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

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A Thesis Submitted in Partial Fulfillment of the Requirements for the

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วิธีตรวจหาการติดเชื้อพยาธิใบไม้ตับ *Opisthorchis viverrini* ในจังหวัดกระแจะ ประเทศกัมพูชา

นางสาวโมนิก้า เล่ง

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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ปีการศึกษา 2566

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

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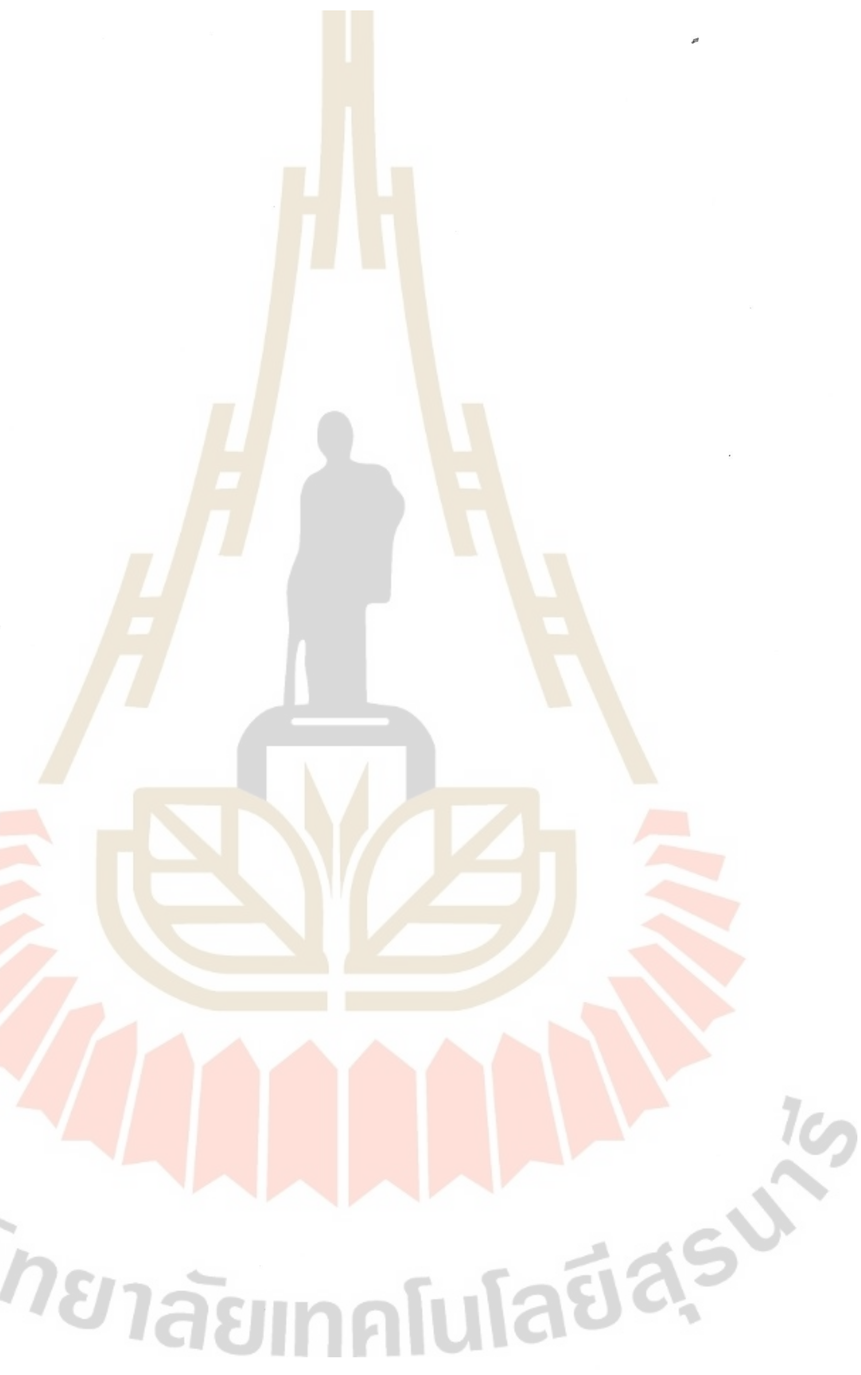
โมนิก้า เล่ง : วิธีตรวจหาการติดเชื้อพยาธิใบไม้ตับ *Opisthorchis viverrini* ในจังหวัดกระแจะ ประเทศกัมพูชา (DIAGNOSTIC METHODS FOR THE DETECTION OF *OPISTHORCHIS VIVERRINI* IN KRATIE PROVINCE, CAMBODIA) อาจารย์ที่ปรึกษา : รองศาสตราจารย์ แพทย์หญิงชวัลญ์ญา รัตนพิทูลย์, 102 หน้า.

คำสำคัญ: ออร์พิสทอร์คิส วิเวอร์รินิ มะเร็งท่อน้ำดี/วิธีการตรวจปรสิตในอุจจาระแบบเข้มข้นวิธีตกตะกอนด้วยฟอร์มาลิน-อะซีเตต โพลีเมอเรซเชนรีแอคชั่น กัมพูชา

พยาธิใบไม้ตับชนิด *Opisthorchis viverrini* เป็นปัญหาสุขภาพที่สำคัญในภูมิภาคเอเชียตะวันออกเฉียงใต้ การติดเชื้อมีความสัมพันธ์กับโรคมะเร็งท่อน้ำดีในท่อน้ำดี (CCA) อย่างไรก็ตาม อัตราการติดเชื้อปัจจุบันในจังหวัดกระแจะ ประเทศกัมพูชา ยังไม่พบรายงานการศึกษา ดังนั้น งานวิจัยนี้จึงมีวัตถุประสงค์เพื่อตรวจหาการติดเชื้อพยาธิใบไม้ตับ *O. viverrini* ในตัวอย่างประชากรจังหวัดกระแจะ ประเทศกัมพูชา จากจำนวนตัวอย่างอุจจาระทั้งหมด 380 ตัวอย่าง ศึกษา ณ ห้องปฏิบัติการศูนย์วิจัยโรคปรสิต มหาวิทยาลัยเทคโนโลยีสุรนารี จังหวัดนครราชสีมา ประเทศไทย เริ่มศึกษาในช่วงเดือนพฤศจิกายน พ.ศ. 2561 โดยใช้ 2 วิธีการตรวจหาเชื้อปรสิต ประกอบด้วย วิธีการตรวจปรสิตในอุจจาระแบบเข้มข้น Fecal parasite concentrator kit (FPCK) และวิธีตกตะกอนด้วยฟอร์มาลิน-อะซีเตต Formalin-ethly acetate concentration (FECT) และยืนยันการติดเชื้อพยาธิใบไม้ตับ *O. viverrini* ด้วยวิธีโพลีเมอเรซเชนรีแอคชั่น (PCR) ผลการศึกษาพบว่า 25 ตัวอย่าง (6.57 %) มีการติดเชื้อปรสิตในระบบทางเดินอาหาร โดยปรสิตที่พบตรวจพบมากที่สุด คือ โปรโตซัว *Entamoeba coli* 1.84 % รองลงมาคือ พยาธิใบไม้ตับ *O. viverrini* 1.31 % พยาธิปากขอ Hookworm *spp* 1.05 %, พยาธิสตรองจีลอยด์ *Strongyloides stercoralis* 1.05 % พยาธิใส้เดือน *Ascaris lumbricoides* 0.52 % พยาธิตืดแคระ *Hymenolepis nana* 0.26 % และ พยาธิแส้ม้า *Trichuis trichiura* 0.26 % ตามลำดับ เมื่อเปรียบเทียบความไวและความจำเพาะในการตรวจหาการติดเชื้อของพยาธิใบไม้ตับ *O. viverrini* ของ 2 วิธี (FPCK และ FECT) พบว่า วิธี FPCK มีความไวเท่ากับ 50.00 % วิธี FECT มีความไวเท่ากับ 66.67 % ซึ่งทั้ง 2 วิธีมีความจำเพาะเท่ากับ 99.74 % ความหนาแน่นของการติดเชื้อพยาธิใบไม้ตับ *O. viverrini* (วิธี FPCK=144 และ วิธี FECT=84.83 ผลการยืนยันการติดเชื้อพยาธิใบไม้ตับ *O. viverrini* ด้วยวิธี PCR พบว่า 2 ตัวอย่าง จาก 4 ตัวอย่าง ใน ทั้งหมด 380 ตัวอย่าง ยืนยันว่าเป็นสารพันธุ์กรรมของพยาธิใบไม้ตับ *O. viverrini* งานวิจัยนี้เป็นรายงานครั้งแรกเกี่ยวกับการติดเชื้อพยาธิใบไม้ตับ *O. viverrini* ในจังหวัดกระแจะ ประเทศกัมพูชา โดยใช้วิธีวิธี FPCK และ วิธี FECT และยืนยันการติดเชื้อพยาธิใบไม้ตับด้วยวิธี PCR ข้อมูลจากงานวิจัยนี้ ชี้ให้เห็นความสำคัญในการ

เฝ้าระวังการติดเชื้อการควบคุมการติดเชื้อปรสิต ที่มากับอาหารรวมถึงการป้องกันโรคมะเร็งท่อน้ำดีที่สัมพันธ์กับพยาธิใบไม้ตับ *O. viverrini* ใน ประเทศกัมพูชา



สาขาวิชา เวชศาสตร์ปริวรรต

ปีการศึกษา 2566

ลายมือชื่อนักศึกษา Monica

ลายมือชื่ออาจารย์ที่ปรึกษา

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม Kamyarat T.

