

Threat Reduction Network *on* **Rickettsial Pathogens**

Focus Area Working Group Meeting • Chiang Rai, Thailand

Final Report
December 2019





Handling Instructions

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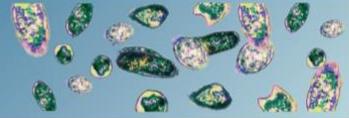
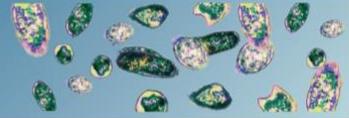


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Executive Summary

On November 7, 2019, the Defense Threat Reduction Agency, Biological Threat Reduction Program, sponsored a meeting of the Threat Reduction Network on Rickettsial Pathogens (TRN-RP) in Chiang Rai, Thailand. The meeting followed the Second Asia-Pacific Rickettsia Conference (APRC2), hosted by the Mahidol-Oxford Medical Research Unit (MORU). The meeting's goals were to provide progress reports on work being conducted by the TRN-RP Working Groups, hear updates from MORU on development of the TRN-RP database, and welcome new members into the group. The meeting's objectives and agenda were developed during a TRN-RP Working Group meeting in August 2018.

TRN-RP members possess diverse expertise, including in infectious disease and entomology. They represent various organizations, including:

- MORU
- University of Malaysia
- U.S. Naval Medical Research Unit-2 detachment in Cambodia (NAMRU-2)
- Armed Forces Research Institute of Medical Sciences (AFRIMS)
- Uniformed Services University of Health Services (USU)
- U.S. Centers for Disease Control and Prevention (CDC)
- Mahidol University in Thailand
- Lao-Oxford-Mahosot Hospital Wellcome Trust Research Unit (LOMWRU)
- Navy Medical Research Center (NMRC)

*Denotes new member's organization.

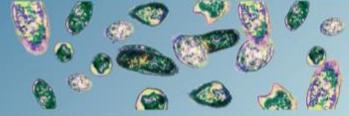
In addition to adding new disciplinary expertise, the meeting served to scope out future activities to advance the TRN-RP's objectives for 2020.

New experts were invited to the TRN to explore innovative ways to overcome the poor understanding of Rickettsial pathogens' distribution. Dr. Assaf Anyamba, a biospheric scientist from NASA Goddard Space Flight Center, demonstrated how climate variability impacts disease outbreaks – which is key to understanding the changing landscape of Rickettsial vector distribution. And Dr. Alan Hitch, a predictive disease modeler from UC Davis, discussed his work on the relationship between habitat and vector distribution and how changes within this dynamic can affect Rickettsia reservoir locations.



Figure 1 Volunteer Members of the TRN-RP Working Group Meeting

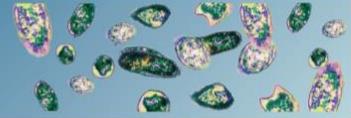
- National Aeronautics and Space Administration (NASA)*
- Philipps University of Marburg*
- Liverpool University*
- University of Sao Paulo*
- Institut Pasteur du Laos (IPL)*



Existing experts shared their Working Groups' progress from the past 14-months and identified areas for growth in the coming year. The four Working Groups seek to (1) establish field sampling protocols; (2) organize a website / communications platform; (3) determine foci for baseline literature reviews; and (4) survey existing diagnostics and protocols. Updates for each group are located in the [Meeting Outcomes](#) section of this report. The groups also discussed remaining gaps in the TRN-RP, as well as in the Rickettsia field. From these discussions, the group determined that the lack of effective diagnostics remain the most critical concern for the TRN and that it is necessary to develop an accurate disease distribution and risk map for Rickettsial diseases. Additional gaps were identified and incorporated into the Working Groups' focus areas, also detailed in the [Meeting Outcomes](#) section of this final report. Two additional foci were identified for new Working Groups to address:

- Ongoing clinical and treatment issues
- Community engagement and communication of risk factors, disease prevention and treatment

Additional meeting outcomes include agreement to meet more frequently in 2020 and commitment from BTRP to assist in trainings and additional expert discussions and forums. Overall, participant feedback about the meeting was positive and actionable for moving forward. Respondents thought the event was interactive and very valuable for networking. An in-depth readout from the meeting's discussions and outputs is found in the [Meeting Outcomes](#) section of this report.



