e-ASIA Joint Research Program
Final Report

1. Project title : Health impact of Opisthorchiasis infection in Cambodia and Vietnam : prevalent surveillance of Opisthorchiasis and risk surveillance for liver cancer

2. Joint Research period：Oct. 2, 2016 ～ Mar. 31, 2020

3. Research Team：

■ **Japan team**（up to 6 people including the Principal Investigator）
Funding period: Oct, 2, 2016 – Mar, 31, 2020r
Total Funded Amount (in Local Currency): JP¥39,487,500

	Name	Position	Affiliation	Role in the project
PI	MIYAMOTO Kazuko	Professor	University of Yamanashi	Integrating the researches / Participatory action research
Collaborator	NAKAO Atsuhito	Professor	University of Yamanashi	Trial for developing new design of Immunological tests
Collaborator	ENOMOTO Nobuyuki	Professor	University of Yamanashi	Liver function research
Collaborator	YAMAGATA Zentarou	Professor	University of Yamanashi	Support for developing a health plan
Collaborator	CHIGUSA Yuichi	Professor	Dokkyo Medical University	Intermediate & reservoir hosts survey
Collaborator	KIRINOKI Masashi	Associate Professor	Dokkyo Medical University	Intermediate & reservoir hosts survey
Collaborator	HIRAYAMA Noriko	Assistant Professor	University of Yamanashi	Participatory action research
Total number of participants including students: 4				

■ **Cambodia team**（up to 6 people including the Principal Investigator）
Funding period: In-kind support
Total Funded Amount (in Local Currency):

	Name	Position	Affiliation	Role in the project
PI	Virak Khieu	Manager of National Helminth Control Program	National Center for Parasitology, Entomology and Malaria Control (CNM), Ministry of Health	Management researches in Cambodia
Collaborator	Huy Rekol	Director	National Center for Parasitology, Entomology and Malaria Control (CNM), Ministry of Health	Integrate researches in Cambodia
Collaborator	Heng Leang	Chief of the Radiology department	Calmette Hospital, Ministry of Health	Liver function survey
Total number of participants including students: 2				

■ **Vietnam team**（up to 6 people including the Principal Investigator）
Funding period: In-kind support
Total Funded Amount (in Local Currency):

	Name	Position	Affiliation	Role in the project
PI	Nguyen Thu Huong	Associate Professor, Vice principal	Dang Van Ngu Medical Collage, National Institute of Malariorogy, Parasitology and Entomology(NIMPE), Vietnam	Integrate researches in Vietnam
Collaborator	Do Trung Dung	Chief of Department	National Institute of Malariorogy, Parasitology and Entomology(NIMPE), Vietnam	Providing Stool Ecamination
Collaborator				
Total number of participants including students: 4				

4. Summary of the joint research

The project results show;

1) Obtain the basic data for National Mapping of *Opisthorchis viverrini* endemic in Cambodia
2) Re-recognition of importance of developing the National Health policy for *O. viverrini* in Cambodia and Vietnam
3) Having common understanding for the importance of "Participatory programs for preventing *Opisthorchis viverrini* which is one of the Life-Style-Related diseases
4) Conducting the first cooperated meeting between Cambodia and Vietnam to share idea
5) O v infection in one of the biggest problems of NTDs on Indochina.

5. Outputs and Anticipated Outcomes of Joint Research

5-1 Scientific achievements and implemented activities of the joint research

5-1-1. Cambodia: Finding Opisthorchis viverrini is endemic-widen (Fig.1)

We found out 14 endemic-province in 24 provinces in Cambodia at last (In WHO regulation shows EPR≧20% is endemic by Kato-Katz technique; EPR=egg positive rate). It is reviled that there are 5 provinces of 20% < EPR<0%, too. Those are evidence that *O. viverrini* is endemic in Cambodia widely. The highest EPR is 88.2% and 15 villages show EPR≧50%. Based on the results Ministry of Health recognized *O. viverrini* is one of the serious health issues in Cambodia. WPRO also is interested in those results.

