្ងាត់។ វាអាចប្រើបានលុះគ្រាតែមាន
ស្រាវង្រាវងោយជន្ទៈ	: ហើយចុះហគ្គរ	ឋខាតាមបែបបទនៃកំ ការចុះហរុ	ក្តីលេខាយល់ព្រម
්ර _ි ම්	ខែ	ស្នាំ	
ភ័យដែលអាចកើត ខាងលើមានការយ	មោននៃការស្រា ល់ឌឹងច្បាស់លា: ជ	វង្រាវ <mark>រួមទាំងអត្ថប្រ</mark> ប សមុន និងចុះឈ្មោះងា ហត្ថលេខាអ្នកស្រាវង្រាវ	<mark>សាស្ត្រស្រាវជ្រាវគ្រោះថ្នាក់ឬព្រឹត្តិ</mark> ការណ៍អវិជ្ជមានឬហានិ <mark>រាជន៍។ អ្នកចូលរួមក្នុងគម្រោងស្រាវជ្រាវដែលមានឈ្មោះ <mark>មួយនឹងសំណុំបែបប</mark>ទយល់ព្រមដោយស្ល័គ្រចិត្ត។ វ</mark>
	1) ឈ្មោះអ្នក ឆ្នាំ វត្តលេខាអ្នកដំនួយ	
(_. ឈ្មោះអ្នក នាំ	<u>តជំនួ</u> យ
<u> </u>	ខែ	នាំ	~



No	ID	Gender	Drops of number	stool wieght	Dro	Drop 1		Drop 2		Drop/stool 1g	Result: stool concentration	
140					Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
1	Ck00001	1	17	0.5	SS	-1		0	0.5	34	positive	20
2	Ck00002	2	20	0.5	1	0		0	0	40	Negative	0
3	Ck00004	2	19	0.5	Н	1	Н	1	1	38	positive	48
4	Ck00005	2	24	0.5	-	0	.	0	0	48	Negative	0
5	Ck00006	2	25	0.5		0	Z	0	0	50	Negative	0
6	Ck00007	1	20	0.5	-	0		0	0	40	Negative	0
7	Ck00008	1	23	0.5	4-//	0		0	0	46	Negative	0
8	Ck00009	1	19	0.5	_	0		0	9 0	38	Negative	0
9	Ck00010	2	18	0.5	15 ner	-0	ดโนโลร์	136	0	36	Negative	0
10	Ck00011	2	42	0.5	-	0	Himier	0	0	84	Negative	0
11	Ck00012	2	17	0.5	-	0	-	0	0	34	Negative	0
12	Ck00014	1	26	0.5	-	0	-	0	0	52	Negative	0

No	ID	Gender	Drops of number	stool wieght	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
NO		derider			Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	result	EPG
13	Ck00015	2	20	0.5	-	0	-	0	0	40	Negative	0
14	Ck00016	1	20	0.5	-	-0	\;	0	0	40	Negative	0
15	Ck00017	1	17	0.5	-	0	A	0	0	34	Negative	0
16	Ck00018	1	18	0.5	-	0	- 7	0	0	36	Negative	0
17	Ck00019	1	26	0.5	-	0	5 -	0	0	52	Negative	0
18	Ck00020	1	22	0.5		0		0	0	44	Negative	0
19	Ck00021	2	30	0.5		0		0	0	60	Negative	0
20	Ck00022	1	23	0.5	4-//	0		0	0	46	Negative	0
21	Ck00023	2	21	0.5	-	0		0	0	42	Negative	0
22	Ck00024	2	17	0.5	Dhu.	lagun	กโมโลร์	135	0	34	Negative	0
23	Ck00025	2	22	0.5	-	0	-	0	0	44	Negative	0
24	Ck00026	1	30	0.5	-	0	-	0	0	60	Negative	0
25	Ck00027	1	22	0.5	-	0	-	0	0	44	Negative	0

No	ID	Gender	Drops of number	stool wieght	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: sto	
NO					Species of parasite	number of	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
26	Ck00028	1	20	0.5	-	0	١ .	0	0	40	Negative	0
27	Ck00029	2	28	0.5	-	-0	1	0	0	56	Negative	0
28	Ck00030	2	22	0.5	-	0		0	0	44	Negative	0
29	Ck00031	1	25	0.5	-	0	- 4	0	0	50	Negative	0
30	Ck00032	2	26	0.5	-	0		0	0	52	Negative	0
31	Ck00033	2	31	0.5	5	0		0	0	62	Negative	0
32	Ck00034	2	23	0.5		0		0	0	46	Negative	0
33	Ck00035	1	23	0.5	\-/ ₁	0		0	0	46	Negative	0
34	Ck00038	2	25	0.5	_	0		0	0	50	Negative	0
35	Ck00039	2	20	0.5	Dhu.	lacun	ดโมโล โ	138	0	40	Negative	0
36	Ck00041	2	14	0.5	-	0	Llimie	0	0	28	Negative	0
37	Ck00042	2	23	0.5	-	0	-	0	0	46	Negative	0
38	Ck00043	2	21	0.5	E.coli	1	E.coli	1	1	42	positive	38

No	ID	Gender	Drops of number	stool wieght	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: sto	
NO					Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
39	Ck00044	2	19	0.5	-	0	-	0	0	38	Negative	0
40	Ck00045	2	16	0.5	-	-0	1	0	0	32	Negative	0
41	Ck00046	2	24	0.5	-	0		0	0	48	Negative	0
42	Ck00048	2	21	0.5	-	0	- 1	0	0	42	Negative	0
43	Ck00049	2	23	0.5	-	0	5 .	0	0	46	Negative	0
44	Ck00050	2	24	0.5		0		0	0	48	Negative	0
45	Ck00051	1	20	0.5		0	(-7)	0	0	40	Negative	0
46	Ck00052	2	19	0.5	4//	0	Ov	1	0.5	38	positive	36
47	Ck00053	2	36	0.5	-	0		0	0	72	Negative	0
48	Ck00054	2	20	0.5	Dhe.	lagun	ดโมโลร์	130	0	40	Negative	0
49	Ck00055	2	16	0.5	-	0	·	0	0	32	Negative	0
50	Ck00056	1	17	0.5	-	0	-	0	0	34	Negative	0
51	Ck00057	2	21	0.5	-	0	-	0	0	42	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	result	EPG
52	Ck00059	2	21	0.5	-	0	-	0	0	42	Negative	0
53	Ck00060	1	20	0.5	-	0	-	0	0	40	Negative	0
54	Ck00061	2	20	0.5	-	0		0	0	40	Negative	0
55	Ck00062	2	33	0.5	-	0	1	0	0	66	Negative	0
56	Ck00063	2	14	0.5	-	0	-	0	0	28	Negative	0
57	Ck00064	2	18	0.5		0		0	0	36	Negative	0
58	Ck00065	2	20	0.5	SS	3	SS	1	2	40	positive	172
59	Ck00066	2	43	0.5	H.nana	1	H.nana	1	1	86	positive	54
60	Ck00067	2	27	0.5		0		0	0	54	Negative	0
61	Ck00068	2	24	0.5	Sha	lagun	อโมโลร์		0	48	Negative	0
62	Ck00070	2	18	0.5	-	0	- III	0	0	36	Negative	0
63	Ck00071	2	24	0.5	-	0	-	0	0	48	Negative	0
64	Ck00072	1	18	0.5	-	0	-	0	0	36	Negative	0

No	ID		Drops of number	stool wieght	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
NO		Gender			Species of parasite	number of	Species of parasite	number of eggs	average	Drop/stoot 1g	result	EPG
65	Ck00073	2	11	0.5	-	0	-	0	0	22	Negative	0
66	Ck00074	2	16	0.5	-	0		0	0	32	Negative	0
67	Ck00075	1	36	0.5	-	0		0	0	72	Negative	0
68	Ck00076	2	28	0.5	-	0	- 1	0	0	56	Negative	0
69	Ck00077	2	21	0.5	-	0	A - N	0	0	42	Negative	0
70	Ck00078	2	16	0.5		0		0	0	32	Negative	0
71	Ck00079	2	18	0.5		0		0	0	36	Negative	0
72	Ck00080	2	18	0.5	4/7	0	1444	0	0	36	Negative	0
73	Ck00081	2	21	0.5	-	0		0	0	42	Negative	0
74	Ck00082	1	29	0.5	Dha.	lagun	อโมโลร์	135	0	58	Negative	0
75	Ck00083	2	16	0.5	-	0	-	0	0	32	Negative	0
76	Ck00084	1	17	0.5	-	0	-	0	0	34	Negative	0