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 Translational Medicine

Academic Year 2023

Student's Signature .....Monica.....

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Co-Advisor's Signature .....

Co-Advisor's Signature .....Kanyarat T.....

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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

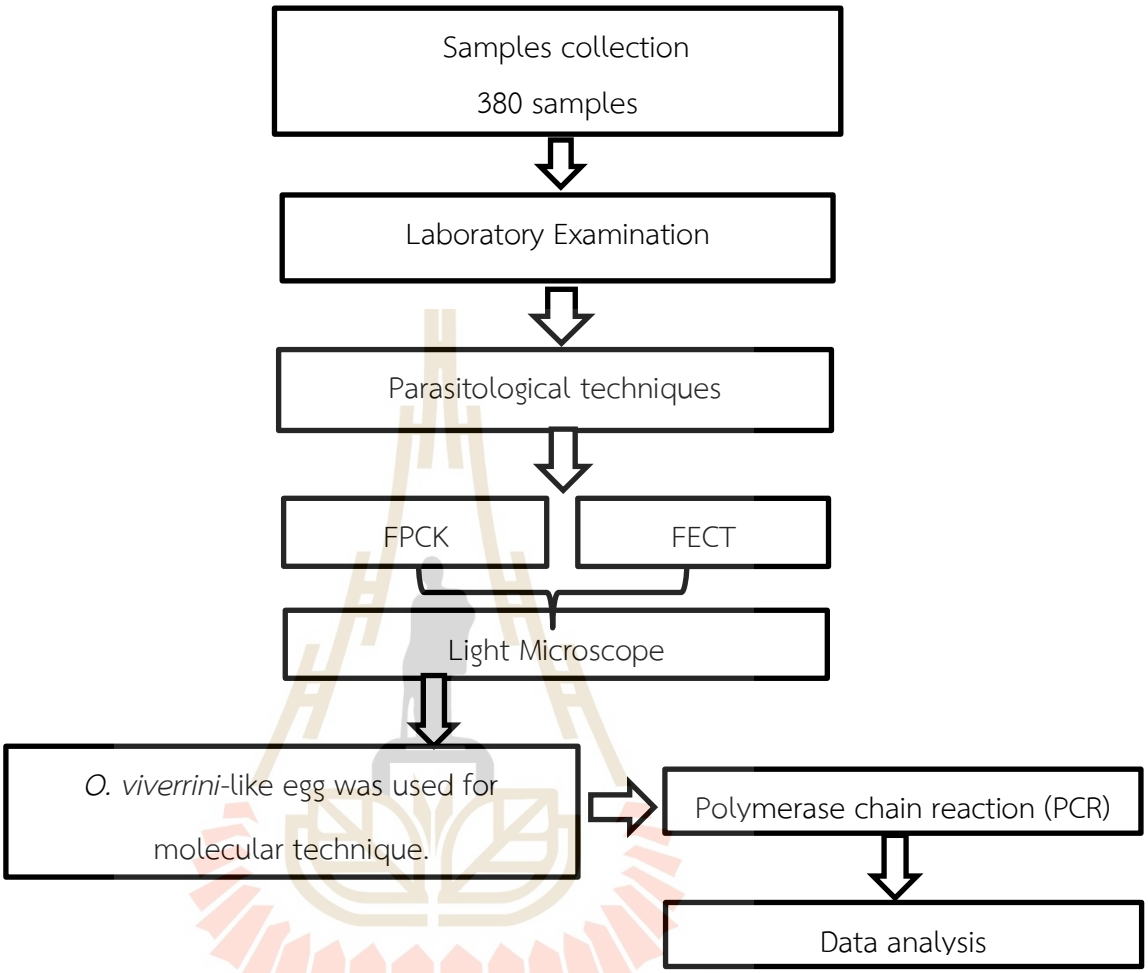

Figure 1.1 The conceptual framework of this study.

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. viverrini* 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 µm by 16 µm 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).

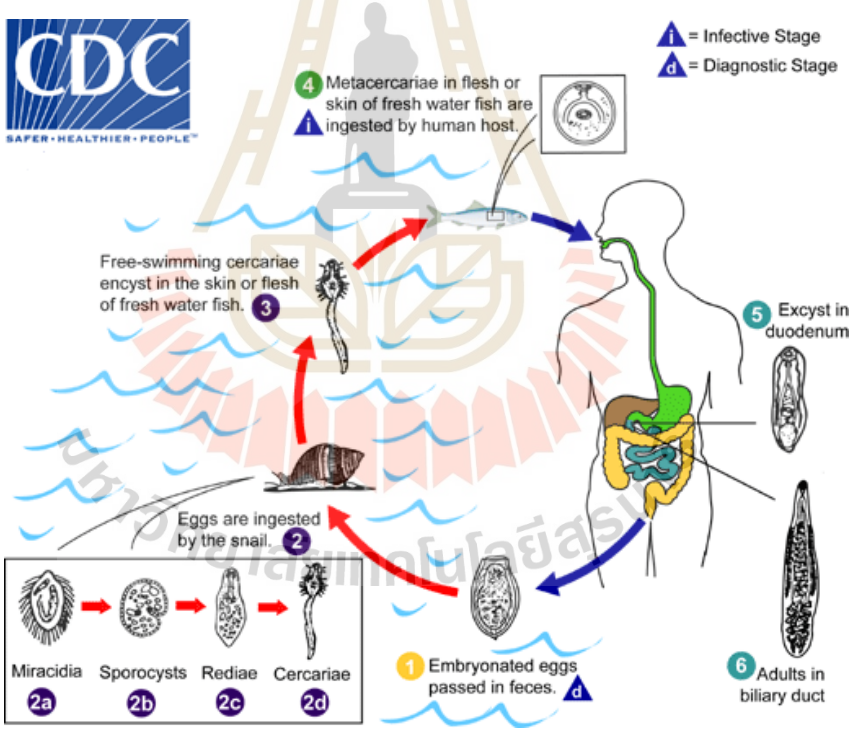

Figure 2.2 The life cycle of *Opisthorchis viverrini* (CDC et al., 2018).

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:

$$n = \frac{N}{1+N\,e^2}$$

n = sample size,

N= 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.

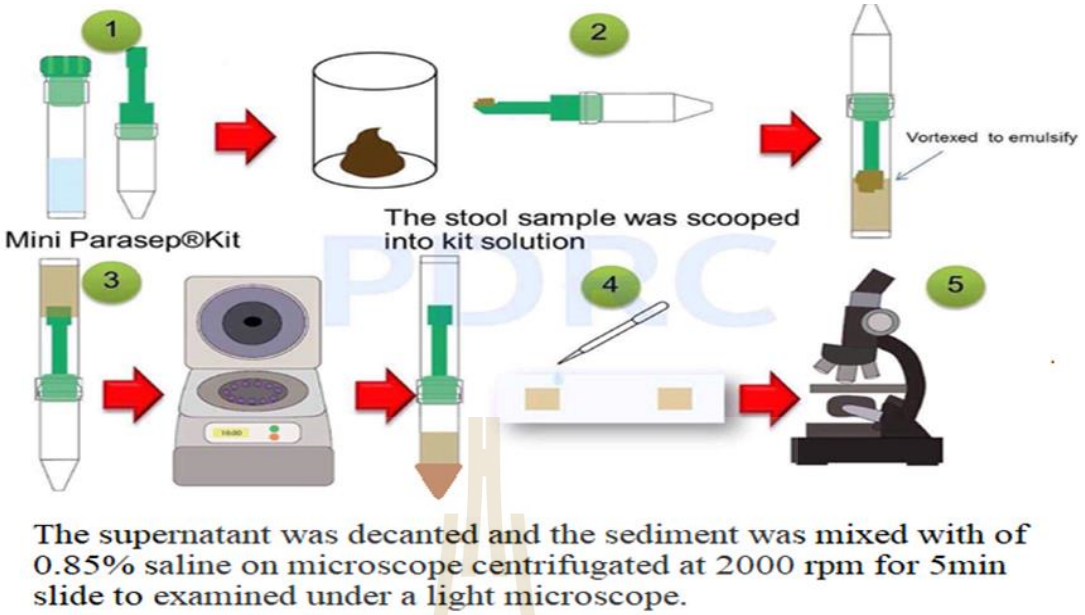

Figure 3.2 The fecal parasite concentrator kit (FPCK) (PDRC et al., 2019).

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.