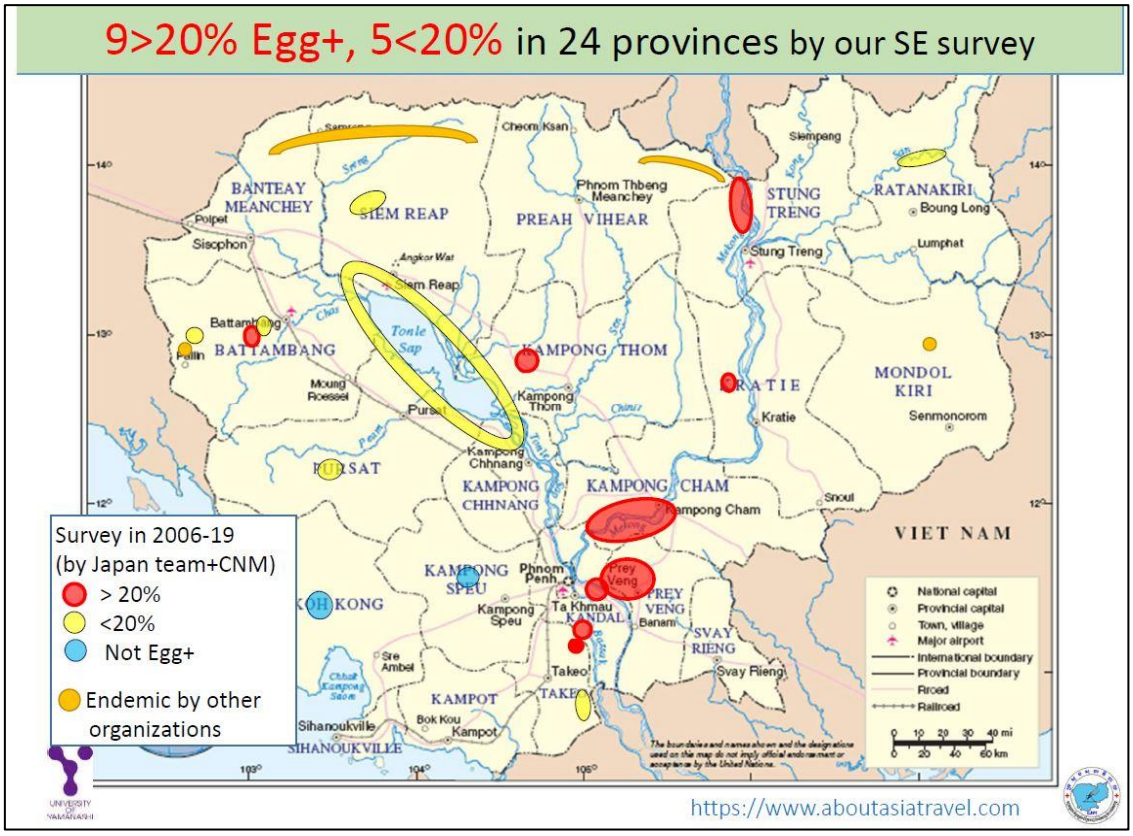


Fig.1: Temporary Endemic Map in Cambodia

5-1-2. Vietnam: O. viverrini is endemic in the central area

Vietnam team provide some researches. One of the results shows of *O. viverrini* is endemic in central Vietnam (Table1).

Table1: Results of Stool Exam in Vietnam

Study site		Species of small fluke – No. (%)			
	No. exam	*C. sinensis*	*O. viverrini*	*H. taichui*	*H. pumillio*
North	26	9 (34.6)	0 (0.0)	24 (92.3)	16 (61.5)
Central	24	2 (8.3)	7 (29.2)	20 (83.3)	18 (75.0)
Total	50	11(22.0)	7(14.0)	44(88.0)	34(68.0)

5-1-3. Cambodia: Results of intermediate & reservoir hosts survey

741 of *Bithynia* sp. were collected and 3 of them are infected by cercariae of *O. viverrini* in 8 points of endemic areas (Table2). Metacercariae are found in *Cyclocheilichthys* sp., a kind of Carp-fish, which is 2nd intermediate host. The results show differences in seasons and in some endemic areas.