77	Ck00085	2	16	0.5	-	0	-	0	0	32	Negative	0

No	ID	Gender	Drops of number	stool wieght	Dro	p 1	Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
NO					Species of parasite	number of eggs	Species of parasite	number of eggs	average	Biop/stoot 1g	result	EPG
78	Ck00086	2	28	0.5	E.coli	35	E.coli	43	39	56	positive	1170
79	Ck00087	2	15	0.5	-	0		0	0	30	Negative	0
80	Ck00088	1	18	0.5	-	0		0	0	36	Negative	0
81	Ck00089	1	20	0.5	-	0	- 7	0	0	40	Negative	0
82	Ck00090	2	25	0.5	-	0	-	0	0	50	Negative	0
83	Ck00091	1	25	0.5	4	0		0	0	50	Negative	0
84	Ck00092	1	24	0.5		0		0	0	48	Negative	0
85	Ck00093	2	16	0.5		0		0	0	32	Negative	0
86	Ck00094	1	21	0.5	-	0		0	0	42	Negative	0
87	Ck00095	2	21	0.5	Ding!	lagun	ดโมโลร์	128	0	42	Negative	0
88	Ck00096	1	15	0.5	-	0	-	0	0	30	Negative	0
89	Ck00097	2	25	0.5	-	0	-	0	0	50	Negative	0
90	Ck00098	1	13	0.5	-	0	-	0	0	26	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	ID.	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
91	Ck00099	1	11	0.5	-	0	-	0	0	22	Negative	0
92	Ck00100	2	13	0.5	-	0		0	0	26	Negative	0
93	Ck00101	2	18	0.5	-	0		0	0	36	Negative	0
94	Ck00102	1	24	0.5	-	0	- 4	0	0	48	Negative	0
95	Ck00103	2	18	0.5	-	0	-	0	0	36	Negative	0
96	Ck00104	2	25	0.5		0	12	0	0	50	Negative	0
97	Ck00105	2	21	0.5		0		0	0	42	Negative	0
98	Ck00106	2	18	0.5		0		0	0	36	Negative	0
99	Ck00107	2	17	0.5	-	0		0	0	34	Negative	0
100	Ck00108	1	20	0.5	Dha.	lagun	ດໂນໂລເ	130	0	40	Negative	0
101	Ck00109	2	26	0.5	-	0	-	0	0	52	Negative	0
102	Ck00110	1	19	0.5	-	0	-	0	0	38	Negative	0
103	Ck00111	1	21	0.5	-	0	-	0	0	42	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	U	Geridei	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
104	Ck00112	1	25	0.5	-	0	-	0	0	50	Negative	0
105	Ck00113	2	18	0.5	-	0		0	0	36	Negative	0
106	Ck00114	1	18	0.5	-	0		0	0	36	Negative	0
107	Ck00115	2	22	0.5	-	0	- 1	0	0	44	Negative	0
108	Ck00116	2	21	0.5	-	0	-	0	0	42	Negative	0
109	Ck00117	2	25	0.5	4	0	12	0	0	50	Negative	0
110	Ck00118	2	13	0.5		0		0	0	26	Negative	0
111	Ck00119	2	23	0.5		0		0	0	46	Negative	0
112	Ck00120	1	25	0.5	-	0		0	0	50	Negative	0
113	Ck00121	2	21	0.5	Dne	lagun	อโมโลร์	128	0	42	Negative	0
114	Ck00122	2	21	0.5	E.coli	2	E.coli	1	1.5	42	positive	69
115	Ck00123	2	23	0.5	-	0	-	0	0	46	Negative	0
116	Ck00124	2	19	0.5	-	0	-	0	0	38	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	U	Geridei	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
117	Ck00125	1	15	0.5	-	0	١ .	0	0	30	Negative	0
118	Ck00126	1	24	0.5	-	-0		0	0	48	Negative	0
119	Ck00127	2	17	0.5	-	0		0	0	34	Negative	0
120	Ck00128	1	18	0.5	-	0	- 1	0	0	36	Negative	0
121	Ck00130	1	23	0.5	-	0		0	0	46	Negative	0
122	Ck00131	2	20	0.5		0		0	0	40	Negative	0
123	Ck00132	1	27	0.5		0		0	0	54	Negative	0
124	Ck00133	2	28	0.5	4//	0		0	0	56	Negative	0
125	Ck00134	2	20	0.5		0		0	0	40	Negative	0
126	Ck00135	2	17	0.5	Dhu	lagun	อโมโลริ	128	0	34	Negative	0
127	Ck00136	2	14	0.5	-	0	-	0	0	28	Negative	0
128	Ck00137	2	14	0.5	-	0	-	0	0	28	Negative	0
129	Ck00138	2	21	0.5	-	0	-	0	0	42	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	result	EPG
130	Ck00139	2	15	0.5	E.coli	1	E.coli	1	1	30	positive	40
131	Ck00140	1	20	0.5	-	-0		0	0	40	Negative	0
132	Ck00141	1	24	0.5	-	0	A	0	0	48	Negative	0
133	Ck00142	2	14	0.5	-	0	- 1	0	0	28	Negative	0
134	Ck00143	2	15	0.5	-	0	A · N	0	0	30	Negative	0
135	Ck00144	1	18	0.5	SS	10	SS	13	11.5	36	positive	483
136	Ck00145	2	21	0.5		0		0	0	42	Negative	0
137	Ck00146	1	20	0.5		0		0	0	40	Negative	0
138	Ck00147	1	16	0.5		0		0	0	32	Negative	0
139	Ck00148	2	18	0.5	Dha.	lagun	ดโมโลร์	130	0	36	Negative	0
140	Ck00149	1	19	0.5	-	0	-	0	0	38	Negative	0
141	Ck00150	2	26	0.5	-	0	-	0	0	52	Negative	0
142	Ck00151	2	18	0.5	-	0	-	0	0	36	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	טו	gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
143	Ck00152	1	16	0.5	Ov	8	Ov	6	7	32	positive	252
144	Ck00153	2	18	0.5	-	0		0	0	36	Negative	0
145	Ck00154	1	18	0.5	-	0		0	0	36	Negative	0
146	Ck00155	1	16	0.5	-	0	- 1	0	0	32	Negative	0
147	Ck00156	2	18	0.5	-	0	A -	0	0	36	Negative	0
148	Ck00157	1	18	0.5		0		0	0	36	Negative	0
149	Ck00158	2	18	0.5		0		0	0	36	Negative	0
150	Ck00159	2	15	0.5	\-/ <i>\</i>	0		0	0	30	Negative	0
151	Ck00160	2	24	0.5		0		0	0	48	Negative	0
152	Ck00161	2	22	0.5	E.coli	ladus	E.coli	25	1.5	44	positive	87
153	Ck00163	2	29	0.5	-	0	Llimie	0	0	58	Negative	0
154	Ck00164	1	20	0.5	-	0	-	0	0	40	Negative	0
155	Ck00165	1	20	0.5	-	0	-	0	0	40	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	result	EPG
156	Ck00166	2	18	0.5	-	0	-	0	0	36	Negative	0
157	Ck00167	2	23	0.5	E.coli	1	E.coli	5	3	46	positive	114
158	Ck00168	1	19	0.5	E.coli	3	E.coli	4	3.5	38	positive	105
159	Ck00169	2	15	0.5	-	0		0	0	30	Negative	0
160	Ck00170	1	28	0.5	-	0	-	0	0	56	Negative	0
161	Ck00171	2	20	0.5	1	0		0	0	40	Negative	0
162	Ck00172	2	21	0.5		0		0	0	42	Negative	0
163	Ck00173	1	12	0.5	4-//	0		0	0	24	Negative	0
164	Ck00174	2	23	0.5	_	0		0	0	46	Negative	0
165	Ck00175	1	14	0.5	Dhu	lagun	อโมโลร์	13.5	0	28	Negative	0
166	Ck00176	1	20	0.5	-	0	-	0	0	40	Negative	0