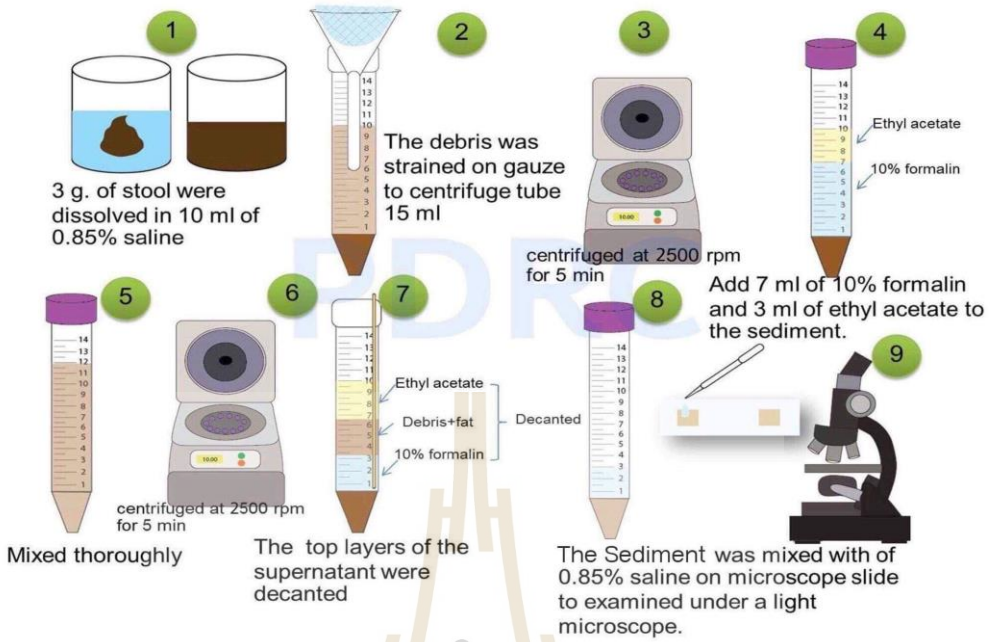

Figure 3.3 The formalin- ethyl acetate concentration technique (FECT) (PDRC et al., 2019).

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 µL) with new spindrift add supernatant (200 µL) then add buffer AL (200 µL) and the whole was incubated at 70°C for 10 min, then add Ethanol 95% (200 µL) and vortex for 15 s.

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

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 µL) 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 µL 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 25µL including distilled water or molecular water 16.8µL, 10X taq buffer with KCL 2.5µL, dNTP (dGTP, dATP, dCTP, dTTP) 1µL (2mM/each), forward primer 1µL (10 µM), reverse primer 1µL (10 µM), Taq DNA polymerase 0.2µL (0.2 U), MgCl2 1.5µL (0.67mM), and DNA sample (template) 1µL. 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 post-amplification 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.

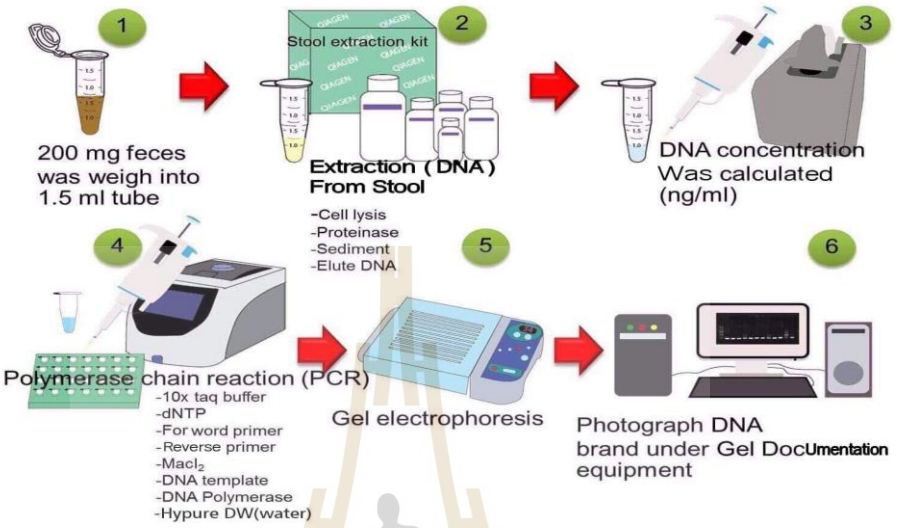

Figure 3.4 The polymerase chain reaction (PCR) (PDRC et al., 2019).

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).

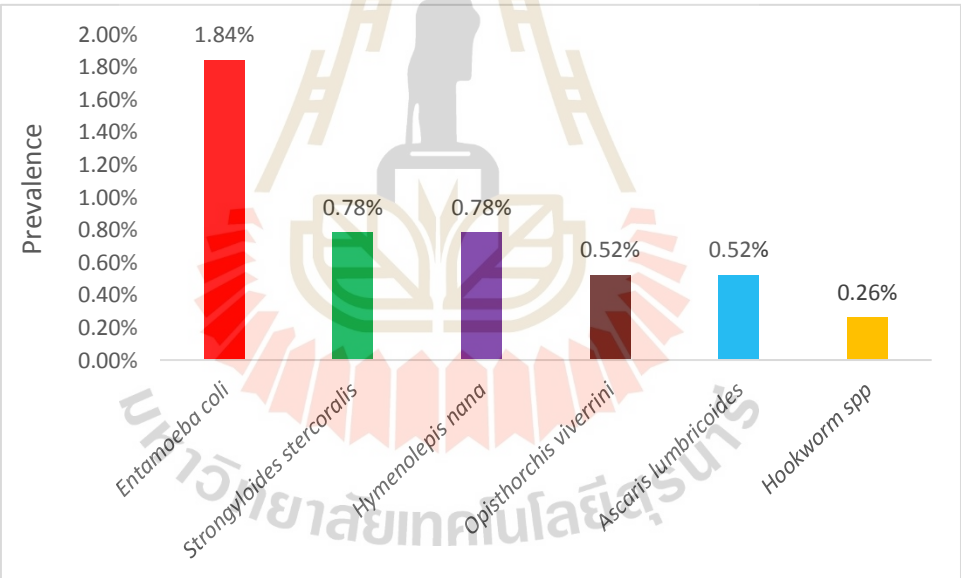

Figure 4.1 Prevalence of intestinal parasite infections (Mini parasep kit).

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).

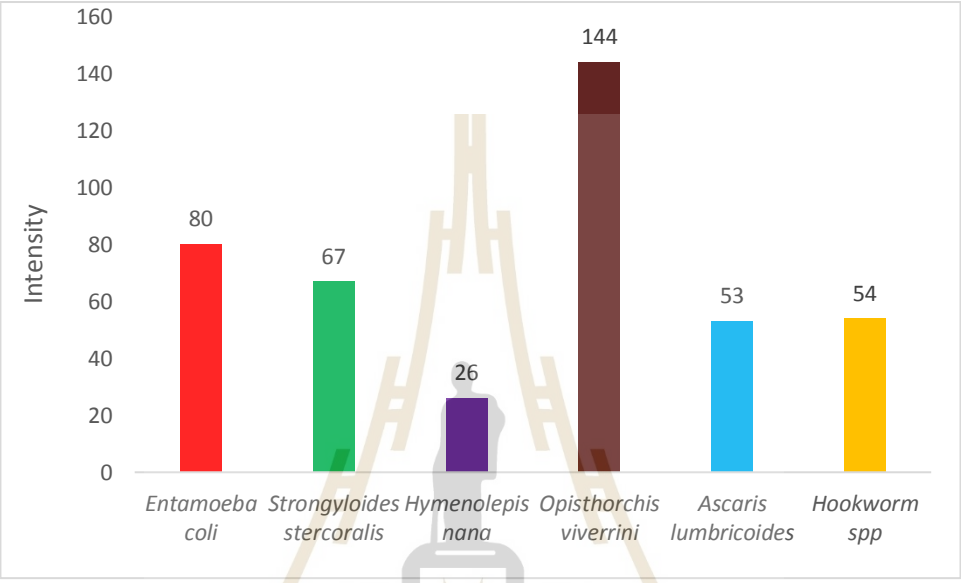

Figure 4.2 Intensity of intestinal parasite infections (Mini parasep kit).

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).

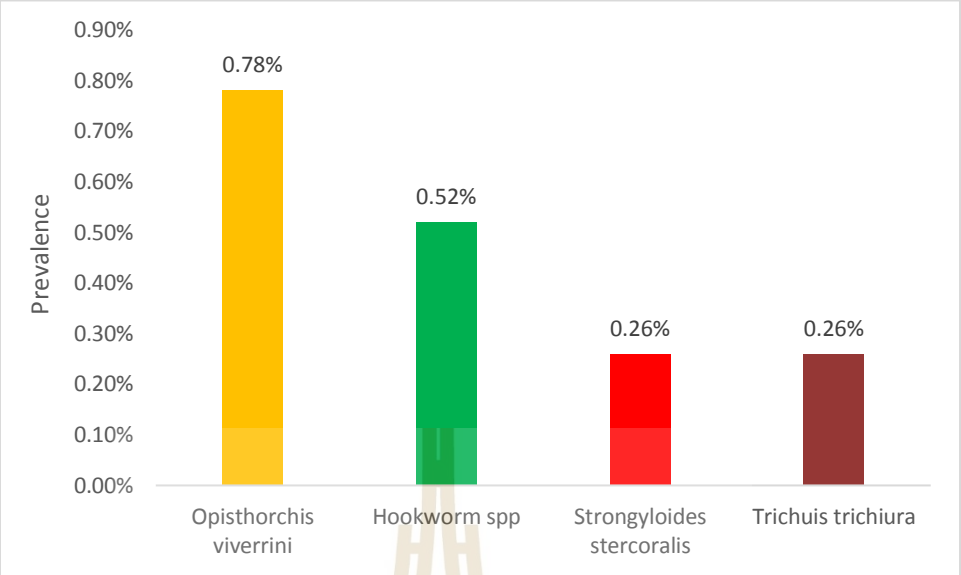

Figure 4.3 Prevalence of intestinal parasite infections (FECT).

