

Lao – Lux lab / Vaccine preventable diseases 2020-2021

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Executive summary

The LaoLux Laboratory (LLL) aims to build capacity for investigations of human and animal infectious diseases that are of relevance for Lao PDR and operates in partnership with the Clinical and Applied Virology group at the Luxembourg Institute of Health, Luxembourg, headed by Judith Hübschen. All studies are conducted in close collaboration with local partners and focus mainly on the epidemiology and seroprevalence of vaccine-preventable infectious diseases, as well as animal and zoonotic diseases. These studies have importance for stakeholders in public and animal health by providing estimates about the burden of specific infections, promoting outbreak control and vaccination programs, improving animal health and productivity, and proposing measures to optimize national health strategies. Our evidence-based results and recommendations are communicated to stakeholders

and partners in the form of written and oral reports and policy briefs. In this year's report, we show data from several completed studies.

Hepatitis B virus (HBV) infection continues to be a key area of interest for us and this year we report our study on HBV in Lao blood donors. In this collaboration with the Lao Red Cross, we determined the HBV serological profile in Lao adult donors nationwide. We confirm the high levels of HBV exposure and chronic infection in adults in Lao PDR and also find a dramatic regional variation, with higher levels of exposure and chronic infection in the North of the country. This regional difference, together with other observations regarding the blood donor screening program, has been communicated and discussed with the Lao Red Cross and other stakeholders and has been submitted as a manuscript for publication.

In a study on dental workers, we determined HBV exposure, protection and risk practices. We found that, as in the general Lao adult population, exposure to HBV and chronic infection were high, but they also had a high risk of infection from frequent exposure to blood or saliva and low levels of vaccination and inadequate protective measures. The study was communicated to the relevant Lao Dental Association, and recommendations on vaccination and other preventative measures were given. The data were published as a manuscript in 2020.

In addition to the HBV situation in adults, we were interested to determine the impact of the introduction of the HBV vaccine into the Lao infant vaccination schedule. We found that adolescents who were born after the HBV vaccine introduction had significantly lower levels of exposure than those born before vaccine introduction. Whilst this is good news and a key indicator of the success of the program, the exposure to HBV and chronic infection is still continuing at younger ages. This is probably a result of low vaccination coverage,

particularly of the HBV birth dose vaccine which needs urgent strengthening in order to break the cycle of HBV transmission. As well as communicating the study results and recommendations to stakeholders and policymakers as a policy brief, these data were published in a manuscript in 2020.

Following the birth dose of HBV, the vaccine is also scheduled at the age of 6, 10 and 14 weeks in the form of the pentavalent vaccine – containing diphtheria, tetanus, pertussis, HBV and haemophilus influenzae components. The timely administration of this vaccination is crucial in order to ensure adequate protection against all five pathogens. In this year's report, we detail a study where we investigated the timeliness of the pentavalent vaccine. The study had important findings including significant discrepancies between hospital-based and personal vaccination records and large numbers of delayed vaccinations. Such findings have implications for vaccine management as well as vaccine immunogenicity and coverage. The data have been communicated as a policy brief to relevant stakeholders such as the Lao Ministry of Health and have been accepted as a manuscript for publication in 2020.

The final study that we present in this year's annual report is an investigation into pertussis seroprevalence in Lao PDR. As mentioned above, whole-cell pertussis is one of the components of the pentavalent vaccine administered to Lao infants. Our study highlighted inadequate pertussis protection in several age-groups in the Lao population. Our recommendations to strengthen pertussis reporting, vaccination outreach, administer booster doses for children and healthcare workers and to consider vaccination of pregnant women, have been communicated with policyholders such as the National Immunization Technical Advisory Group. The study was published as a manuscript in 2020.

This year we co-supervised Susanne Heemskirk, an undergraduate student from Vu University. Whilst in the Netherlands, Susanne

completed her thesis on the modeling HBV infection in Lao PDR and predicted the impact of varying vaccination coverage on disease epidemiology. From September we were joined by Vanjing Lorkonegnim, a Lao military healthcare worker, who will train on research skills with our lab for 6-9 months in the framework of the Arboshield program. Visitors to the laboratory were limited this year due to COVID-19 related travel restrictions.

Teaching and training activities are given by LLL staff

- Seminar given to two cohorts of Lao Military staff on vaccines
- Military healthcare workers training on field-work, laboratory skills, data analysis
- 1 week LTPHI course (immunology, vaccines)
- Supervised 3 Masters students from LTPHI; Xaysomboun serostudy
- Supervised Susanne Heemskirk; HBV modeling study
- Supervised Thongchan Khammoun, Biomedical Specialist 1 student from UHS; Monitoring of immune response to HBV vaccinated Lao Red Cross and Blood Center staff in Lao PDR
- Supervised Thipsavanh Suliyavong, a student from EPI at Field Epidemiology Training (FET11); KAP of HCW on the utilization of EPI data collection and report forms in central, district and health center levels in Vientiane Municipality
- Supervision of 11 LTPHI students; COVID-19 serostudy