The reservoir hosts survey of dogs was conducted in some of endemic villages using GPS loggers. Some dogs are walking and reach to the lake where fish, 2nd intermediate host, lives. It is not found eggs of *O. viverrini* in feces of dogs.

Table2: Results of intermediate host survey1: 1st intermediate host (*Bithynia* sp.)

Province District	Commune	Village	Lake/Pond	2017 April-May	2018 January	2018 April-May	2018 November-December	2019 April-May
Stung Treng P. Sesan	Sdau	**Sdau Muoy**		0/289	0/85	-	-	-
		Sdau Pir		0/175		-	-	-
Prey Veng P. Pea Reang	Prey Sniet	**Me Loang**	Chnok Tru Lake	-	-	0/37	0/120	-
			A pond beside the school	-	-	-	0/1	-
			Prang Lake	-	-	0/17	0/331	-
	Kampong Russei		Chum Num Pond	-	-	0/1	0/3	-
		Tnaot	Kanlenlang Sva Lake	-	-	-	-	0/161
			Kanlenlang Trav Lake	-	-	-	-	0/10
		Chray Kroheum	Anlong Reang Lake	-	-	1/43 (2.3%)	2/42 (4.8%)	
Prey Veng P. Kampong Leav	Preak Chrey	**Bak Daok**		-	-	-	-	0/12

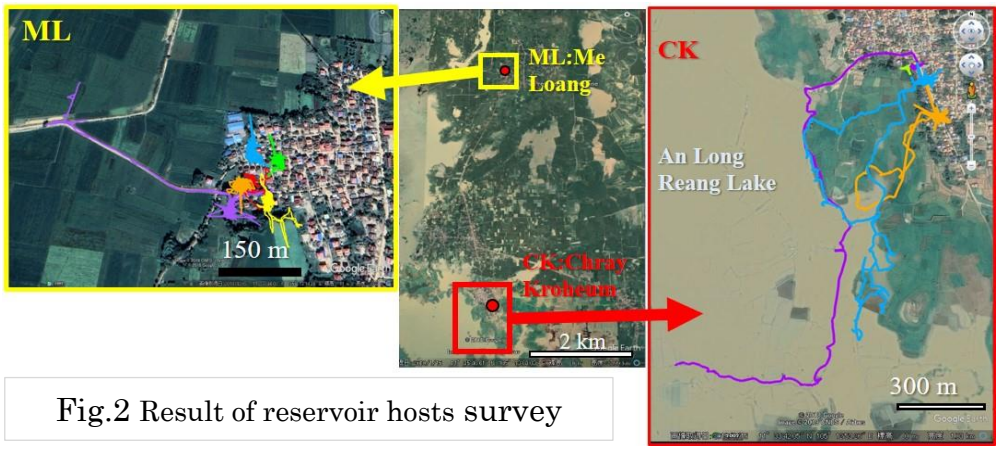


Fig.2 Result of reservoir hosts survey

5-1-3. Cambodia: Results of food consumption survey for fresh water fish

Seven kinds of fish dish names eaten raw are listed. “Trie plea” and “Trie bok” are the common ones. Those are same in other provinces. There are 12 names are listed using for raw dishes.