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).

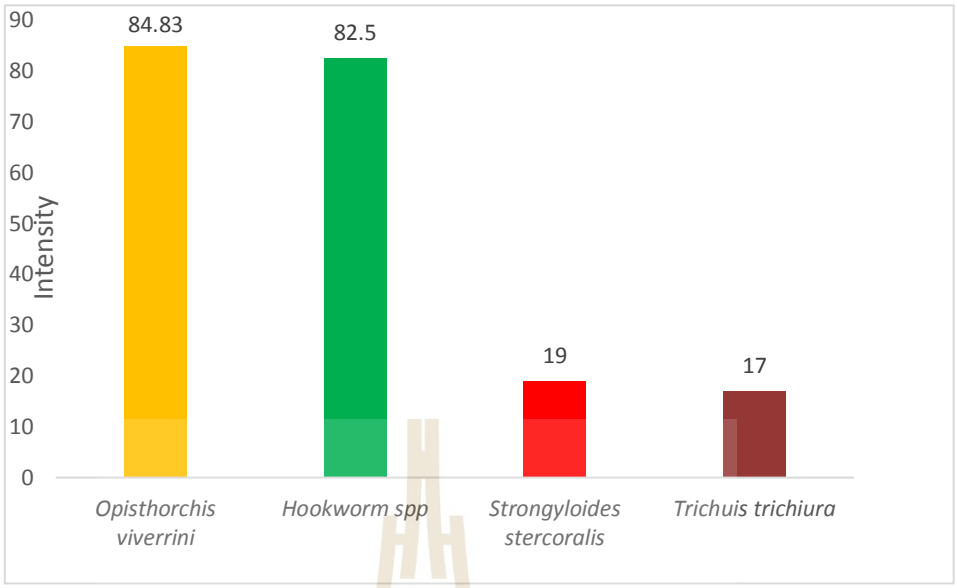

Figure 4.4 Intensity of intestinal parasite infections (FECT)

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).

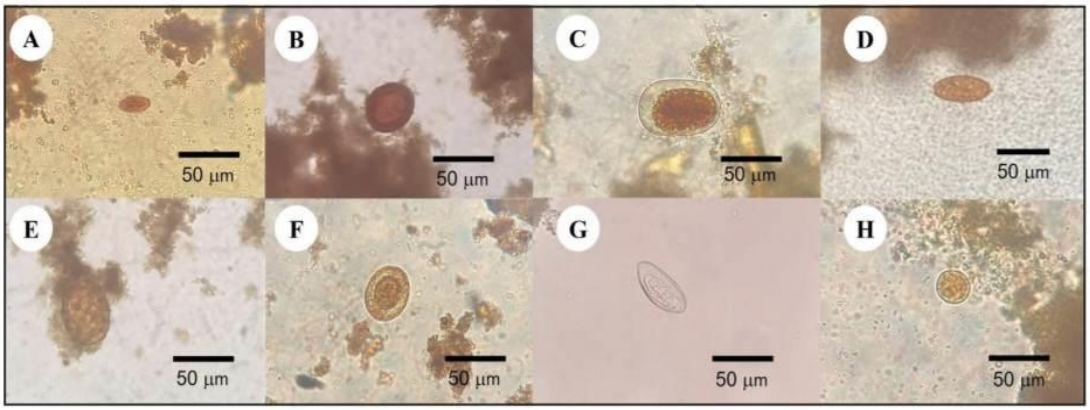

Figure 4.5 The morphology of intestinal parasites in stool sample. (A) *O. viverrini*, (B) *Taenia spp.,* (C) Hookworm, (D) *Trichuris trichiura*, (E) *Ascaris lumbricoides*, (F) *Hymenolepis nana*, (G) *Enterobius vermicularis*, and (H) *Entamoeba coli*. Scale bar: 50 µm (Nav et al., 2022).

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	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 n (%)	infection rate (%)	P- value	Chi- square test
Sex	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		
Education	Illiterate	10	2.64		
	Primary school	9	2.37		
	Secondary school	4	1.05	0.143	5.428
	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 n (%)	infection rate (%)	P- value	Chi- square 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).

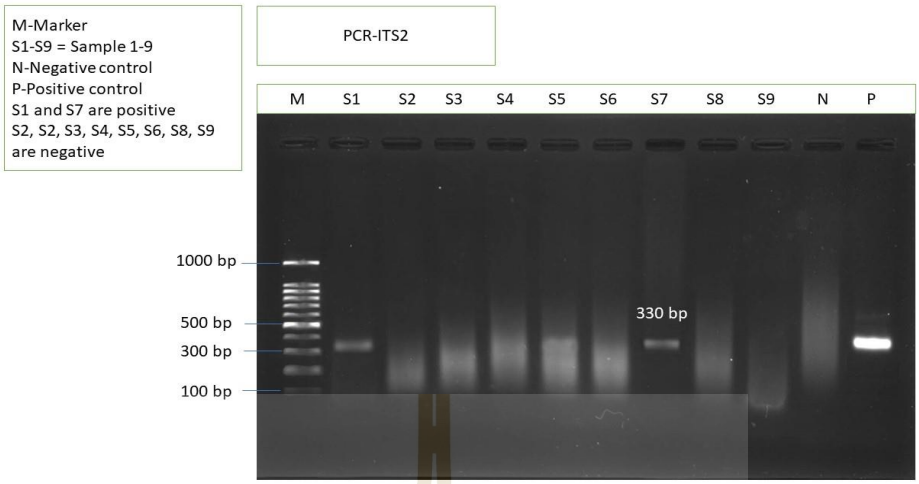

Figure 4.6 The *O. viverrini* amplifying based on internal transcribed spacer2 (ITS2) under 1.5% of agarose gel electrophoresis M- marker or ladder 100 bp, N-negative control (DW), P-positive control the primer ITS2 was set at 330 bp. Number S1 and S7 were sample products show that positive bands. However, 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* (0.26 %), 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.

REFERENCES

Aung, WP., Htoon, TT., Tin, HH., Thinn, KK., Sanpool, O., Jongthawin, J., & Maleewong, W. (2017). First report and molecular identification of *Opisthorchis viverrini* infection in human communities from Lower Myanmar. *PLoS one.*12, e0177130.

Bless, P., Schar, V., Khieu, S., Kramme, S., Muth, H., Marti, P., & Odermatt, P. (2015). High prevalence of large trematode eggs in schoolchildren in Cambodia. *Acta Trop,* 141, 295-302.

Buathong, S., Leelayoova, M., Naaglor, T., Taamasri, P., Suwannahitatorn, P., & Tan-ariya, P. (2015). Development and evaluation of PCR methods based on (cox1) and NADH dehydrogenase subunit one gene (nad1) to detect *Opisthorchis viverrine* human fecal samples. *Parasitology Research* 114, 3547-3549.

Centers for Disease Control and Prevention [CDC] (2018.). Laboratory Identification of Parasites of Public Health Concern, DPDx. Available from*: www.cdc.gov/dpdx/opisthorchiasis/index.html.*

Charoensuk, L., Subrungruang, I., Mungthin, M., Pinlaor, S., & Suwannahitatorn, P. (2019). Comparison of stool examination techniques to detect *Opisthorchis viverrini* in low intensity infection. *Acta Trop,* 191, 13-16.

Chai, JY., Han, ET., Guk, SM., Shin, EH., Sohn, WM., Yong, TS., Eom, KS., Lee, KH., Jeong, HG., Ryang, YS., Hoang, EH., Phommasack, B., Insisiengmay, B., Lee, SH., & Rim, HJ. (2007). High prevalence of liver and residents of Savannakhet Province in Laos. *Korean J Parasitol.* 45(3): 213-218.

Chai, JY., Sohn, WM., Na, BK., Yong, TS., Eom, KS., Yoon, CH., & Socheat, D. (2014). Zoonotic trematode metacercariae in fish from Phnom Penh and Purat Cambodia. *Korean J Parasitol*, 52, 35-40.

Kaewpitoon, SJ., Rujirakul, R., Tongtawee, T., Matrakool, L., Panpimanmas, S., Wakkuwattapong, P., Kaewpitoon, N. (2016). Detection of the carcinogenic liver fluke *Opisthorchis viverrini* using a mini parasep SF faecal parasite concentrator. *Asian Pac J Cancer Prev*, 17, 373-6.

Kaewpitoon, N., Kaewpitoon, SJ., Pengsaa, P., & Sripa, B. (2008). *Opisthorchis viverrini*: The carcinogenic human liver fluke. *World journal of gastroenterology*, 7,14(5), 666-674.

Kim, CS., Smith, JF., Suwannatrai, A., Echaubard, P., Wilcox, B., Kaewke, S., Sithithaworn, P., & Sripa, B. (2017). Role of socio-cultural and economic factors in cyprinid fish distribution networks and consumption in Lawa Lake region, Northeast Thailand: novel perspectives on *Opisthorchis viverrini* transmission dynamics. *Acta Trop,* 170, 85–94.

Kaewpitoon, SJ., Rujirakul, R., Wakkuwattapong, R., Matrakool, L., Tongtawee, T., Panpimanmas, S., & Kaewpitoon, N. (2016*). Opisthorchis viverrini* infection among people in the border areas of three provinces, northeast of Thailand. *Asian Pac J Cancer_Prev*, 17, 2973-7.