167	Ck00177	2	16	0.5	-	0	-	0	0	32	Negative	0
168	Ck00178	2	46	0.5	-	0	-	0	0	92	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Brop/stoot 1g	result	EPG
169	Ck00179	2	13	0.5	-	0	-	0	0	26	Negative	0
170	Ck00181	2	22	0.5	-	0	1	0	0	44	Negative	0
171	Ck00182	2	23	0.5	-	0	H	0	0	46	Negative	0
172	Ck00183	1	23	0.5	-	0	- 1	0	0	46	Negative	0
173	Ck00184	2	21	0.5	-	0	A ·	0	0	42	Negative	0
174	Ck00185	2	37	0.5		0		0	0	74	Negative	0
175	Ck00186	2	19	0.5		0	(- -))	0	0	38	Negative	0
176	Ck00187	1	19	0.5	4-//	0		0	0	38	Negative	0
177	Ck00188	1	15	0.5	-	0	1.	0	0	30	Negative	0
178	Ck00189	1	20	0.5	Dns.	lagun	ดโมโลร์	120	0	40	Negative	0
179	Ck00190	1	20	0.5	-	0	Haler	0	0	40	Negative	0
180	Ck00191	2	28	0.5	-	0	-	0	0	56	Negative	0
181	Ck00192	1	24	0.5	-	0	-	0	0	48	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	ID.	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Brop/stoot 1g	result	EPG
182	Ck00193	2	18	0.5	-	0	-	0	0	36	Negative	0
183	Ck00194	2	20	0.5	-	0	l i	0	0	40	Negative	0
184	Ck00195	1	17	0.5	-	0		0	0	34	Negative	0
185	Ck00196	2	25	0.5	-	0	- 4	0	0	50	Negative	0
186	Ch001	2	20	0.5	-	0	A ·	0	0	40	Negative	0
187	Ch002	1	28	0.5		0		0	0	56	Negative	0
188	Ch003	1	17	0.5		0		0	0	34	Negative	0
189	Ch004	1	18	0.5	4-//	0		0	0	36	Negative	0
190	Ch005	1	21	0.5	_	0		0	0	42	Negative	0
191	Ch006	1	20	0.5	Dhu	lagun	อโมโลร์	12.5	0	40	Negative	0
192	Ch007	2	31	0.5	-	0	-	0	0	62	Negative	0
193	Ch008	2	16	0.5	-	0	-	0	0	32	Negative	0
194	Ch009	2	22	0.5	-	0	-	0	0	44	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/31001 1g	result	EPG
195	Ch010	1	20	0.5	-	0	-	0	0	40	Negative	0
196	Ch011	2	16	0.5	-	-0	1	0	0	32	Negative	0
197	Ch012	2	10	0.5	-	0	A	0	0	20	Negative	0
198	Ch013	2	28	0.5	-	0	- 1	0	0	56	Negative	0
199	Ch014	2	16	0.5	-	0	A · ·	0	0	32	Negative	0
200	Ch015	1	20	0.5		0		0	0	40	Negative	0
201	Ch016	1	10	0.5		0		0	0	20	Negative	0
202	Ch017	1	29	0.5	4-//	0		0	0	58	Negative	0
203	Ch018	2	11	0.5	-	0		0	0	22	Negative	0
204	Ch019	2	22	0.5	Dner	ladun	กโมโลร์	13.5	0	44	Negative	0
205	Ch020	2	18	0.5	-	0	Haier	0	0	36	Negative	0
206	Ch021	1	14	0.5	-	0	-	0	0	28	Negative	0
207	Ch022	1	29	0.5	-	0	-	0	0	58	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	טו	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	result	EPG
208	Ch023	2	29	0.5	1	0	-	0	0	58	Negative	0
209	Ch024	2	24	0.5	-	0	l i	0	0	48	Negative	0
210	Ch025	2	17	0.5	-	0		0	0	34	Negative	0
211	Ch026	2	20	0.5	-	0		0	0	40	Negative	0
212	Ch027	2	13	0.5	-	0	-	0	0	26	Negative	0
213	Ch028	1	20	0.5		0	12 1	0	0	40	Negative	0
214	Ch029	2	42	0.5		0		0	0	84	Negative	0
215	Ch030	2	18	0.5	4-//	0		0	0	36	Negative	0
216	Ch031	1	26	0.5	Ι	1		0	0.5	52	positive	14
217	Ch032	2	14	0.5	วกย	lagun	อโมโลร์	300	0	28	Negative	0
218	Ch033	2	29	0.5	-	0	- Ilaici	0	0	58	Negative	0
219	Ch034	1	25	0.5	-	0	-	0	0	50	Negative	0
220	Ch035	1	31	0.5	-	0	-	0	0	62	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: ste	
140	U	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	ыор/31001 Ту	result	EPG
221	Ch036	1	28	0.5	1	0	-	0	0	56	Negative	0
223	Ch037	2	17	0.5	1	0	-	0	0	34	Negative	0
224	Ch038	2	33	0.5	-	0		0	0	66	Negative	0
225	Ch039	2	21	0.5	#VALUE!	0	1	0	0	42	Negative	0
226	Ch040	1	27	0.5	As	3	-	0	1.5	54	positive	78
227	Ch041	1	26	0.5		0		0	0	52	Negative	0
228	Ch042	1	25	0.5		0		0	0	50	Negative	0
229	Ch043	1	30	0.5	4-//	0		0	0	60	Negative	0
230	Ch044	1	23	0.5	-	0		0	0	46	Negative	0
231	Ch045	1	26	0.5	Sne	lagun	As	jas	0.5	52	positive	28
232	Ch046	2	28	0.5	-	0	- III	0	0	56	Negative	0
233	Ch047	2	45	0.5	-	0	-	0	0	90	Negative	0
234	Ch048	2	29	0.5	-	0	-	0	0	58	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	טו	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	ыор/31001 Ту	result	EPG
235	Ch049	1	17	0.5	-	0	-	0	0	34	Negative	0
236	Ch050	2	27	0.5	-	0	l l	0	0	54	Negative	0
237	Ch051	1	27	0.5	-	0		0	0	54	Negative	0
238	Ch052	1	13	0.5	-	0	- 1	0	0	26	Negative	0
239	Ch053	1	37	0.5	-	0	. .	0	0	74	Negative	0
240	Ch054	1	26	0.5		0		0	0	52	Negative	0
241	Ch055	1	16	0.5		0		0	0	32	Negative	0
242	Ch056	2	23	0.5	Y-//	0		0	0	46	Negative	0
243	Ch057	2	18	0.5	_	0		0	0	36	Negative	0
244	Ch058	1	26	0.5	Dner	lagun	กโนไล ์	120	0	52	Negative	0
245	Ch059	1	14	0.5	-	0	Haier	0	0	28	Negative	0
246	Ch060	2	36	0.5	-	0	Н	1	0.5	72	positive	16
247	Ch061	1	16	0.5	-	0	-	0	0	32	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	result	EPG
248	Ch062	2	14	0.5	-	0	١ -	0	0	28	Negative	0
249	Ch063	2	27	0.5	-	0	\;	0	0	54	Negative	0
250	Ch064	2	19	0.5	-	0		0	0	38	Negative	0
251	Ch065	2	35	0.5	-	0		0	0	70	Negative	0
252	Ch066	2	20	0.5	-	0	-	0	0	40	Negative	0
253	M001	2	23	0.5		0		0	0	46	Negative	0
254	M002	1	17	0.5		0		0	0	34	Negative	0
255	M003	2	37	0.5	4-//	0		0	0	74	Negative	0
256	M004	2	32	0.5	_	0		0	0	64	Negative	0
257	M006	1	31	0.5	Dhu.	lagun	อโมโลร์	12.5	0	62	Negative	0
258	M007	2	19	0.5	-	0	Hole	0	0	38	Negative	0
259	M008	2	14	0.5	-	0	-	0	0	28	Negative	0
260	M009	1	40	0.5	-	0	-	0	0	80	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
NO	U	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