Meeting Outcomes

On November 7, 2019, following with the Asia-Pacific Rickettsia Conference (November 3-6, 2019), volunteer experts from the Threat Reduction Network for Rickettsial Pathogens (TRN-RP) gathered in Chiang Rai, Thailand for a TRN-RP meeting. The following objectives were achieved:

- Convened experts updated the TRN-RP community on Working Group activity progress, specifically:
 - Provided an overview of the groups' priority and targeted areas of work;
 - Reviewed status of groups' activities – including previewing the Rickettsial Pathogens website and timeline to launch; and
 - Discussed next steps for accomplishing the groups' long-term goals.
- Participants identified and validated gaps / needs for the TRN-RP and discussed how to address them
- Participants identified timeline for 2020 TRN-RP meetings and Working Groups activities

Working Group Coordinating Instructions

The TRN-RP Working Groups were established with volunteer leads at the inaugural TRN meeting in Singapore, in March 2018 and their associated activities were identified during a Working Group meeting in Vientiane, Laos, in August 2018. Volunteers, self-nominated, discussed key areas for work during that meeting. For the 2019 Chiang Rai meeting, the Working Group leads were asked to present a brief background on their Working Group focus, update the group on their activities, and identify gaps that need to be addressed by the TRN. Event organizers provided reference material, a list of potential gaps, and other source material [[Annex 2](#)] to help facilitate discussions and to keep Working Groups moving towards the objectives.

Working Group Summaries

Working groups provided an overview of their objectives and presented and updated the TRN on their progress. For the purpose of this report, updates and outputs have been reformatted, removing acronyms and providing full names and references where applicable. The full slides presented at the end of the conference are provided in Appendix 1 of this report for reference.

WORKING GROUP 1
Objective: Establish protocols for field sampling and develop platform for communicating protocols
Leads: Jeff Hertz and Serge Morand
ACTIVITIES: (1) establish data collection and management processes for vectors; (2) collect and share keys and species distribution lists; (3) collect surveillance points of contact for each country; (4) establish repository for identification; and (5) conduct trainings
Update Working Group (WG) 1's tasks have largely been on hold while awaiting the completion of the Rickettsia website (WG 2). The WG agreed they need the platform to exist before they can



link data and review various protocols. In the meantime, the WG has been working to facilitate activities that will accelerate their work once the website is operational. They identified experts to serve as points of contact for surveillance in Southeast Asia (SEA). One contact includes, Deputy Director, Dr. Boripat Siriaroonrat, who is working on protocols in his position at the new Natural History Museum in Thailand.

The WG also held two exercises in March 2019. The first exercise was to improve ethical, efficient, and safe field and lab collecting and sampling protocols. The second was to improve Biosafety / Biosecurity standards for field work with the University of Malaya.

Gaps / Needs

Gaps / needs were identified by the WG prior to the TRN meeting. The WG presented on the gaps and then the larger TRN identified potential ways in which to address them.

- 1) Hold a forum/discussion on the Nagoya protocol in 2020. The Protocol seeks to create greater legal certainty and transparency for both providers and users of genetic resources by establishing more predictable conditions for access to genetic resources and by helping to ensure benefit-sharing when genetic resources leave the country providing the genetic resource.
 - a. *The TRN-RP agreed that the group will take the lead in better understanding the protocol and its impact on sharing information and samples.*
- 2) Address the lack of standardization with data both in SOPs and reporting, such that data sets can be aggregated to achieve broader understanding of the overall disease burden and risk. The Rickettsia website will be used as a central data repository and communication tool for this purpose.

WORKING GROUP 2

Objective: Transition melioidosis website and integrate other website data; and work with other groups to create webpage content plan

Leads: Nick Day and Parporn Pakdee-asa

ACTIVITIES: (1) develop website; (2) define content; and (3) determine governance and maintenance

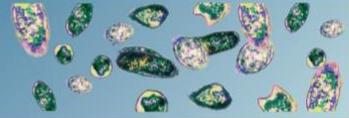
Update

WG 2 hired a full-time program manager, dedicated to the development of the Rickettsia website, for which the domain name: rickettsia.info has been secured. MORU contracted Parporn Pakdee-asa for this position. She has created and secured the domain name, built a framework for the website, and started collating data for the website's World Map.

Ms. Pakdee-asa noted three challenges: 1) standardizing requirements for data that feed into the map, 2) creating a methodology to clean existing data as well as actually cleaning data, and 3) overcoming these challenges and completing the website by the stated deadline of December 2020.