Kulthida, Y., Kopolrat, S., Singthong, N., Khuntikeo, W., Loilome, Ch., Worasith, C., Hommwong, T., & Paiboon, Sithithaworn. (2022). Performance of Mini Parasep SF stool concentration kit, Kato- Katz, and formalin-ethylacetate concentration methods for diagnosis of opisthorchiasis in Northeast Thailand. *Parasites & Vectors,* 15, 234.

Nav, L., Monica L., Rattnapitoon, N., Pechdee, P., Boonsuya A., Arunsan, P., Rattanapitoon S. (2022). Intestinal parasitic infections and risk factors among the population in Cambodia. *Tropical Biomedicine,* 39(4), 539-546.

Miyamoto, K., Kirinoki, M., Matsuda, H., Hayashi, N., Chigusa, Y., Sinuon, M., Chuor, CM., Kitikoon, V. (2013). Field survey focused on *Opisthorchis viverrini* infection in five provinces of Cambodia. *Parasitol Int*, 63, 366-72.

Naing, L., Winn, B., & Rusli, N. (2006) Practical issues in calculating the sample size for prevalence. studies. *Archives of Orofacial Sciences*, 1, 9-14.

Prueksapanich, P., Piyachaturawat, P., Aumpansub, W., Ridtitid, R., Chaiteerakij, R., & Rerknimitr, P. (2018). Liver Fluke-Associated Biliary Tract Cancer. *Gut Liver*, 12, 236-45.

Pynoos, J., Steinman, B., & Nguyen, Q. (2010). Environmental assessment and modification as fall-prevention strategies for older adults. *Clin Geriatr Med*, 26: 63344.

Ramsdell, J W., J A Swart, J E., Jackson, T., & Renvall, M. (1989). The yield of a home visit in the assessment of geriatric patients. *J Am Geriatr Soc*, 37, 17-24.

Rim, H. J. (1990). Clonorchiasis in Korea. *Kisaengchunghak Chapchi*, 28 Suppl: 63-78.

Sohn, WM., Yong, TS., Eorm, KS., Pyo, KH., Lee, MY., Lim, H., Choe, S., Jeong, HG., Sinuon, M., Socheat, D., & Chai, JY. (2012). Prevalence of *Opisthorchis viverrini* infection in humans and fish in Kratie Province, Cambodia. *Acta Trop*, 10,1016.

Sripa, B., Kaewkes, S., Sithithaworn, P., Mairiang, E., Laha, T., Smout, M., Pairojkul, C., & Brindley, PJ. (2007). Liver fluke induces cholangiocarcinoma. *PLoS Med*, 4 (7), 201.

Sriamporn, S., Pisani, P., Pipitgool, V., Suwanrungruang, K., & Kamsa-ard, S. (2004). Prevalence of *Opisthorchis viverrini* infection and incidence of cholangiocarcinoma in Khon Kaen, Northeast Thailand. *Trop Med Int Health*, 9, 588–594.

Sithithaworn, P., Andrews RH, Nguyen, VD., Wongsaroj, T., Sinuon, M., Odermatt, P., Nawa, Y., Liang, S., Brindley, PJ., Sripa, B. (2012). The status of Opisthorchiasis and clonorchiasis in the Mekong Basin. *Parasitol Int*, 61, 10-6.

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

Steensvold, CR., Saijuntha, W., Sithithaworn, P., Wongratanacheewin, S., Strandgaard, H., Ornbjerg, N., & Johansen, MV. (2006). Evaluation of PCR based coprodiagnosis of human Opisthorchiasis. *Acta Trop,* 97, 26-30.

Sithithaworn, P., Andrews, V., Nguyen, T., Wongsaroj, M., Sinuon, P., Odermatt, Y., Nawa, S., Liang, P., Brindley, P., & Sripa, B. (2012). The current status of opisthorchiasis and clonorchiasis in the Mekong Basin. *Parasitol Int*, 61, 10-6.

Sithithaworn, P., & Haswell, M. (2003). Epidemiology of *Opisthorchis viverrini. Acta Trop*, 88, 187-94.

Sithithaworn, P., Nuchjungreed, T., Srisawangwong, K., Ando, T., Petney, N., Chilton, R., & H Andrews. (2007). Genetic variation in *Opisthorchis viverrini* (Trematoda: Opisthorchiidae) from northeast Thailand and Laos PDR based on random amplified polymorphic DNA analyses. *Parasitol Res*, 100, 613-7.

Touch, S., Komalamisra, C., Radomyos, P., & Waikagul, J. (2009). Discovery of *Opisthorchis viverrini* metacercariae in freshwater fish in southern Cambodia. *Acta Tro,* 111, 10813.

Dao, HTT., Dermauw, V., Gabriel, S., Suwannatrai, A., Tesana, S., Nguyen, GTT., & Demy, P. (2017) *Opisthorchis viverrini* infection in the snail and fish intermediate hosts in Central Vietnam. *Acta Trop*, 170, 120-125.

Worasith, C., Kamamia, C., Yakovleva, A., Duenngai, K., Wangboon, C., Sithithaworn, J., Watwiengkam, N., & Bethony, JM. (2015). Advances in the Diagnosis of Human Opisthorchiasis: Development of *Opisthorchis viverrini* Antigen Detection in Urine. *PLoS Negl Trop*, 9, e0004157.

Wongratanacheewin, S., Pumidonming, R., Sermswan, W., & Maleewong, K. (2001). Development of a PCR based method for the detection of *Opisthorchis viverrini* in experimentally infected hamsters. *Parasitology,* 122, 175-80.

Wongratanacheewin, S., Pumidonming, R., Sermswan, V., Pipitgool, W., & Maleewong, Y. (2002). Detection of *Opisthorchis viverrini* in human stool specimens by PCR. *J Clin Microbiol,* 40, 387.

Yong, TS., Shin, EH., Chai, JY., Sohn, WM., Eom, KS., Lee, DM., Park, K., Jeoung, HG., Hoang, EH., & Socheat, D. (2012). High prevalence of *Opisthorchis viverrini* infection in a riparian population in Takeo province, Cambodia. *Korean J Parasitol*, 50(2), 173-6.

APPENDIX A

THE COMPONENT OF EXAMINATION METHODS

1.1 Fecal parasite concentrator kit (FPCT)

Miniparasep ® kit	
Mix with 0.85% saline solution	

1.2 Formalin-ethyl acetate concentration technique (FECT)

10% Formalin	7 ml
Ethyl acetate	3 ml
Mix with 0.85% saline solution	

1.3 Molecular method

Inhibit Ex buffer	1 ml
ATE	25 µl
AW1	500 µl
AW2	500 µl
Ethanol (96-100%)	200 µl
Taq DNA polymerase (0.2 U)	0.2 µl
Reverse primer (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
DW	16.8 µl
MgCl2 (0.67 mM)	1.5 µl
DNA extracted (sample)	1 µl
DNA ladder	1 µl
Maestrosafe Nucleic acid stain (Loading dye)	1 µl
6x DNA loading (6x loading Dye)	1 µl

APPENDIX B

THE QUESTIONNAIRE

SUT-OV-001

ទំរង់ពត៍មានលំអិតពីព្រួនសំប៉ែតក្នុងថ្លើម

ភាគទី១.ការឆ្លើយតបបញ្ហាសុខភាព

ឈ្មោះ - នាមត្រកូល.....កេទ.....អាយុ.....

មុខរបរ.....កំរិតការអប់រំ.....ប្រាក់ចំណូល.....រៀល/ខែ

ផ្ទះលេខ.....ភូមិ.....ឃុំ.....ស្រុក.....ខេត្ត.....ប្រទេស

.....។

ទំងន់រាងកាយ.....គីឡូក្រាម BP(blood pressure).....mm/hg.

ភាគទី 2: ការពិនិត្យមើលហានិភ័យនៃការឆ្លងព្រួនសំប៉ែតក្នុងថ្លើម

សូមគូសសញ្ញាសំគាល់ ✓ នៅក្នុងប្រអប់ខាងក្រោមនេះ

N.	កម្រងសំនួរ	ពិត	មិនពិត
1	តើអ្នកធ្លាប់បរិភោគអាហារឆៅដូចជាបន្លែឆៅ ស៊ុតឆៅ ប្រហុកឆៅ សាច់ឆៅ និងត្រីឆៅ (ត្រីតាមតំបន់ទន្លេសាប ត្រីពណ៌សត្រីទឹកសាបត្រីរៀលជាដើម)		
2	តើអ្នកចូលចិត្តធ្វើម្ហូបឆៅ ដែលចំអិនពីត្រីមិនឆ្អិន ដែរទេ? (ពពួកហ្លួងត្រី Cyprinid Fish ជាដើម)		
3	តើអ្នកធ្លាប់ទទួលការព្យាបាលពីព្រួនសំប៉ែតក្នុងថ្លើមនៅតាមមន្ទីរពេទ្យដែរទេ?		
4	តើអ្នកមានសាច់ញាតិ (ឪពុក ម្តាយ បងប្អូនសាច់សាលោហិត) កើតជំងឺមហារីកថង់ប្រមាត់ដែរទេ?		
5	ប្រសិនបើអ្នកបានចូលរួមក្នុងពិធីបុណ្យ ឬពិធីការ ហើយពិធីជួបជុំផ្សេងៗទៀត ដោយមានការបរិភោគអាហារឆៅ ដូចជាត្រីឆៅគ្រប់ប្រភេទ តើអ្នកញ៉ែដែរទេ?		
6	តើគ្រួសាររបស់អ្នកធ្លាប់ទទួលការវិនិច្ឆ័យរោគសញ្ញាព្រួនសំប៉ែតក្នុងថ្លើមដែរទេ?		
7	តើក្រុមគ្រួសាររបស់អ្នក និយមបរិភោគអាហារឆៅ ត្រីឆៅជាប្រចាំដែរទេ?		
8	តើលំនៅដ្ឋានរបស់អ្នកនៅជិតមាត់ទឹក ទន្លេ ស្ទឹង ទឹកអូរ ទឹកព្រែក និងទឹកបឹង (ស្ទឹងទន្លេមិនលើសពី 10 គីឡូម៉ែត្រ)		