261	M010	2	22	0.5	-	0	١ -	0	0	44	Negative	0
262	M011	2	24	0.5	-	0	1	0	0	48	Negative	0
263	M012	2	17	0.5	-	0	A	0	0	34	Negative	0
264	M013	1	27	0.5	-	0	- 4	0	0	54	Negative	0
265	M016	2	24	0.5	-	0	-	0	0	48	Negative	0
266	M015	2	31	0.5		0		0	0	62	Negative	0
267	M017	1	26	0.5		0		0	0	52	Negative	0
268	M018	1	28	0.5	4-//	0		0	0	56	Negative	0
269	M019	2	23	0.5	_	0		0	0	46	Negative	0
270	M020	1	30	0.5	วกย		อโมโลร์		0	60	Negative	0
271	M021	2	26	0.5	-	0	- III	0	0	52	Negative	0
272	M022	1	37	0.5	-	0	-	0	0	74	Negative	0
273	M024	1	20	0.5	-	0	-	0	0	40	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	טו	gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
274	M024(2)	2	21	0.5	-	0	-	0	0	42	Negative	0
275	M025	1	25	0.5	-	0	l i	0	0	50	Negative	0
276	M026	2	27	0.5	-	0	H	0	0	54	Negative	0
277	M028	2	24	0.5	-	0	- 1	0	0	48	Negative	0
278	M029	2	30	0.5	-	0	. .	0	0	60	Negative	0
279	M030	1	21	0.5		0		0	0	42	Negative	0
280	M031	2	40	0.5		0	(-7)	0	0	80	Negative	0
281	M032	2	23	0.5	Y-//	0		0	0	46	Negative	0
282	M033	1	15	0.5	-	0		0	0	30	Negative	0
283	M034	1	25	0.5	Dng.	lagun	ดโมโลร์	120	0	50	Negative	0
284	M035	2	24	0.5	-	0	Holler	0	0	48	Negative	0
285	M036	2	20	0.5	-	0	-	0	0	40	Negative	0
286	M037	1	28	0.5	-	0	-	0	0	56	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
No	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/31001 1g	result	EPG
287	M038	1	33	0.5	-	0	-	0	0	66	Negative	0
288	M039	2	29	0.5	-	0	-	0	0	58	Negative	0
289	M040	1	28	0.5	-	0		0	0	56	Negative	0
290	M041	2	25	0.5	-	0	4	0	0	50	Negative	0
300	M042	2	44	0.5	-	0	-	0	0	88	Negative	0
301	M043	1	34	0.5		0		0	0	68	Negative	0
302	M044	2	28	0.5		0		0	0	56	Negative	0
303	M045	2	40	0.5	4-//	0		0	0	80	Negative	0
304	M046	2	32	0.5		0		0	0	64	Negative	0
305	M047	1	29	0.5	15 ng	lagun	อโมโลร์		0	58	Negative	0
306	M048	1	10	0.5	-	0	-	0	0	20	Negative	0
307	M049	2	40	0.5	-	0	-	0	0	80	Negative	0
308	M050	2	37	0.5	-	0	-	0	0	74	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/31001 1g	result	EPG
309	M051	2	24	0.5	-	0	-	0	0	48	Negative	0
310	M052	1	28	0.5	-	0	·	0	0	56	Negative	0
311	M053	2	27	0.5	-	0		0	0	54	Negative	0
312	M054	1	29	0.5	-	0	1	0	0	58	Negative	0
313	M055	1	31	0.5	-	0	-	0	0	62	Negative	0
314	M056	1	30	0.5		0	Zi	0	0	60	Negative	0
315	M057	2	31	0.5		0		0	0	62	Negative	0
316	M058	2	29	0.5	4-//	0		0	0	58	Negative	0
317	M059	2	28	0.5		0		0	0	56	Negative	0
318	M060	1	29	0.5	วกย	lagun	อโมโลร์		0	58	Negative	0
319	M061	2	27	0.5	-	0	- III	0	0	54	Negative	0
320	M062	1	30	0.5	-	0	-	0	0	60	Negative	0
321	M064	1	31	0.5	1	0	-	0	0	62	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
NO	U	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	ыор/31001 Ту	result	EPG
322	M064(2)	2	28	0.5	-	0	١ -	0	0	56	Negative	0
324	M064(3)	1	27	0.5	-	0	l i	0	0	54	Negative	0
325	M065	2	26	0.5	-	0	H	0	0	52	Negative	0
326	M066	2	28	0.5	-	0	- H	0	0	56	Negative	0
327	M067	2	31	0.5	-	0	. .	0	0	62	Negative	0
328	M068	2	33	0.5		0		0	0	66	Negative	0
329	M069	2	26	0.5		0		0	0	52	Negative	0
330	M070	2	29	0.5	\-/ <i>\</i>	0		0	0	58	Negative	0
331	M070(2)	1	30	0.5	_	0		0	0	60	Negative	0
332	M071	1	31	0.5	Dng.	lagun	กโนไล ์	120	0	62	Negative	0
333	M072	2	26	0.5	-	0	Haier	0	0	52	Negative	0
334	M074	2	37	0.5	-	0	-	0	0	74	Negative	0
335	M075	1	43	0.5	-	0	-	0	0	86	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	Ü	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
336	M075(2)	2	43	0.5	-	0	-	0	0	86	Negative	0
337	M076	1	27	0.5	-	0	1	0	0	54	Negative	0
338	M077	1	28	0.5	-	0) A	0	0	56	Negative	0
339	M078	1	27	0.5	-	0	- 4	0	0	54	Negative	0
340	M079	2	24	0.5	-	0	5	0	0	48	Negative	0
341	M081	2	18	0.5		0		0	0	36	Negative	0
342	M082	1	19	0.5		0		0	0	38	Negative	0
343	M083	2	43	0.5	\-// ₋ //	0		0	0	86	Negative	0
344	M084	2	29	0.5		0		0	9 0	58	Negative	0
345	M085	2	25	0.5	Dhu	lacun	าโมโลร์	120	0	50	Negative	0
346	M086	2	24	0.5	-	0	Hillier	0	0	48	Negative	0
347	M087	2	11	0.5	-	0	-	0	0	22	Negative	0
348	M088	2	29	0.5	-	0	-	0	0	58	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
349	M089	2	30	0.5	-	0	١ -	0	0	60	Negative	0
350	M090	2	18	0.5	-	0	\;	0	0	36	Negative	0
351	M091	2	48	0.5	-	0	H	0	0	96	Negative	0
352	M092	1	11	0.5	-	0	- 1	0	0	22	Negative	0
353	M093	1	18	0.5	-	0	-	0	0	36	Negative	0
354	M094	1	25	0.5		0		0	0	50	Negative	0
355	M095	1	30	0.5		0		0	0	60	Negative	0
356	M096	1	34	0.5	4-//	0		0	0	68	Negative	0
357	M097	1	27	0.5	_	0		0	0	54	Negative	0
358	M098	2	30	0.5	Dhu	lagun	อโมโลร์	12.5	0	60	Negative	0
359	M099	1	41	0.5	-	0	- III	0	0	82	Negative	0
360	M100	2	31	0.5	-	0	-	0	0	62	Negative	0
361	M101	2	16	0.5	-	0	-	0	0	32	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	U	gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	result	EPG
362	M102	2	25	0.5	-	0	-	0	0	50	Negative	0
363	M103	1	10	0.5	-	-0	1	0	0	20	Negative	0
364	M104	1	24	0.5	-	0		0	0	48	Negative	0
365	M105	2	23	0.5	-	0	/	0	0	46	Negative	0
366	M106	1	26	0.5	-	0	- 1	0	0	52	Negative	0
367	M107	1	48	0.5		0	Z	0	0	96	Negative	0
368	M108	2	19	0.5		0	(5)	0	0	38	Negative	0