Table3: Results of food consumption survey

Fish dish name eaten raw		N=35	
risks		no. of ans.	%
	Nhean	8	22.9%
	Phrok	1	2.9%
◎	Trie plea	30	85.7%
	Raw plohok	3	8.6%
	sa.fish	4	11.4%
◎	Trie dam/dom	2	5.7%
◎	Triebok	18	51.4%

7 kinds of dishes were raised

Fish dish name eaten raw	N=35	
	no. of ans.	%
Trie changva	11	31.4%
Trie riel	27	77.1%
Tire kanhchous	8	22.9%
Trie achkok	8	22.9%
Trie chhkoak	2	5.7%
Trie khrek krek	4	11.4%
Trie konlang	2	5.7%
Trie krapat	1	2.9%
Trie kros	2	5.7%
Trie ptouk	1	2.9%
Trie slek russey	1	2.9%
Trie spin	1	2.9%

11 kinds of name were raised
(Local name only)

5-1-4. Cambodia: Results of liver function survey in high EPR villagers

Conducting liver function survey (ultrasonic test and blood test) 2 times, 1) 78 participants in Kampong Cham and Prey Veng provinces in Feb/2018, 2) Stung Treng province in Feb/2020. In survey 1) intrahepatic bile duct dilation was found in 5 patients. In survey 2) one patient, who suspect Cholangiocarcinoma was found (CCA). ALT/AST were slightly higher in some patients. Identification of liver disorder is important, for “Ab-Hepatitis B +” patients are recognized in high percentages (44.9% in 2018, 42.9% in 2020). It is required wide areas survey for CCA in Cambodia.

5-1-5. e-DNA survey: technical support and results in Cambodia & Vietnam

Before starting surveillance, we provided technical training for 2 counter parts. In Cambodia, in total around 60 samples, 3 water samples are positive, 1 from Kampong Cham and 2 from Prey Veng. In Vietnam 4 samples are positive in 120 samples.

5-1-6. Sustainable participatory approaches are required for prevention

We provided some village activities in endemic areas. They were interested in the topics of health education and discussed actively in feedback meetings. However one-shot activity would not be effective to prevent *O. viverrini* infection. Since it is a kind of Life-Style-Related-Diseases.

5-1-7. Human resource development and technical support

We provided some of technical training for human resources of Cambodia and Vietnam. 2 Cambodia researchers were invited to Japan and provided several kinds of training. When we provide technical support for e-DNA survey, we found Vietnam team has high level of laboratories to conduct survey by themselves, while Cambodia side has not yet had basic level ones.

5-2 Synergistic effects of the international joint research

Though Cambodia and Vietnam are the neighbor countries, it was the first joint research. They recognized they suffer from same health problems of *O. viverrini*. They could share ideas in the end-point meeting in Cambodia, Nov/2019. This research program is the starting points of cooperation. Vietnam may support Cambodia in the laboratory techniques.

5-3 Broader impacts including contribution to society

1) The research results show *O. viverrini* infection is the one of the biggest health issues in Indochina. After presenting our research results in some of international conferences, more researchers are interested in *O. viverrini* infection in Cambodia.
2) WHO/WPRO shows their interest toward our research result and *O. viverrini* infection in Cambodia, as NTDS problem.
3) JICA Grass Routs Project has started from2018, based on this research results. It focuses on developing participatory prevention program by people.
4) Sector wide sharing in Cambodia has started after the end-point meeting.

5-4 Development and sustainability of the cooperation

1) Human resource development and networking: The research results show *O. viverrini* infection is the one of the serious health issue in Indochina.
2) Laboratory development in Cambodia: It is insufficient to organize scientific experiments for conducting independent research in the future. Laboratory and human resource developments are important in Cambodia. Japan, Vietnam and Thailand will cooperate to develop them.
3) National Health Plan development in Cambodia and Vietnam: Sharing information and idea should be continued among 3 countries.

6. Future Goals and Plan of Activities after the project period

1) Japan Team will support Cambodia to develop laboratory and human resources (Planning to apply SATREPS)
2) Cooperating to WPRO/NTDS: Place *O. viverrini* infection to one of the main health issues of NTDS in Indochina.

7. Scientific Achievements and Implemented Activities (Publication, Research Exchange, Workshop, etc.)

For this item, please fill in the attached Excel file.