របៀបអោយពិន្ទ

ចំនុច1=0.2,ចំនុច2=0.2,ចំនុច3=0.2,ចំនុច4=0.2,ចំនុច5=0.05,ចំនុច6=0.05,ចំនុច7= 0.05,ចំនុច8=0.05

តារាងចំណាត់ថ្នាក់ពិន្ទ

គ្មានផលប៉ះពាល់	0	ពិន្ទុ
ផលប៉ះពាល់តិច	0.01-0.50	ពិន្ទុ
ផលប៉ះពាល់មធ្យម	0.51-0.70	ពិន្ទុ
ផលប៉ះពាល់ខ្លាំង	0.71-1.00	ពិន

ចំនុចវាយតម្លៃនៃផលប៉ះពាល់

❑ផលប៉ះពាល់ខ្លាំង

❑ផលប៉ះពាល់មធ្យម

❑ផលប៉ះពាល់តិច

❑

Suranaree University of Technology

Institutional Review Board

លិខិតអនុញ្ញាតលើគម្រោងស្រាវជ្រាវ

(Informed Consent Form)

គម្រោងស្រាវជ្រាវ ការព្យាបាលជម្ងឺព្រួនស៉ប៉ែតក្នុងផ្ទៃម

អនុម័តនថ្ងៃទី.....ខែ.....ឆ្នាំ២០១៨

ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ.....ទីកន្លែងស្នាក់នៅ.....។

កិច្ចព្រមព្រៀងសម្រាប់អ្នកចូលរួមក្នុងគម្រោងស្រាវជ្រាវដែលភ្ជាប់មកជាមួយកាលបរិច្ឆេទថ្ងៃទី.....ហើយខ្ញុំយល់ព្រមចូលរួមដោយស្ម័គ្រចិត្ត។ខ្ញុំបាទ/នាងខ្ញុំបាន ទទួលច្បាប់ចម្លងនៃទំរង់ការព្រមព្រៀងដែលភ្ជាប់ទៅនឹងគម្រោងស្រាវជ្រាវដែលខ្ញុំ ចុះហត្ថលេខា និងកាលបរិច្ឆេទរួមជាមួយព័ត៌មានសម្រាប់ការចូលរួម។

មុននឹងចុះហត្ថលខាលើទម្រង់យល់ព្រមនេះ សូមធ្វើការអានពត៌មានលំអិតខាងក្រោមនេះអោយបានច្បាស់លាស់

១. ខ្ញុំបាទ/នាងខ្ញុំស្ម័គ្រចិត្តអោយអ្នកស្រាវជ្រាវពិនិត្យក្នុងគោលបំណងនៃការសិក្សា ដែលមានរយៈពេលស្រាវជ្រាវ, វិធីសាស្ត្រស្រាវជ្រាវ, គ្រោះថ្នាក់ឬរោគសញ្ញាដែលអាចកើតឡើងក្នុងអំឡុងនៃការស្រាវជ្រាវ មានដូចជាការប្រើថ្នាំ ក៍ដូចជាការប្រើអេកូសាស្ត្រនៃការស្រាវជ្រាវ និងវិធីសាស្ត្រផ្សេងទៀតនៃការព្យាបាលយ៉ាងហ្មត់ចត់របស់អ្នកស្រាវជ្រាវ។
២. ខ្ញុំបាទ/នាងខ្ញុំមានពេលវេលា និងឱកាសគ្រប់គ្រាន់ដើម្បីសួរសំណួរហូតដល់ខ្ញុំមានការយល់ដឹងច្បាស់លាស់។ អ្នកស្រាវជ្រាវបានឆ្លើយសំណួរដោយស្ម័គ្រចិត្តមិនមែនលាក់បាំងរហូតដល់ខ្ញុំពេញចិត្ត។
៣. ខ្ញុំបាទ/នាងខ្ញុំបានទទួលចំនេះដឹងពីអ្នកស្រាវជ្រាវ។ ខ្ញុំមានសិទ្ធិបដិសេធមិនចូលរួមក្នុងការស្រាវជ្រាវនៅពេលណាក៍បានដោយមិនចាំបាច់ផ្តល់ហេតុផលទេ នឹងមិនប៉ះពាល់ដល់ការព្យាបាលនៃជំងឺឬសិទ្ធិផ្សេងៗទេ ខ្ញុំនឹងទទួលបានវា។
៤. ខ្ញុំបាទ/នាងខ្ញុំបានដឹងថាពត៌មាននៅក្នុងការស្រាវជ្រាវរួមទាំងព័ត៌មានវេជ្ជសាស្ត្រ មិនបង្ហាញឈ្មោះតាមទិន្នន័យដែលបានកំណត់ក្នុងកុំព្យូទ័រ ហើយការតាមដានជាយការណ៍ទិន្នន័យសម្រាប់គោលបំណងសិក្សា។
៥. អ្នកស្រាវជ្រាវអះអាងថាព័ត៌មានផ្ទាល់ខ្លួនរបស់ខ្ញុំបាទ/នាងខ្ញុំគឺរក្សាការសម្ងាត់។ វាអាចប្រើបានលុះត្រាតែមានការយល់ព្រមខ្ញុំបាទ/នាងខ្ញុំ។
៦. ខ្ញុំបាទ/នាងខ្ញុំបានអានខាងលើហើយមានការយល់ដឹងច្បាស់គ្រប់ជ្រុងជ្រោយ។ មានឆន្ទៈចូលរួមក្នុងការស្រាវជ្រាវដោយឆន្ទៈ ហើយចុះហត្ថលេខាតាមបែបបទនៃកិច្ចព្រមព្រៀងនេះ។

.....ការចុះហត្ថលេខាយល់ព្រម

(.....) ឈ្មោះអ្នកដាក់ពាក្យ

ថ្ងៃទី.....ខែ.....ឆ្នាំ.....

ខ្ញុំបាទ/នាងខ្ញុំរៀបរាប់ពីគោលបំណងនៃការស្រាវជ្រាវវិធីសាស្ត្រស្រាវជ្រាវគ្រោះថ្នាក់ឬព្រឹត្តិការណ៍អវិជ្ជមានឬហានិភ័យដែលអាចកើតមាននៃការស្រាវជ្រាវ រួមទាំងអត្ថប្រយោជន៍។ អ្នកចូលរួមក្នុងគម្រោងស្រាវជ្រាវដែលមានឈ្មោះខាងលើមានការយល់ដឹងច្បាស់លាស់មុន និងចុះឈ្មោះជាមួយនឹងសំណុំបែបបទយល់ព្រមដោយស្ម័គ្រចិត្ត។

.....ហត្ថលេខាអ្នកស្រាវជ្រាវ

(.....) ឈ្មោះអ្នកស្រាវជ្រាវ

ថ្ងៃទី.....ខែ.....ឆ្នាំ.....

.....ហត្ថលេខាអ្នកជំនួយ

(.....) ឈ្មោះអ្នកជំនួយ

ថ្ងៃទី.....ខែ.....ឆ្នាំ.....