369	M109	1	37	0.5	4-//	0		0	0	74	Negative	0
370	M110	1	34	0.5	_	0		0	0	68	Negative	0
371	M111	2	16	0.5	วกย	lagun	ดโมโลร์	305	0	32	Negative	0
372	M112	2	40	0.5	-	0	riidie	0	0	80	Negative	0
373	M113	1	25	0.5	-	0	-	0	0	50	Negative	0
374	M114	2	27	0.5	-	0	-	0	0	54	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: st	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	result	EPG
375	M115	1	30	0.5	-	0	-	0	0	60	Negative	0
376	M116	1	47	0.5	-	0	\;	0	0	94	Negative	0
377	M117	1	31	0.5	-	0		0	0	62	Negative	0
378	M118	1	14	0.5	-	0	-	0	0	28	Negative	0
379	M119	1	18	0.5	-	0		0	0	36	Negative	0
380	M120	2	20	0.5		0	Z	0	0	40	Negative	0

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No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: st concentra	
NO	U	Geridei	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	Result	EPG
1	Ck00001	1	25	0.5	-	0		0	0	33	Negative	0
2	Ck00002	2	30	0.5	-	0		0	0	11	Negative	0
3	Ck00004	2	26	0.5	-	0	- 1	0	0	20	Negative	0
4	Ck00005	2	24	0.5	OV	2	ov	3	3.5	42	Positive	115.5
5	Ck00006	2	16	0.5		0		0	0	33	Negative	0
6	Ck00007	1	31	0.5		0		0	0	17	Negative	0
7	Ck00008	1	24	0.5	4//	0		0	0	23	Negative	0
8	Ck00009	1	21	0.5	-	0		0	0	24	Negative	0
9	Ck00010	2	40	0.5	10 Mg	lagun	อโปโลร	jaş	2.5	23	Positive	135
10	Ck00011	1	29	0.5	-	0	-	0	0	54	Negative	0
11	Ck00012	2	13	0.5	-	0	-	0	0	56	Negative	0
12	Ck00014	2	26	0.5	-	0	-	0	0	45	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
13	Ck00015	2	32	0.5	-	0	-	0	0	32	Negative	0
14	Ck00016	2	14	0.5	-	0		0	0	43	Negative	0
15	Ck00017	1	16	0.5	-	0) A	0	0	46	Negative	0
16	Ck00018	1	21	0.5	-	0	/-	0	0	22	Negative	0
17	Ck00019	1	19	0.5	-	0	A - N	0	0	19	Negative	0
18	Ck00020	2	32	0.5	15	0		0	0	44	Negative	0
19	Ck00021	2	40	0.5		0		0	0	60	Negative	0
20	Ck00022	2	18	0.5		0		0	0	43	Negative	0
21	Ck00023	1	23	0.5	-	0		0	0	27	Negative	0
22	Ck00024	2	25	0.5	Dha.	lagun	อโมโลร์	130	0	26	Negative	0
23	Ck00025	1	27	0.5	-	0	-	0	0	18	Negative	0
24	Ck00026	1	30	0.5	-	0	-	0	0	12	Negative	0
25	Ck00027	1	24	0.5	-	0	-	0	0	32	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
26	Ck00028	1	20	0.5	-	0	-	0	0	29	Negative	0
27	Ck00029	1	16	0.5	-	-0		0	0	40	Negative	0
28	Ck00030	2	10	0.5	-	0		0	0	35	Negative	0
29	Ck00031	1	23	0.5	OV	1	OV	3	2.5	38	Positive	100
30	Ck00032	2	26	0.5	-	0	5 -	0	0	40	Negative	0
31	Ck00033	2	27	0.5	4	0		0	0	33	Negative	0
32	Ck00034	2	28	0.5		0		0	0	29	Negative	0
33	Ck00035	1	29	0.5	4//	0	1444	0	0	18	Negative	0
34	Ck00038	1	21	0.5	-	0		0	0	30	Negative	0
35	Ck00039	1	23	0.5	Dner	lagun	ดโนโลร์	128	0	44	Negative	0
36	Ck00041	2	19	0.5	-	0	-	0	0	33	Negative	0
37	Ck00042	2	15	0.5	-	0	-	0	0	29	Negative	0
38	Ck00043	1	32	0.5	-	0	-	0	0	30	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: st	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
39	Ck00044	2	26	0.5	-	0	١ .	0	0	31	Negative	0
40	Ck00045	2	25	0.5	-	-0		0	0	39	Negative	0
41	Ck00046	2	28	0.5	-	0		0	0	27	Negative	0
42	Ck00048	1	14	0.5	-	0	- 1	0	0	25	Negative	0
43	Ck00049	2	10	0.5	-	0	A · N	0	0	24	Negative	0
44	Ck00050	2	11	0.5	4	0		0	0	23	Negative	0
45	Ck00051	2	21	0.5		0	(4)	0	0	26	Negative	0
46	Ck00052	2	27	0.5		0		0	0	33	Negative	0
47	Ck00053	2	24	0.5	-	0		0	0	28	Negative	0
48	Ck00054	2	25	0.5	Diner	ladun	<u>ดโมโลร</u> ์	135	0	37	Negative	0
49	Ck00055	2	28	0.5	-	0	-	0	0	28	Negative	0
50	Ck00056	2	31	0.5	-	0	-	0	0	30	Negative	0
51	Ck00057	2	20	0.5	-	0	-	0	0	50	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
52	Ck00059	2	25	0.5	-	0	-	0	0	42	Negative	0
53	Ck00060	2	24	0.5	-	0		0	0	22	Negative	0
54	Ck00061	1	26	0.5	-	0		0	0	54	Negative	0
55	Ck00062	2	13	0.5	-	0	- 1	0	0	39	Negative	0
56	Ck00063	2	26	0.5	-	0	5	0	0	32	Negative	0
57	Ck00064	2	24	0.5	4	0		0	0	33	Negative	0
58	Ck00065	2	13	0.5		0		0	0	28	Negative	0
59	Ck00066	1	22	0.5		0		0	0	26	Negative	0
60	Ck00067	2	31	0.5	-	0		0	0	33	Negative	0
61	Ck00068	2	27	0.5	Dns.	lagun	ດໂນໂລຊີ	13.5	0	27	Negative	0
62	Ck00070	1	24	0.5	-	0	-	0	0	43	Negative	0
63	Ck00071	2	21	0.5	-	0	-	0	0	28	Negative	0
64	Ck00072	2	14	0.5	-	0	-	0	0	19	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: st	
140	lD .	Geridei	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	Result	EPG
65	Ck00073	2	25	0.5	-	0	-	0	0	50	Negative	0
66	Ck00074	2	22	0.5	-	-0		0	0	15	Negative	0
67	Ck00075	2	31	0.5	-	0		0	0	26	Negative	0
68	Ck00076	2	40	0.5	-	0	- 1	0	0	37	Negative	0
69	Ck00077	2	11	0.5	-	0	5 -	0	0	33	Negative	0
70	Ck00078	2	34	0.5	4	0		0	0	28	Negative	0
71	Ck00079	2	25	0.5		0		0	0	33	Negative	0
72	Ck00080	2	21	0.5		0		0	0	25	Negative	0
73	Ck00081	1	25	0.5	-	0		0	0	24	Negative	0
74	Ck00082	2	22	0.5	Dines.	lagun	ดโมโลร์	128	0	22	Negative	0
75	Ck00083	2	15	0.5	-	0	-	0	0	28	Negative	0
76	Ck00084	1	32	0.5	-	0	-	0	0	16	Negative	0
77	Ck00085	2	25	0.5	-	0	-	0	0	34	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
78	Ck00086	2	21	0.5	-	0	-	0	0	25	Negative	0
79	Ck00087	2	32	0.5	-	-0		0	0	34	Negative	0
80	Ck00088	2	22	0.5	-	0	A	0	0	26	Negative	0
81	Ck00089	2	34	0.5	-	0	- 1	0	0	37	Negative	0
82	Ck00090	2	25	0.5	-	0	A - V	0	0	26	Negative	0