8. Recommendations and Comments to the Program

It is very interesting that e-ASIA program support researches among 3 kind countries. But there are 2 “In-Kind” countries in this research teams and it was changed on the process of the selection. We agreed this changing, but actuary it was not easy they understand what is “In-Kind” country and Japan side were also not so clear how we cooperate 2 “In Kind” countries.

I should ask more support and explanation to e-ASIA office how to cooperate and support 2 In-Kinds countries by 1 county.

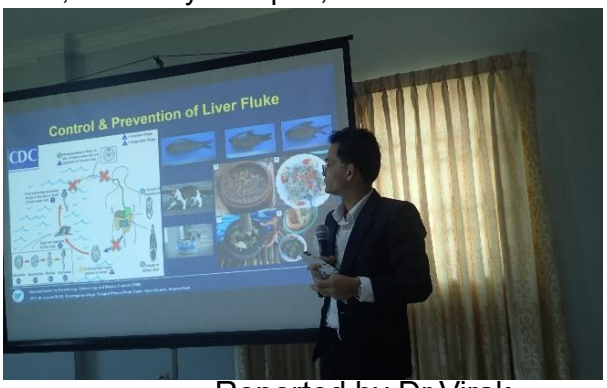
9. Others (agenda of workshop, photos of research teams, meetings, and etc.)

1) AMED Final meeting（5, Nov/2019）

Group photo of the meeting

Director, Embassy of Japan, Mr.Hori from AMED

A scene of presentation



Reported by Dr.Virak

Prof. Miyamoto, CNM vice director, World Fish

Dr. Houn from Vietnam

WHO Cambodia and Dr.Kita

JICA Cambodia, MoAgriculture, MoE

O.V eggs under microscope at CNM Labo

Medical refrigerator and freezer donated by project

Message from CNM Director

Group photo at terrace

Additional activity of final meeting：Field work in target area
Cambodian team, Japanese team, Mr.Hori from AMED, Dr.Kita from Pacific office and Dr. Houn from Vietnam visited target area (Kampong Cham) :
Confirm inhabitance of intermediate host snails.

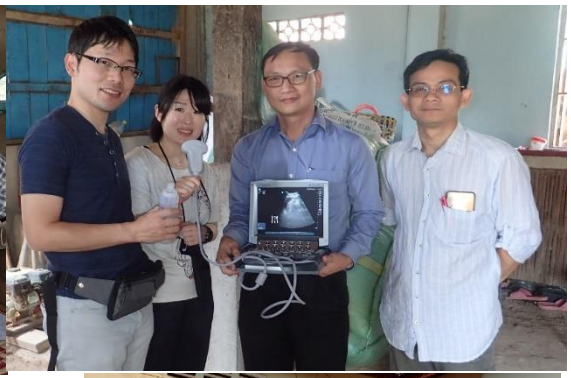
2) Stool examination in villages

3) Feedback meeting in endemic villages

4) e-DNA sampling in Cambodia




5) Liver function survey

6) Cooperation activities in Vietnam

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Lists of Achievements and Implemented Activities

1. Original Publication of Articles etc.

1. 1 Original Publications (Articles co-authored among Research Teams)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)
Khieu V, Furst T, Miyamoto K, Yong TS, Chai JY, Huy R, Muth S, Odermatt P. Is Opisthorchis viverrini Emerging in Cambodia? Adv Parasitol, 103:31-73, 2019	10.1016/bs.apar.2019.02.002	published	
1			

Total

1. 2 Original Publications (Articles by Single Team only)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)	Country name of the team
0				

Total

Lists of Achievements and Implemented Activities

2. presentations at Academic Conferences etc. (Seminars, Workshops, Symposia)

2. 1 Conference Presentations (Joint Presentations among Research Teams)