APPENDIX C

RAW DATA OF FPCK

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
1	Ck00001	1	17	0.5	ss	1		0	0.5	34	positive	20
2	Ck00002	2	20	0.5	-	0	-	0	0	40	Negative	0
3	Ck00004	2	19	0.5	H	1	H	1	1	38	positive	48
4	Ck00005	2	24	0.5	-	0	-	0	0	48	Negative	0
5	Ck00006	2	25	0.5	-	0	-	0	0	50	Negative	0
6	Ck00007	1	20	0.5	-	0	-	0	0	40	Negative	0
7	Ck00008	1	23	0.5	-	0	-	0	0	46	Negative	0
8	Ck00009	1	19	0.5	-	0	-	0	0	38	Negative	0
9	Ck00010	2	18	0.5	-	0	-	0	0	36	Negative	0
10	Ck00011	2	42	0.5	-	0	-	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	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	34	Negative	0
16	Ck00018	1	18	0.5	-	0	-	0	0	36	Negative	0
17	Ck00019	1	26	0.5	-	0	-	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	-	0	-	0	0	46	Negative	0
21	Ck00023	2	21	0.5	-	0	-	0	0	42	Negative	0
22	Ck00024	2	17	0.5	-	0	-	0	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	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
26	Ck00028	1	20	0.5	-	0	-	0	0	40	Negative	0
27	Ck00029	2	28	0.5	-	0	-	0	0	56	Negative	0
28	Ck00030	2	22	0.5	-	0	-	0	0	44	Negative	0
29	Ck00031	1	25	0.5	-	0	-	0	0	50	Negative	0
30	Ck00032	2	26	0.5	-	0	-	0	0	52	Negative	0
31	Ck00033	2	31	0.5	-	0	-	0	0	62	Negative	0
32	Ck00034	2	23	0.5	-	0	-	0	0	46	Negative	0
33	Ck00035	1	23	0.5	-	0	-	0	0	46	Negative	0
34	Ck00038	2	25	0.5	-	0	-	0	0	50	Negative	0
35	Ck00039	2	20	0.5	-	0	-	0	0	40	Negative	0
36	Ck00041	2	14	0.5	-	0	-	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	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
39	Ck00044	2	19	0.5	-	0	-	0	0	38	Negative	0
40	Ck00045	2	16	0.5	-	0	-	0	0	32	Negative	0
41	Ck00046	2	24	0.5	-	0	-	0	0	48	Negative	0
42	Ck00048	2	21	0.5	-	0	-	0	0	42	Negative	0
43	Ck00049	2	23	0.5	-	0	-	0	0	46	Negative	0
44	Ck00050	2	24	0.5	-	0	-	0	0	48	Negative	0
45	Ck00051	1	20	0.5	-	0	-	0	0	40	Negative	0
46	Ck00052	2	19	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	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	-	0	-	0	0	48	Negative	0
62	Ck00070	2	18	0.5	-	0	-	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	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	56	Negative	0
69	Ck00077	2	21	0.5	-	0	-	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	-	0	-	0	0	36	Negative	0
73	Ck00081	2	21	0.5	-	0	-	0	0	42	Negative	0
74	Ck00082	1	29	0.5	-	0	-	0	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	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	40	Negative	0
82	Ck00090	2	25	0.5	-	0	-	0	0	50	Negative	0
83	Ck00091	1	25	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	48	Negative	0
95	Ck00103	2	18	0.5	-	0	-	0	0	36	Negative	0
96	Ck00104	2	25	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	44	Negative	0
108	Ck00116	2	21	0.5	-	0	-	0	0	42	Negative	0
109	Ck00117	2	25	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
117	Ck00125	1	15	0.5	-	0	-	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	-	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	-	0	-	0	0	56	Negative	0
125	Ck00134	2	20	0.5	-	0	-	0	0	40	Negative	0
126	Ck00135	2	17	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	48	Negative	0
133	Ck00142	2	14	0.5	-	0	-	0	0	28	Negative	0
134	Ck00143	2	15	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	32	Negative	0
147	Ck00156	2	18	0.5	-	0	-	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	-	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	1	E.coli	2	1.5	44	positive	87
153	Ck00163	2	29	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	-	0	0	40	Negative	0
162	Ck00172	2	21	0.5	-	0	-	0	0	42	Negative	0
163	Ck00173	1	12	0.5	-	0	-	0	0	24	Negative	0
164	Ck00174	2	23	0.5	-	0	-	0	0	46	Negative	0
165	Ck00175	1	14	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
169	Ck00179	2	13	0.5	-	0	-	0	0	26	Negative	0
170	Ck00181	2	22	0.5	-	0	-	0	0	44	Negative	0
171	Ck00182	2	23	0.5	-	0	-	0	0	46	Negative	0
172	Ck00183	1	23	0.5	-	0	-	0	0	46	Negative	0
173	Ck00184	2	21	0.5	-	0	-	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	-	0	-	0	0	38	Negative	0
177	Ck00188	1	15	0.5	-	0	-	0	0	30	Negative	0
178	Ck00189	1	20	0.5	-	0	-	0	0	40	Negative	0
179	Ck00190	1	20	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
182	Ck00193	2	18	0.5	-	0	-	0	0	36	Negative	0
183	Ck00194	2	20	0.5	-	0	-	0	0	40	Negative	0
184	Ck00195	1	17	0.5	-	0	-	0	0	34	Negative	0
185	Ck00196	2	25	0.5	-	0	-	0	0	50	Negative	0
186	Ch001	2	20	0.5	-	0	-	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	-	0	-	0	0	36	Negative	0
190	Ch005	1	21	0.5	-	0	-	0	0	42	Negative	0
191	Ch006	1	20	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
195	Ch010	1	20	0.5	-	0	-	0	0	40	Negative	0
196	Ch011	2	16	0.5	-	0	-	0	0	32	Negative	0
197	Ch012	2	10	0.5	-	0	-	0	0	20	Negative	0
198	Ch013	2	28	0.5	-	0	-	0	0	56	Negative	0
199	Ch014	2	16	0.5	-	0	-	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	-	0	-	0	0	58	Negative	0
203	Ch018	2	11	0.5	-	0	-	0	0	22	Negative	0
204	Ch019	2	22	0.5	-	0	-	0	0	44	Negative	0
205	Ch020	2	18	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
208	Ch023	2	29	0.5	-	0	-	0	0	58	Negative	0
209	Ch024	2	24	0.5	-	0	-	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	-	0	0	40	Negative	0
214	Ch029	2	42	0.5	-	0	-	0	0	84	Negative	0
215	Ch030	2	18	0.5	-	0	-	0	0	36	Negative	0
216	Ch031	1	26	0.5	H	1	-	0	0.5	52	positive	14
217	Ch032	2	14	0.5	-	0	-	0	0	28	Negative	0
218	Ch033	2	29	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
221	Ch036	1	28	0.5	-	0	-	0	0	56	Negative	0
223	Ch037	2	17	0.5	-	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	-	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	-	0	-	0	0	60	Negative	0
230	Ch044	1	23	0.5	-	0	-	0	0	46	Negative	0
231	Ch045	1	26	0.5	-	0	As	1	0.5	52	positive	28
232	Ch046	2	28	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
235	Ch049	1	17	0.5	-	0	-	0	0	34	Negative	0
236	Ch050	2	27	0.5	-	0	-	0	0	54	Negative	0
237	Ch051	1	27	0.5	-	0	-	0	0	54	Negative	0
238	Ch052	1	13	0.5	-	0	-	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	-	0	-	0	0	46	Negative	0
243	Ch057	2	18	0.5	-	0	-	0	0	36	Negative	0
244	Ch058	1	26	0.5	-	0	-	0	0	52	Negative	0
245	Ch059	1	14	0.5	-	0	-	0	0	28	Negative	0
246	Ch060	2	36	0.5	-	0	H	1	0.5	72	positive	16
247	Ch061	1	16	0.5	-	0	-	0	0	32	Negative	0

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
248	Ch062	2	14	0.5	-	0	-	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	-	0	-	0	0	74	Negative	0
256	M004	2	32	0.5	-	0	-	0	0	64	Negative	0
257	M006	1	31	0.5	-	0	-	0	0	62	Negative	0
258	M007	2	19	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
261	M010	2	22	0.5	-	0	-	0	0	44	Negative	0
262	M011	2	24	0.5	-	0	-	0	0	48	Negative	0
263	M012	2	17	0.5	-	0	-	0	0	34	Negative	0
264	M013	1	27	0.5	-	0	-	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	-	0	-	0	0	56	Negative	0
269	M019	2	23	0.5	-	0	-	0	0	46	Negative	0
270	M020	1	30	0.5	-	0	-	0	0	60	Negative	0
271	M021	2	26	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
274	M024(2)	2	21	0.5	-	0	-	0	0	42	Negative	0
275	M025	1	25	0.5	-	0	-	0	0	50	Negative	0
276	M026	2	27	0.5	-	0	-	0	0	54	Negative	0
277	M028	2	24	0.5	-	0	-	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	-	0	0	80	Negative	0
281	M032	2	23	0.5	-	0	-	0	0	46	Negative	0
282	M033	1	15	0.5	-	0	-	0	0	30	Negative	0
283	M034	1	25	0.5	-	0	-	0	0	50	Negative	0
284	M035	2	24	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	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	-	0	-	0	0	80	Negative	0
304	M046	2	32	0.5	-	0	-	0	0	64	Negative	0
305	M047	1	29	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	58	Negative	0
313	M055	1	31	0.5	-	0	-	0	0	62	Negative	0
314	M056	1	30	0.5	-	0	-	0	0	60	Negative	0
315	M057	2	31	0.5	-	0	-	0	0	62	Negative	0
316	M058	2	29	0.5	-	0	-	0	0	58	Negative	0
317	M059	2	28	0.5	-	0	-	0	0	56	Negative	0
318	M060	1	29	0.5	-	0	-	0	0	58	Negative	0
319	M061	2	27	0.5	-	0	-	0	0	54	Negative	0
320	M062	1	30	0.5	-	0	-	0	0	60	Negative	0
321	M064	1	31	0.5	-	0	-	0	0	62	Negative	0