83	Ck00091	1	10	0.5	4	0		0	0	34	Negative	0
84	Ck00092	2	27	0.5		0		0	0	55	Negative	0
85	Ck00093	1	23	0.5		0		0	0	47	Negative	0
86	Ck00094	2	48	0.5	π	1		0	1	32	Positive	17
87	Ck00095	2	21	0.5	Dne	lagun	อโนโลร์	135	0	17	Negative	0
88	Ck00096	2	30	0.5	-	0	-	0	0	13	Negative	0
89	Ck00097	1	25	0.5	-	0	-	0	0	22	Negative	0
90	Ck00098	1	28	0.5	-	0	-	0	0	19	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
NO	ID.	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
91	Ck00099	2	37	0.5	Н	1	Н	2	2	47	Positive	30
92	Ck00100	1	21	0.5	-	-0		0	0	15	Negative	0
93	Ck00101	1	20	0.5	-	0		0	0	35	Negative	0
94	Ck00102	2	19	0.5	-	0	- 1	0	0	25	Negative	0
95	Ck00103	1	30	0.5	-	0	.	0	0	27	Negative	0
96	Ck00104	2	26	0.5		0		0	0	23	Negative	0
97	Ck00105	1	23	0.5		0		0	0	29	Negative	0
98	Ck00106	2	21	0.5		0		0	0	30	Negative	0
99	Ck00107	1	29	0.5	-	0		0	0	33	Negative	0
100	Ck00108	1	30	0.5	Dines.	lagun	ดโมโลร์	128	0	44	Negative	0
101	Ck00109	2	21	0.5	-	0	-	0	0	18	Negative	0
102	Ck00110	2	10	0.5	-	0	-	0	0	89	Negative	0
103	Ck00111	1	13	0.5	-	0	-	0	0	22	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: st	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	DIOD/31001 15	Result	EPG
104	Ck00112	2	16	0.5	-	0	١ .	0	0	56	Negative	0
105	Ck00113	2	26	0.5	-	-0		0	0	57	Negative	0
106	Ck00114	2	15	0.5	-	0	A	0	0	34	Negative	0
107	Ck00115	2	18	0.5	-	0	- 7	0	0	35	Negative	0
108	Ck00116	2	20	0.5	-	0	A · N	0	0	24	Negative	0
109	Ck00117	1	25	0.5	4	0		0	0	22	Negative	0
110	Ck00118	2	25	0.5		0		0	0	11	Negative	0
111	Ck00119	1	24	0.5	4//	0		0	0	56	Negative	0
112	Ck00120	1	16	0.5	-	0		0	0	37	Negative	0
113	Ck00121	1	21	0.5	Diner.	lagun	ດໂນໂລເ	13.5	0	36	Negative	0
114	Ck00122	2	21	0.5	-	0	-	0	0	34	Negative	0
115	Ck00123	1	15	0.5	-	0	-	0	0	36	Negative	0
116	Ck00124	2	25	0.5	-	0	-	0	0	38	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
117	Ck00125	2	13	0.5	-	0	-	0	0	29	Negative	0
118	Ck00126	2	11	0.5	-	-0		0	0	32	Negative	0
119	Ck00127	2	13	0.5	-	0	A	0	0	45	Negative	0
120	Ck00128	2	18	0.5	-	0		0	0	37	Negative	0
121	Ck00130	1	24	0.5	-	0	A - N	0	0	54	Negative	0
122	Ck00131	2	18	0.5	1	0		0	0	29	Negative	0
123	Ck00132	2	25	0.5		0		0	0	38	Negative	0
124	Ck00133	2	21	0.5		0		0	0	34	Negative	0
125	Ck00134	2	18	0.5	-	0		0	0	50	Negative	0
126	Ck00135	1	17	0.5	Dhe.	ladun	ດໂນໂລເ	13.5	0	30	Negative	0
127	Ck00136	1	20	0.5	-	0	-	0	0	20	Negative	0
128	Ck00137	2	15	0.5	-	0	-	0	0	40	Negative	0
129	Ck00138	1	18	0.5	-	0	-	0	0	22	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: st	
NO	U	Gerider	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
130	Ck00139	1	20	0.5	-	0	-	0	0	34	Negative	0
131	Ck00140	2	25	0.5	-	0		0	0	12	Negative	0
132	Ck00141	1	25	0.5	-	0		0	0	32	Negative	0
133	Ck00142	2	24	0.5	-	0	- 4	0	0	76	Negative	0
134	Ck00143	2	16	0.5	-	0	-	0	0	35	Negative	0
135	Ck00144	2	21	0.5	1	0		0	0	23	Negative	0
136	Ck00145	2	21	0.5		0		0	0	23	Negative	0
137	Ck00146	2	18	0.5		0		0	0	19	Negative	0
138	Ck00147	2	25	0.5	-	0		0	0	43	Negative	0
139	Ck00148	2	21	0.5	Dhe.	ladun	กโมโลร์	135	0	26	Negative	0
140	Ck00149	1	18	0.5	-	0	-	0	0	23	Negative	0
141	Ck00150	1	17	0.5	-	0	-	0	0	14	Negative	0
142	Ck00151	2	20	0.5	-	0	-	0	0	25	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
143	Ck00152	2	33	0.5	OV	2	-	2	3	33	Positive	39
144	Ck00153	1	18	0.5	-	0		0	0	13	Negative	0
145	Ck00154	2	18	0.5	-	0		0	0	22	Negative	0
146	Ck00155	1	16	0.5	-	0	- 1	0	0	23	Negative	0
147	Ck00156	1	18	0.5	-	0	A · ·	0	0	23	Negative	0
148	Ck00157	2	18	0.5		0		0	0	36	Negative	0
149	Ck00158	1	18	0.5		0	<i>[</i> -7]	0	0	27	Negative	0
150	Ck00159	2	15	0.5		0		0	0	33	Negative	0
151	Ck00160	2	24	0.5	-	0		0	? 0	27	Negative	0
152	Ck00161	1	21	0.5	Jane.	lagun	อโมโลร์		0	44	Negative	0
153	Ck00163	2	22	0.5	-	0	-	0	0	37	Negative	0
154	Ck00164	1	19	0.5	-	0	-	0	0	28	Negative	0
155	Ck00165	1	12	0.5	-	0	-	0	0	39	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	op 2	Eggs	Drop/stool 1g	Result: sto	
NO	טו	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
156	Ck00166	2	32	0.5	-	0	-	0	0	40	Negative	0
157	Ck00167	1	24	0.5	-	0	-	0	0	30	Negative	0
158	Ck00168	2	10	0.5	-	0	H	0	0	33	Negative	0
159	Ck00169	2	15	0.5	-	0	- 7	0	0	45	Negative	0
160	Ck00170	2	28	0.5	-	0	.	0	0	26	Negative	0
161	Ck00171	2	20	0.5	4	0		0	0	33	Negative	0
162	Ck00172	2	21	0.5		0		0	0	27	Negative	0
163	Ck00173	1	12	0.5		0		0	0	19	Negative	0
164	Ck00174	1	23	0.5		0		0	0	11	Negative	0
165	Ck00175	2	14	0.5	Dnu		วโ นโลโ	135	0	23	Negative	0
166	Ck00176	2	20	0.5	-	0	Himier	0	0	22	Negative	0
167	Ck00177	1	16	0.5	-	0	-	0	0	54	Negative	0
168	Ck00178	2	46	0.5	-	0	-	0	0	36	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: st	
NO	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	DIOD/31001 15	Result	EPG
169	Ck00179	1	13	0.5	-	0	-	0	0	38	Negative	0
170	Ck00181	2	22	0.5	-	-0		0	0	26	Negative	0
171	Ck00182	2	23	0.5	-	0	A	0	0	17	Negative	0
172	Ck00183	1	23	0.5	-	0	- 1	0	0	23	Negative	0
173	Ck00184	2	21	0.5	-	0	.	0	0	54	Negative	0
174	Ck00185	1	37	0.5		0		0	0	22	Negative	0
175	Ck00186	1	19	0.5		0		0	0	37	Negative	0