Date	Type of Presentation	Speaker, "Title", Conference Name, Location, etc.
March 7, 2017	Oral Presentation	Kazuko MIYAMOTO, "Opisthorchis viverrini infection in Cambodia: until now and from now", NTDASIA2017, Thailand
November 25,2017	Oral Presentation	Kazuko MIYAMOTO, "*Opisthorchis viverrini* infection in Cambodia: Finding new endemic areas", Global Health 2017, Tokyo
March 23, 2018	Guest/Invited Speaker	Kazuko MIYAMOTO, "Opisthorchis viverrini infection in Cambodia: Finding new endemic areas", Symposium14, The Japanese Society for Hygine, Tokyo
Jul 26-29, 2018	Oral Presentation	Nguyen Thu Huong ,"Application of Realtime PCR and environmental DNA analysis for the detection of Opisthorchis viverrini and Clonorchis seninsis DNA in water samples and sedimentation feces", 8th ASEAN Congress of Tropical Medicine and Parasitology, Viethnam
November 10, 2018	Poster Session	Kazuko Miyamoto, "Opisthorchis viverrini in Cambodia: New endemic areas in 2017-2018", The 59th Annual Meeting for the Japanese Society of Tropical Medicine, Nagashaki
March 15-16, 2019	Poster Session	Masashi Kirinoki, "Epidemiological study on hosts of Opisthorchis viverrini in high endemic area in Cambodia", The 60th annual Meeting for the Japanese Society of Parasitology, Nagasaki
March 5, 2019	Oral Presentation	Kazuko Miyamoto, "Lessen-Learn from researches and actions for Opisthorchis viverrini infection in Cambodia", Asia - Pacific Scientific Workshop, Singapore
August 7, 2019	Oral Presentation	Kazuko Miyamoto, "Is Opisthorchis viverrini infection endemic in Cambodia?", NTDASIA2019, Khon Kean, Thailand
November 9, 2019	Poster Session	Masashi Kirinoki, "Study on intermediate and reservoir hosts of Opisthorchis viverrini in high endemic area in Cambodia", The 60th annual Meeting for the Japanese Society of Tropical Medicine, Okinawa
November 9, 2019	Poster Session	Kazuko Miyamoto, "Outline of Opisthorchis viverrini endemic in Cambodia", The 60th Annual Meeting for the Japanese Society of Tropical Medicine, Okinawa
November 9, 2019	Poster Session	Noriko Hirayama, "Is Praziquantel delivered to individuals who really need to take? : Challenges of MDA with local government in Cambodia's local villages?", The 60th Annual Meeting for the Japanese Society of Tropical Medicine, Okinawa
March 5-6, 2020 (coming)	Oral Presentation	Masashi Kirinoki, "Epidemiological study on helminthiasis in Cambodia and Japan", The retreat for young researchers 2019 held by Social Subcommittee, The Japan Medical Science Federation, Yamanashi

11	Total

2. 2 Conference Presentations (by Single Team)

Date	Type of Presentation	Speaker, ″Title″, Conference Name, Location etc.	Country name of the team

0 Total

Lists of Achievements and Implemented Activities

3. Workshops, Seminars, Symposia and Other Events (Organized by the Project)

Event duration	Name of Organizer	Title of the Event	Location (Country, City, Venue)	Number of Participants (Including Team Members)	Overview
February 17, 2017	Kazuko MIYAMOTO	Seminar for e-DNA	Cambodia, Phnom Penh, CNM	9	Lectured by Toshifmi MINAMOTO
February 20, 2017	Kazuko MIYAMOTO	Seminar for e-DNA	Vietnam, Hanoi, NIMPE	8	Lectured by Toshifmi MINAMOTO
February 16, 2018	Kazuko MIYAMOTO	Seminar for Ultrasound	Cambodia, Phnom Penh, CNM	8	Lectured by Masaru Muraoka
November 5. 2020	HUY Rekol*	END-PROJECT MEETING: Health Impact of Opisthorchiasis Infection in Cambodia and Vietnam	Cambodia, Phnom Penh, CNM	40	*CNM director