Meeting presentations

University of Health Sciences Research Day, 17th September, Vientiane

*“Vaccine-preventable disease seroprevalence in Xaysomboun Province, Lao PDR: a community-based cross-sectional study.”
Oral presentation by Magnoula Inthepphavong (LTPHI student)*

1st Annual Conference in Public Health, 12th November, Vientiane

“Immune response to Hepatitis B vaccine in Lao Blood Bank staff” Oral presentation

*Mekong Region Hepatitis Congress, 23rd November, Vientiane
“Hepatitis B virus research in Lao PDR” Oral presentation*

Manuscripts published in 2020

Seroprevalence of anti-tetanus antibodies in mothers and cord blood and associated factors in health-care settings in Lao People’s Democratic Republic. Ounnavong P, Chanthavilay P, Khampanisong P, Reinharz D, Muller CP, Black AP. *Vaccine*. 2020 Jan 29;38(5):1234-1240.

The lasting benefit of infant hepatitis B vaccination in adolescents in the Lao People’s Democratic Republic. Hefele L, Vannachone S, Khounvisith V, Nouanthong P, Sayasone S, Kounnavong S, Chanthavilay P, Muller CP, Black AP. *Int J Infect Dis*. 2020 Apr;93:217-223.

Pertussis in Lao PDR: Seroprevalence and disease. Kleine D, Billamay S, Chanthavilay P, Mongkhoun S, Keokhamphoui C, Souksakhone C, Nouanthong P, Khamphongphane B, Muller CP, Black AP. *Int J Infect Dis*. 2020 Jun;95:282-287

Hepatitis A Virus in Lao People’s Democratic Republic: *Seroprevalence and Risk Factors*. Khounvisith V, Xaiyaphet X, Chanthavilay P, Nouanthong P, Vongphachanh B, Reinharz D, Muller CP, Black AP. *Am J Trop Med Hyg*. 2020 Jul;103(1):164-168.

High seroprevalence of Foot and Mouth Disease in Laos: call for nationwide vaccination campaigns and disease surveillance. Kinnaly Xaydalasouk, Nouna Innoula, Vannaphone Putthana, Korakan Chanthavongsa, Chantal J. Snoeck, Judith M. Hübschen, Phommy Oudomphone, Bouangeun Chan, Claude P. Muller, Antony P. Black, Sisavath Pommasichan, Maude Pauly. *Transboundary and Emerging Diseases*. In Press.

Hepatitis B virus in Lao dentists: a cross-sectional

serological study. Bouasone Mangkara, Kinnaly Xaydalasouk, Phetsavanh Chanthavilay, Sengchanh Kounnavong, Somphou Sayasone, Claude P. Muller, Phimpha Paboriboune, Antony P. Black. *Annals of Hepatology.* In Press

Timeliness of immunization with the pentavalent vaccine at different levels of the health care system in the Lao People's Democratic Republic: a cross-sectional study. Sengdavanh Syphan Dalouny Xayavong, Anousin Homsana, Daria Kleine, Phetsavanh Chanthavilay, Phonethipsavanh Nouanthong, Kinnaly Xaydalasouk, Outavong Pathammavong, Somsay Billamay, Anonh Xeuatvongsa, Daniel Reinharz, Antony P Black, Claude P. Muller. *Plos One.* In Press

Financial support

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Siriphone Virachith has received support from Inter-Pasteurian Concerted Actions (ACIP) for the study of "Clinical significance of cellular nucleases in hepatitis B virus chronic infected individuals" in 2020. The COVID-19 serostudy was funded by the Institut Pasteur in Paris, under the "ECOMORE II" project. Our partners include Luxembourg Development Cooperation, Lao National Immunisation Programme, Lao University of Health Sciences, Faculty of Agriculture at the National University of Laos, Lao Tropical and Public Health Institute, Lao Red Cross and various hospitals nationwide.



Bounta
Vongphachanh (IPL
staff) collecting
blood for
participant in
COVID-19
serostudy,
Mitthaphab
Hospital,
Vientiane Capital



Siriphone
Virachith (IPL
staff) giving
extensive pre-
field work
training for
COVID-19 study to
LTPHI students
and University of
Health Sciences
staff

Team:

Scientists:

1. Dr. Phonethipsavanh Nouanthong
2. Dr. Siriphone Virachith

Junior scientists:

1. Dr. Vilaysone Khounvisith

Technicians:

1. Latdavone Khenkha
2. Bounta Vongphachanh
3. Nouna Innoula
4. Nampherng Xayyavong

Project carried on in the lab

- +Hepatitis B virus in Lao Blood donors: a nationwide serostudy
- +Hepatitis B virus in Lao dentists: a cross-sectional serological study
- +Timeliness of immunization with Diphtheria-Tetanus-Pertussis

whole cell–Hepatitis B– *Haemophilus influenzae* Type B at
different levels of the health care system in the Lao People’s
Democratic Republic: a cross sectional study
+Pertussis in Lao PDR: Seroprevalence and disease