176	Ck00187	2	19	0.5		0		0	0	34	Negative	0
177	Ck00188	2	15	0.5	-	0		0	0	26	Negative	0
178	Ck00189	2	20	0.5	Dhe.	lagun	กโมโลร์	135	0	12	Negative	0
179	Ck00190	2	20	0.5	-	0	-	0	0	31	Negative	0
180	Ck00191	2	28	0.5	-	0	-	0	0	24	Negative	0
181	Ck00192	1	24	0.5	-	0	-	0	0	52	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
NO	ib	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	Result	EPG
182	Ck00193	2	18	0.5	-	0	-	0	0	56	Negative	0
183	Ck00194	2	20	0.5	-	-0		0	0	23	Negative	0
184	Ck00195	2	17	0.5	-	0		0	0	13	Negative	0
185	Ck00196	1	25	0.5	-	0	- 1	0	0	24	Negative	0
186	Ch001	1	20	0.5	-	0	A - N	0	0	25	Negative	0
187	Ch002	1	28	0.5	1	0		0	0	34	Negative	0
188	Ch003	1	17	0.5		0		0	0	31	Negative	0
189	Ch004	2	18	0.5	4//	0		0	0	45	Negative	0
190	Ch005	1	21	0.5		0		0	0	35	Negative	0
191	Ch006	2	20	0.5	Dha.	lagun	ดโมโลร์	130	0	34	Negative	0
192	Ch007	2	31	0.5	-	0	-	0	0	29	Negative	0
193	Ch008	1	16	0.5	-	0	-	0	0	17	Negative	0
194	Ch009	2	22	0.5	-	0	-	0	0	29	Negative	0

No	ID	Gender	Drops of	stool	Dro	р 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
INO	U	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
195	Ch010	2	20	0.5	-	0	-	0	0	17	Negative	0
196	Ch011	1	16	0.5	-	0		0	0	45	Negative	0
197	Ch012	1	10	0.5	-	0	-	0	0	34	Negative	0
198	Ch013	1	28	0.5	-	0	4	0	0	24	Negative	0
199	Ch014	1	16	0.5	-	0	-	0	0	35	Negative	0
200	Ch015	1	20	0.5		0	Z	0	0	45	Negative	0
201	Ch016	2	10	0.5		0		0	0	12	Negative	0
202	Ch017	2	29	0.5		0		0	0	34	Negative	0
203	Ch018	2	11	0.5		0		0	0	35	Negative	0
204	Ch019	1	22	0.5	Dha.	lagun	ดโมโลร์		0	34	Negative	0
205	Ch020	2	18	0.5	-	0	-	0	0	24	Negative	0
206	Ch021	2	14	0.5	-	0	-	0	0	35	Negative	0
207	Ch022	2	29	0.5	-	0	-	0	0	27	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	pp 2	Eggs	Drop/stool 1g	Result: sto	
NO	טו	gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
208	Ch023	2	29	0.5	-	0	-	0	0	20	Negative	0
209	Ch024	1	24	0.5	-	0		0	0	14	Negative	0
210	Ch025	1	17	0.5	-	0	A	0	0	23	Negative	0
211	Ch026	1	20	0.5	-	0	- 1	0	0	17	Negative	0
212	Ch027	2	13	0.5	-	0		0	0	18	Negative	0
213	Ch028	2	20	0.5		0		0	0	19	Negative	0
214	Ch029	2	23	0.5		0		0	0	25	Negative	0
215	Ch030	1	28	0.5	4/7	0		0	0	34	Negative	0
216	Ch031	1	12	0.5	-	0		0	0	36	Negative	0
217	Ch032	2	19	0.5	DHE!	lagun	ดโมโลร์	130	0	34	Negative	0
218	Ch033	2	23	0.5	-	0	-	0	0	27	Negative	0
219	Ch034	2	28	0.5	-	0	-	0	0	33	Negative	0
220	Ch035	2	14	0.5	SS	1	-	0	1	28	Positive	19

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
NO	Ü	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
221	Ch036	2	18	0.5	-	0	-	0	0	19	Negative	0
223	Ch037	1	29	0.5	-	0		0	0	35	Negative	0
224	Ch038	2	25	0.5	-	0		0	0	46	Negative	0
225	Ch039	2	31	0.5	-	0		0	0	26	Negative	0
226	Ch040	1	28	0.5	-	0		0	0	37	Negative	0
227	Ch041	2	17	0.5		0		0	0	23	Negative	0
228	Ch042	2	33	0.5		0		0	0	16	Negative	0
229	Ch043	1	21	0.5		0		0	0	17	Negative	0
230	Ch044	1	28	0.5		0		0	0	34	Negative	0
231	Ch045	1	45	0.5	15 ng	lagun	อโมโลร์		0	35	Negative	0
232	Ch046	2	29	0.5	-	0	-	0	0	33	Negative	0
233	Ch047	2	17	0.5	-	0	-	0	0	27	Negative	0
234	Ch048	2	27	0.5	-	0	-	0	0	35	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
NO	Ü	gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diop/stoot 1g	Result	EPG
235	Ch049	1	27	0.5	-	0	-	0	0	26	Negative	0
236	Ch050	1	13	0.5	-	0		0	0	27	Negative	0
237	Ch051	1	37	0.5	-	0	-	0	0	46	Negative	0
238	Ch052	1	26	0.5	-	0	-	0	0	19	Negative	0
239	Ch053	1	16	0.5	-	0	-	0	0	30	Negative	0
240	Ch054	1	23	0.5	1	0		0	0	44	Negative	0
241	Ch055	2	18	0.5		0		0	0	50	Negative	0
242	Ch056	2	26	0.5		0		0	0	37	Negative	0
243	Ch057	2	14	0.5		0		0	0	28	Negative	0
244	Ch058	1	16	0.5	Dhu.	lagun	อโมโลร์		0	23	Negative	0
245	Ch059	2	14	0.5	-	0	-	0	0	25	Negative	0
246	Ch060	1	27	0.5	-	0	-	0	0	26	Negative	0
247	Ch061	1	19	0.5	-	0	-	0	0	34	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
248	Ch062	1	35	0.5	-	0	-	0	0	15	Negative	0
249	Ch063	1	20	0.5	-	-0		0	0	27	Negative	0
250	Ch064	1	23	0.5	-	0		0	0	24	Negative	0
251	Ch065	2	17	0.5	-	0	- 1	0	0	36	Negative	0
252	Ch066	2	37	0.5	-	0	-	0	0	39	Negative	0
253	M001	1	32	0.5	1	0		0	0	31	Negative	0
254	M002	1	31	0.5		0		0	0	19	Negative	0
255	M003	2	19	0.5	4//	0		0	0	35	Negative	0
256	M004	1	14	0.5		0		0	0	30	Negative	0
257	M006	2	40	0.5	15 ng	lagun	อโมโลร์		0	30	Negative	0
258	M007	2	22	0.5	-	0	-	0	0	54	Negative	0
259	M008	2	24	0.5	-	0	-	0	0	32	Negative	0
260	M009	2	17	0.5	-	0	-	0	0	46	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
261	M010	2	27	0.5	-	0	-	0	0	35	Negative	0
262	M011	2	24	0.5	-	0		0	0	11	Negative	0
263	M012	1	31	0.5	-	0		0	0	22	Negative	0
264	M013	2	26	0.5	-	0	- 1	0	0	39	Negative	0
265	M016	2	28	0.5	-	0	A -	0	0	30	Negative	0
266	M015	1	23	0.5	1,	0		0	0	43	Negative	0
267	M017	2	30	0.5		0		0	0	23	Negative	0
268	M018	2	26	0.5		0		0	0	46	Negative	0
269	M019	1	37	0.5	-	0		0	0	23	Negative	0
270	M020	2	20	0.5	Diner	ladun	<u>ดโมโลร</u> ์	135	0	45	Negative	0
271	M021	2	21	0.5	-	0	-	0	0	26	Negative	0
272	M022	2	25	0.5	-	0	-	0	0	33	Negative	0