4 Total

Lists of Achievements and Implemented Activities

4. Record of Research Exchanges

Date of Departure	Date of Return	Last Name & First Name	Country of Affiliation	Affiliation	Position	Exchange Destination (Country, City, Research Organization etc)	Description of Exchange Content/Purpose	Duration of Exchange (autocompleted)
February 16, 2017	February 19, 2017	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	CNM, Phnom Penh	e-DNA research for *O. viverrini*	4
February 20, 2017	February 21, 2017	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	NIMPE, Hanoi	e-DNA research for *O. viverrini*	2
March 7, 2017	March 10, 2017	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	Khon Kean Univ.	NTDASIA2017	4
August 21, 2017	August 30, 2017	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	CNM, Phnom Penh	Stool exam & field research for *O. viverrini*	10
February 8, 2018	February 22, 2018	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	CNM, Phnom Penh	SE & field research for *O. viverrini*	15
March 10, 2018	March 12, 2018	Kazuko MIYAMOTO	Japan	University of Yamanashi	Professor	CNM, Phnom Penh	e-DNA & field research for *O. viverrini*	3
February 16, 2017	February 19, 2017	Toshifmi MINAMOTO	Japan	Kobe University	Assicuate Prof.	CNM, Phnom Penh	e-DNA research for *O. viverrini*	4
February 20, 2017	February 22, 2017	Toshifmi MINAMOTO	Japan	Kobe University	Assicuate Prof.	NIMPE, Hanoi	e-DNA research for *O. viverrini*	3
February 11, 2018	February 16, 2018	Chieko NIBOSHI	Japan	Kobe University	Mastor student	CNM, Phnom Penh	Food consumption research for *O. viverrini*	6
February 12, 2018	February 16, 2018	Masaru Muraoka	Japan	University of Yamanashi	Assistant Prof.	CNM, Phnom Penh	Ultrasound examination	5
February 12, 2018	February 16, 2018	Natsuko Nakakuki	Japan	University of Yamanashi	Assistant Prof.	CNM, Phnom Penh	Ultrasound examination	5
March 10, 2018	March 12, 2018	Noriko HIRAYAMA	Japan	University of Yamanashi	Assistant Prof.	CNM, Phnom Penh	e-DNA & field research for *O. viverrini*	3
April 23, 2017	May 4, 2017	Masashi KIRINOKI	Japan	Dokkyo Medical University	Assicuate Prof.	CNM, Phnom Penh	Intermediate hosts & reservoir hosts survey	12
April 22, 2018	May 2, 2018	Masashi KIRINOKI	Japan	Dokkyo Medical University	Assicuate Prof.	CNM, Phnom Penh	Intermediate hosts & reservoir hosts survey	11
August 5, 2018	August 22, 2018	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	7
September 14, 2019	October 3, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	4
February 8, 2019	February 23, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	6
March 2, 2019	March 5, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	NUS, Singapore	Asia-Pacific Scientific Workshop	4
March 5, 2019	March 13, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	4
August 5, 2019	August 9, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	Khon Kaen, KKU, Thailand	Participate to NTD2019 Conference	4
August 9, 2019	September 5, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	4
October 30, 2019	November 8, 2019	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, Kampong Cham province, Cambodia	AMED End-point Meeting	8
February 8, 2020	February 22, 2020	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey	9