No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
322	M064(2)	2	28	0.5	-	0	-	0	0	56	Negative	0
324	M064(3)	1	27	0.5	-	0	-	0	0	54	Negative	0
325	M065	2	26	0.5	-	0	-	0	0	52	Negative	0
326	M066	2	28	0.5	-	0	-	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	-	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	-	0	-	0	0	62	Negative	0
333	M072	2	26	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
336	M075(2)	2	43	0.5	-	0	-	0	0	86	Negative	0
337	M076	1	27	0.5	-	0	-	0	0	54	Negative	0
338	M077	1	28	0.5	-	0	-	0	0	56	Negative	0
339	M078	1	27	0.5	-	0	-	0	0	54	Negative	0
340	M079	2	24	0.5	-	0	-	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	0	58	Negative	0
345	M085	2	25	0.5	-	0	-	0	0	50	Negative	0
346	M086	2	24	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
349	M089	2	30	0.5	-	0	-	0	0	60	Negative	0
350	M090	2	18	0.5	-	0	-	0	0	36	Negative	0
351	M091	2	48	0.5	-	0	-	0	0	96	Negative	0
352	M092	1	11	0.5	-	0	-	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	-	0	-	0	0	68	Negative	0
357	M097	1	27	0.5	-	0	-	0	0	54	Negative	0
358	M098	2	30	0.5	-	0	-	0	0	60	Negative	0
359	M099	1	41	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			result	EPG
362	M102	2	25	0.5	-	0	-	0	0	50	Negative	0
363	M103	1	10	0.5	-	0	-	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	-	0	0	52	Negative	0
367	M107	1	48	0.5	-	0	-	0	0	96	Negative	0
368	M108	2	19	0.5	-	0	-	0	0	38	Negative	0
369	M109	1	37	0.5	-	0	-	0	0	74	Negative	0
370	M110	1	34	0.5	-	0	-	0	0	68	Negative	0
371	M111	2	16	0.5	-	0	-	0	0	32	Negative	0
372	M112	2	40	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	40	Negative	0

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No	ID	Gender	Drops of number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	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	-	0	-	0	0	23	Negative	0
8	Ck00009	1	21	0.5	-	0	-	0	0	24	Negative	0
9	Ck00010	2	40	0.5	H	2	H	1	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	46	Negative	0
16	Ck00018	1	21	0.5	-	0	-	0	0	22	Negative	0
17	Ck00019	1	19	0.5	-	0	-	0	0	19	Negative	0
18	Ck00020	2	32	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	40	Negative	0
31	Ck00033	2	27	0.5	-	0	-	0	0	33	Negative	0
32	Ck00034	2	28	0.5	-	0	-	0	0	29	Negative	0
33	Ck00035	1	29	0.5	-	0	-	0	0	18	Negative	0
34	Ck00038	1	21	0.5	-	0	-	0	0	30	Negative	0
35	Ck00039	1	23	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			Result	EPG
39	Ck00044	2	26	0.5	-	0	-	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	-	0	0	25	Negative	0
43	Ck00049	2	10	0.5	-	0	-	0	0	24	Negative	0
44	Ck00050	2	11	0.5	-	0	-	0	0	23	Negative	0
45	Ck00051	2	21	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	39	Negative	0
56	Ck00063	2	26	0.5	-	0	-	0	0	32	Negative	0
57	Ck00064	2	24	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	37	Negative	0
69	Ck00077	2	11	0.5	-	0	-	0	0	33	Negative	0
70	Ck00078	2	34	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	26	Negative	0
81	Ck00089	2	34	0.5	-	0	-	0	0	37	Negative	0
82	Ck00090	2	25	0.5	-	0	-	0	0	26	Negative	0
83	Ck00091	1	10	0.5	-	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	TT	1	-	0	1	32	Positive	17
87	Ck00095	2	21	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			Result	EPG
91	Ck00099	2	37	0.5	H	1	H	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	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			Result	EPG
104	Ck00112	2	16	0.5	-	0	-	0	0	56	Negative	0
105	Ck00113	2	26	0.5	-	0	-	0	0	57	Negative	0
106	Ck00114	2	15	0.5	-	0	-	0	0	34	Negative	0
107	Ck00115	2	18	0.5	-	0	-	0	0	35	Negative	0
108	Ck00116	2	20	0.5	-	0	-	0	0	24	Negative	0
109	Ck00117	1	25	0.5	-	0	-	0	0	22	Negative	0
110	Ck00118	2	25	0.5	-	0	-	0	0	11	Negative	0
111	Ck00119	1	24	0.5	-	0	-	0	0	56	Negative	0
112	Ck00120	1	16	0.5	-	0	-	0	0	37	Negative	0
113	Ck00121	1	21	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	45	Negative	0
120	Ck00128	2	18	0.5	-	0	-	0	0	37	Negative	0
121	Ck00130	1	24	0.5	-	0	-	0	0	54	Negative	0
122	Ck00131	2	18	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	76	Negative	0
134	Ck00143	2	16	0.5	-	0	-	0	0	35	Negative	0
135	Ck00144	2	21	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	23	Negative	0
147	Ck00156	1	18	0.5	-	0	-	0	0	23	Negative	0
148	Ck00157	2	18	0.5	-	0	-	0	0	36	Negative	0
149	Ck00158	1	18	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	33	Negative	0
159	Ck00169	2	15	0.5	-	0	-	0	0	45	Negative	0
160	Ck00170	2	28	0.5	-	0	-	0	0	26	Negative	0
161	Ck00171	2	20	0.5	-	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	-	0	-	0	0	23	Negative	0
166	Ck00176	2	20	0.5	-	0	-	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	17	Negative	0
172	Ck00183	1	23	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	24	Negative	0
186	Ch001	1	20	0.5	-	0	-	0	0	25	Negative	0
187	Ch002	1	28	0.5	-	0	-	0	0	34	Negative	0
188	Ch003	1	17	0.5	-	0	-	0	0	31	Negative	0
189	Ch004	2	18	0.5	-	0	-	0	0	45	Negative	0
190	Ch005	1	21	0.5	-	0	-	0	0	35	Negative	0
191	Ch006	2	20	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	24	Negative	0
199	Ch014	1	16	0.5	-	0	-	0	0	35	Negative	0
200	Ch015	1	20	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	23	Negative	0
211	Ch026	1	20	0.5	-	0	-	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	-	0	-	0	0	34	Negative	0
216	Ch031	1	12	0.5	-	0	-	0	0	36	Negative	0
217	Ch032	2	19	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	36	Negative	0
252	Ch066	2	37	0.5	-	0	-	0	0	39	Negative	0
253	M001	1	32	0.5	-	0	-	0	0	31	Negative	0
254	M002	1	31	0.5	-	0	-	0	0	19	Negative	0
255	M003	2	19	0.5	-	0	-	0	0	35	Negative	0
256	M004	1	14	0.5	-	0	-	0	0	30	Negative	0
257	M006	2	40	0.5	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	39	Negative	0
265	M016	2	28	0.5	-	0	-	0	0	30	Negative	0
266	M015	1	23	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	33	Negative	0
277	M028	1	40	0.5	-	0	-	0	0	21	Negative	0
278	M029	2	23	0.5	-	0	-	0	0	54	Negative	0
279	M030	1	23	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	32	Negative	0
300	M042	1	32	0.5	-	0	-	0	0	45	Negative	0
301	M043	1	22	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	29	Negative	0
313	M055	2	22	0.5	-	0	-	0	0	39	Negative	0
314	M056	1	31	0.5	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	46	Negative	0
327	M067	2	29	0.5	-	0	-	0	0	53	Negative	0
328	M068	1	31	0.5	-	0	-	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	-	0	-	0	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 number	stool wieght	Drop 1		Drop 2		Eggs average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			Result	EPG
336	M075(2)	2	18	0.5	-	0	-	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	-	0	0	32	Negative	0
340	M079	1	27	0.5	-	0	-	0	0	47	Negative	0
341	M081	1	31	0.5	-	0	-	0	0	27	Negative	0
342	M082	2	29	0.5	-	0	-	0	0	38	Negative	0
343	M083	2	28	0.5	-	0	-	0	0	35	Negative	0
344	M084	1	29	0.5	-	0	-	0	0	46	Negative	0
345	M085	2	27	0.5	-	0	-	0	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 average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			Result	EPG
349	M089	2	27	0.5	-	0	-	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	-	0	0	32	Negative	0
353	M093	2	17	0.5	-	0	-	0	0	13	Negative	0
354	M094	2	22	0.5	-	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	-	0	-	0	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 average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	30	Negative	0
365	M105	1	23	0.5	-	0	-	0	0	34	Negative	0
366	M106	1	26	0.5	-	0	-	0	0	20	Negative	0
367	M107	2	48	0.5	-	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	-	0	-	0	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 average	Drop/stool 1g	Result: stool concentration	
					Species of parasite	number of eggs	Species of parasite	number of eggs			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	-	0	0	45	Negative	0
380	M120	2	20	0.5	-	0	-	0	0	36	Negative	0

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RESEARCH PUBLICATION

La, N, Leng M, Rattnapitoon N K, Pechdee P, Boonsuya A, Arunsan P, Rattanapitoon S K. (2022). Intestinal parasitic infections and risk factors among the population in Cambodia. *Tropical Biomedicine,* 39(4), 539-546.

PROCESDING

Leng, M, Pechdee P, Rattanapitoon N, Thueng-in K, Rattanapitoon S. (2019). Diagnostic Methods for The Detection of *Opisthorchis viverrini* in Kratie Province, Cambodia.

International Conference on Parasitology 2019 (ICP). Department of Parasitology, Faculty of Medicine, Khon Kaen University, Thailand.

POSTSTER PRESENTATION

Leng M, Meererksom T, Pechdee P, Kaewpitoon N, Thueng-in K, Namhong T, Taweepakdeechot A, Yardcharoen N, Srithongklang W, Wakhuwathapong P, Keeratibharat P, Chasangrat J, Kaewpitoon S. (2019). Detection of Medicine Intestinal Parasites Using a Concentrator Kit. Advancing the Life Sciences & Public Health Awareness (ALPHA). March 23-24, 2019, at the Mitsui Garden Hotel, Hiroshima, Japan.

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