273	M024	1	27	0.5	-	0	-	0	0	27	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
274	M024(2)	2	24	0.5	-	0	-	0	0	47	Negative	0
275	M025	2	30	0.5	-	-0		0	0	46	Negative	0
276	M026	1	21	0.5	-	0	A	0	0	33	Negative	0
277	M028	1	40	0.5	-	0		0	0	21	Negative	0
278	M029	2	23	0.5	-	0	A - N	0	0	54	Negative	0
279	M030	1	23	0.5	4	0		0	0	53	Negative	0
280	M031	2	15	0.5		0		0	0	49	Negative	0
281	M032	1	25	0.5		0		0	0	30	Negative	0
282	M033	1	24	0.5		0		0	0	23	Negative	0
283	M034	2	20	0.5	Dner	lagun	อโนโลร์	135	0	20	Negative	0
284	M035	1	28	0.5	-	0	-	0	0	11	Negative	0
285	M036	2	33	0.5	-	0	-	0	0	45	Negative	0
286	M037	2	29	0.5	-	0	-	0	0	37	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
287	M038	2	28	0.5	-	0	-	0	0	42	Negative	0
288	M039	1	25	0.5	-	0		0	0	39	Negative	0
289	M040	2	44	0.5	-	0		0	0	30	Negative	0
290	M041	2	21	0.5	-	0	- 4	0	0	32	Negative	0
300	M042	1	32	0.5	-	0	-	0	0	45	Negative	0
301	M043	1	22	0.5	1,	0		0	0	28	Negative	0
302	M044	2	27	0.5		0		0	0	43	Negative	0
303	M045	2	18	0.5		0		0	0	25	Negative	0
304	M046	1	10	0.5	-	0		0	0	25	Negative	0
305	M047	1	23	0.5	Dhe.	ladun	ດໂນໂລເ	13.5	0	36	Negative	0
306	M048	2	21	0.5	-	0	-	0	0	37	Negative	0
307	M049	1	27	0.5	-	0	-	0	0	47	Negative	0
308	M050	2	25	0.5	-	0	-	0	0	47	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
309	M051	2	23	0.5	-	0	-	0	0	30	Negative	0
310	M052	1	21	0.5	-	0		0	0	28	Negative	0
311	M053	2	17	0.5	-	0		0	0	30	Negative	0
312	M054	2	20	0.5	-	0	- 4	0	0	29	Negative	0
313	M055	2	22	0.5	-	0	-	0	0	39	Negative	0
314	M056	1	31	0.5	1	0		0	0	20	Negative	0
315	M057	1	34	0.5		0		0	0	33	Negative	0
316	M058	2	28	0.5		0		0	0	28	Negative	0
317	M059	2	40	0.5	-	0		0	0	18	Negative	0
318	M060	2	32	0.5	Diner.	ladun	ດໂນໂລເ	13.5	0	29	Negative	0
319	M061	1	29	0.5	-	0	-	0	0	30	Negative	0
320	M062	2	10	0.5	-	0	-	0	0	38	Negative	0
321	M064	1	40	0.5	-	0	-	0	0	43	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	ib	Gender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
322	M064(2)	1	37	0.5	-	0	-	0	0	37	Negative	0
324	M064(3)	1	24	0.5	-	0		0	0	22	Negative	0
325	M065	2	28	0.5	-	0		0	0	35	Negative	0
326	M066	2	27	0.5	-	0	- 1	0	0	46	Negative	0
327	M067	2	29	0.5	-	0	A -	0	0	53	Negative	0
328	M068	1	31	0.5	4	0	12	0	0	12	Negative	0
329	M069	2	26	0.5		0		0	0	43	Negative	0
330	M070	1	23	0.5		0		0	0	30	Negative	0
331	M070(2)	1	15	0.5	-	0		0	0	23	Negative	0
332	M071	2	13	0.5	Dnu	lagun	อโมโลร์	130	0	44	Negative	0
333	M072	1	27	0.5	-	0	-	0	0	23	Negative	0
334	M074	2	20	0.5	-	0	-	0	0	16	Negative	0
335	M075	2	19	0.5	-	0	-	0	0	27	Negative	0

No	ID	Gender	Drops of	stool	Dro	p 1	Dro	p 2	Eggs	Drop/stool 1g	Result: sto	
140	10	dender	number	wieght	Species of parasite	number of eggs	Species of parasite	number of eggs	average	D10p/3t00t 1g	Result	EPG
336	M075(2)	2	18	0.5	-	0	١ .	0	0	28	Negative	0
337	M076	2	14	0.5	-	-0		0	0	29	Negative	0
338	M077	2	10	0.5	-	0		0	0	30	Negative	0
339	M078	2	21	0.5	-	0	- 1	0	0	32	Negative	0
340	M079	1	27	0.5	-	0	A · N	0	0	47	Negative	0
341	M081	1	31	0.5	4	0		0	0	27	Negative	0
342	M082	2	29	0.5		0		0	0	38	Negative	0
343	M083	2	28	0.5	4/7	0		0	0	35	Negative	0
344	M084	1	29	0.5	-	0		0	0	46	Negative	0
345	M085	2	27	0.5	Dner	lagun	อโนโลร์	135	0	57	Negative	0
346	M086	1	30	0.5	-	0	-	0	0	37	Negative	0
347	M087	1	31	0.5	-	0	-	0	0	30	Negative	0
348	M088	1	28	0.5	-	0	-	0	0	34	Negative	0

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistoot 1g	Result	EPG
349	M089	2	27	0.5	-	0	١ .	0	0	22	Negative	0
350	M090	2	26	0.5	-	0		0	0	43	Negative	0
351	M091	1	22	0.5	-	0		0	0	56	Negative	0
352	M092	2	23	0.5	-	0	- 1	0	0	32	Negative	0
353	M093	2	17	0.5	-	0	A · N	0	0	13	Negative	0
354	M094	2	22	0.5	4	0		0	0	25	Negative	0
355	M095	2	30	0.5		0		0	0	46	Negative	0
356	M096	2	34	0.5		0		0	0	23	Negative	0
357	M097	2	27	0.5	-	0		0	0	43	Negative	0
358	M098	2	30	0.5	Dhe.	lagun	กโมโลร์	120	0	30	Negative	0
359	M099	2	41	0.5	-	0	-	0	0	33	Negative	0
360	M100	2	31	0.5	-	0	-	0	0	26	Negative	0
361	M101	1	16	0.5	-	0	-	0	0	37	Negative	0

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs	average	210p/31031 15	Result	EPG
362	M102	1	25	0.5	-	0	-	0	0	28	Negative	0
363	M103	1	10	0.5	-	-0		0	0	29	Negative	0
364	M104	1	24	0.5	-	0	A	0	0	30	Negative	0
365	M105	1	23	0.5	-	0	- H	0	0	34	Negative	0
366	M106	1	26	0.5	-	0	A - N	0	0	20	Negative	0
367	M107	2	48	0.5	1	0		0	0	17	Negative	0
368	M108	1	19	0.5		0		0	0	30	Negative	0
369	M109	2	37	0.5		0		0	0	34	Negative	0
370	M110	2	34	0.5	-	0		0	0	25	Negative	0
371	M111	2	16	0.5	Dhe.	ladun	ດໂນໂລເ	13.5	0	25	Negative	0
372	M112	1	40	0.5	-	0	-	0	0	36	Negative	0
373	M113	1	25	0.5	-	0	-	0	0	47	Negative	0
374	M114	2	27	0.5	-	0	-	0	0	30	Negative	0

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs	average	Diopistost 1g	Result	EPG
375	M115	1	30	0.5	-	0	-	0	0	26	Negative	0
376	M116	1	47	0.5	-	0		0	0	37	Negative	0
377	M117	2	31	0.5	-	0		0	0	30	Negative	0
378	M118	1	14	0.5	-	0		0	0	23	Negative	0
379	M119	1	18	0.5	-	0	A -	0	0	45	Negative	0
380	M120	2	20	0.5		0		0	0	36	Negative	0

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