March 2, 2020	March 17, 2020	Kazuko Miyamoto	Japan	University of Yamanashi	Professor	CNM, some provinces, Cambodia	Field survey, final meeting with CNM	5
February 12, 2018	February16,2018	Masaru Muraoka	Japan	University of Yamanashi	Assistant Professor	CNM, Kampong Cham & Prey Veng province, Cambodia	Liver function survey	5
February 16, 2020	February22,2020	Masaru Muraoka	Japan	University of Yamanashi	Assistant Professor	CNM, Kampong Cham & Prey Veng province, Cambodia	Liver function survey	7
February 12, 2018	February16,2018	Natsuyo Nakakuki	Japan	University of Yamanashi	Assistant Professor	CNM, Kampong Cham & Prey Veng province, Cambodia	Liver function survey	5
February 11, 2018	February16,2018	Chieko Niboshi	Japan	University of Yamanashi	Master Student	CNM, Kampong Cham & Prey Veng province, Cambodia	Eating behavior survey	7
September 14, 2018	September26 ,2018	Noriko Hirayama	Japan	University of Yamanashi	Assistant Professor	CNM, some provinces, Cambodia	Field survey	3
January 25, 2019	March 18, 2019	Noriko Hirayama	Japan	University of Yamanashi	Assistant Professor	CNM, some provinces, Cambodia	Field survey	10
August 18, 2019	September 16, 2019	Noriko Hirayama	Japan	University of Yamanashi	Assistant Professor	CNM, some provinces, Cambodia	Field survey	1
October 28, 2019	November 7, 2019	Noriko Hirayama	Japan	University of Yamanashi	Assistant Professor	CNM, some provinces, Cambodia	AMED End-point Meeting	9
January 27, 2020	March 19, 2020	Noriko Hirayama	Japan	University of Yamanashi	Assistant Professor	CNM, some provinces, Cambodia	Field survey, final meeting with CNM	20
April 23, 2017	May 4, 2017	Masashi Kirinoki	Japan	Dokkyo Medical University	Associate Professor	Stung Treng Province, Kratie Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	12
April 23, 2017	May 2, 2017	Marcello Otake Sato	Japan	Dokkyo Medical University	Research Associate	Stung Treng Province, Kratie Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	10
January 14, 2018	January 25, 2018	Masashi Kirinoki	Japan	Dokkyo Medical University	Associate Professor	Stung Treng Province, Kratie Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	12
April 22, 2018	May 2, 2018	Masashi Kirinoki	Japan	Dokkyo Medical University	Associate Professor	Prey Veng Province, Kratie Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	11

April 25, 2019	May 4, 2019	Masashi Kirinoki	Japan	Dokkyo Medical University	Associate Professor	Prey Veng Province, Kratie Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	10
February23, 2020 (coming)	March 5, 2020	Masashi Kirinoki	Japan	Dokkyo Medical University	Associate Professor	Prey Veng Province, Kampong Cham Province, Phnom Penh, CAMBODIA	Field survey (intermediate and reservoir hosts, e-DNA)	12
February 16, 2017	February 23, 2017	Toshifumi Minamoto	Japan	Kobe University	Professor	CNM, Kampong Cham province, others, Cambodia; NIMPE, Hanoi, Vietnam	e-DNA survey, e-DNA technical advice and training	8
July 14, 2019	July 28,2019	Virak Khieu	Cambodia	CNM, MOH	Manager, MD	University of Yamanashi, Dokkyo Medical University, Kobe University, Japan	Joining training / meetings	4
August 5, 2019	August 10,2019	Virak Khieu	Cambodia	CNM, MOH	Manager, MD	Khon Kaen, Thailand	Participate to NTD2019 Conference	6
July 21, 2019	July 28,2019	Heng Leang	Cambodia	Calmette Hospital, MOH	Chief of department, MD	University of Yamanashi, Japan	Joining training / meetings	8
November 3, 2019	November 6, 2019	Nguyen Thu Huong	Vietnam	NIMPE, MOH	Vice principal, MD	CNM, Kampong Cham province, Cambodia	AMED End-point Meeting	4

Total (Person) 44 Total (Persond-day) 306

Parasitology Department of National Institute of Malaria, Parasitology and Entomology (NIMPE)

Lists of Achievements and Implemented Activities

5. Patent Applications

5. 1 Independent Applications by Single Team

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)	Country Name of the Team

0 Total (Number of Application)

0 Total (Number of Registration)

5. 2 Joint Applications

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)

0 Total (Number of Application)

0 Total (Number of Registration)

Lists of Achievements and Implemented Activities

6. Awards

Date of Award	Name of Award	Recipient	Remarks	Country Name of the Team

0 Total