Gaps / Needs

Gaps / needs were identified by the WG prior to the TRN meeting. The WG presented on the gaps and then the larger TRN identified potential ways in which to address them.



- 1) Additional human resources for data curation and entry into the website.
- 2) Identification of researchers to contribute data and case reports.

A smaller TRN group will convene in early 2020 to address the two gaps raised by WG2.

WORKING GROUP 3

Objective: Set literature review foci and bounds

Leads: Kartika Saraswati

ACTIVITIES: (1) tabulation and mapping of global distribution of human typhus group graded by diagnostic evidence; and (2) tabulation and mapping treatment and outcomes (clinical trial, case series data) for (a) typhus group, (b) scrub typhus, and (c) spotted fever group

Update

WG 3 has developed a protocol template for the literature reviews, which is being used in the group's work.

Due to the breadth of the literature, WG 3 is initially targeting select reviews. These include:

- Scrub typhus distributed in Thailand and Indonesia
- Untreated murine typhus cases
- Erlichiosis treatment outcomes
- Neurological complications of Rickettsial pathogens in humans, including incidence, clinical features and diagnosis

Gaps / Needs

Gaps / needs were identified by the WG prior to the TRN meeting. The WG presented on the gaps and then the larger TRN identified potential ways in which to address them.

- 1) Additional human resources to conduct literature reviews.
- 2) A prioritization of the work to be conducted.

A smaller TRN group will convene in early 2020 to address the two gaps raised by WG3.

WORKING GROUP 4

Objective: Survey existing molecular and serological tests and survey available reagents and SOPs

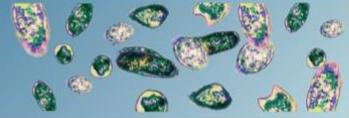
Leads: Stuart Blacksell, Cecilia Kato, Matt Robinson

ACTIVITIES: (1) assess various forms for diagnostics (Luminex, EQA molecular/serological diagnostics, biomarkers, etc.); and (2) identification of Southeast Asia biobank

Update

WG 4 has been actively working to identify improved diagnostics for Rickettsia.

- They have shared isolation and culture techniques within the Rickettsia community as well as with local institutions in SEA. In addition to sharing, they have been comparing and reviewing various techniques to identify an optimized method.



- To assist with these comparisons and evaluations, WG 4 shared protocols for isolation within the community to standardize methods.
 - LOMWRU will take a lead role in developing greater proficiency in lab diagnostic techniques while working to standardize SOPs.
- WG 4 is also evaluating different DNA extraction techniques.

Gaps / Needs

Gaps / needs were identified by the WG prior to the TRN meeting. The WG presented on the gaps and then the larger TRN identified potential ways in which to address them.

- 1) The lack of adequate vector isolation techniques.
- 2) Quality Assurance (QA) training for lab technicians.
- 3) Sample transport SOPs and training.
- 4) A reference database and/or biobank for Southeast Asia samples.

A smaller TRN group will convene in early 2020 to discuss locations for the trainings and content, as well as for an in-depth discussion on the Southeast Asia biobank.

Working Group Gaps

Working groups identified gaps during their updates – APRC2 also identified gaps, which meeting facilitators collated for the TRN’s review. The TRN reviewed and validated all gaps. TRN members then grouped gaps by theme and aligned them with the Working Groups, as seen in the figures below. Black coloring indicates a collated gap by meeting organizers, while red coloring indicates the TRN’s response to the gap and alignment within the TRN. Outcomes of the gap discussion are shown below:

GAPS/QUESTIONS FROM APRC2

<ul style="list-style-type: none"> • What factors determine a high risk area? – Yes – WG1 – new group <ul style="list-style-type: none"> • Niche mapping – where could <u>orientia</u> be? • What drives <u>orientia</u> genetic diversity? Yes – WG1 / WG4 – invite experts along! <ul style="list-style-type: none"> • Recombination and genome rearrangement in OT – how and why? • Birds and <u>orientia</u> 	<ul style="list-style-type: none"> • Species - Chigger identification – WG3 <ul style="list-style-type: none"> • Molecular barcoding? • MALDI-TOF? • Genetic epidemiology – who can be included for a new WG (genetic diversity + epi) <ul style="list-style-type: none"> • Diversity between species, locations, host/vector • Relationship to disease severity • Host factors? • Why do some species have vast genetic diversity & some none?
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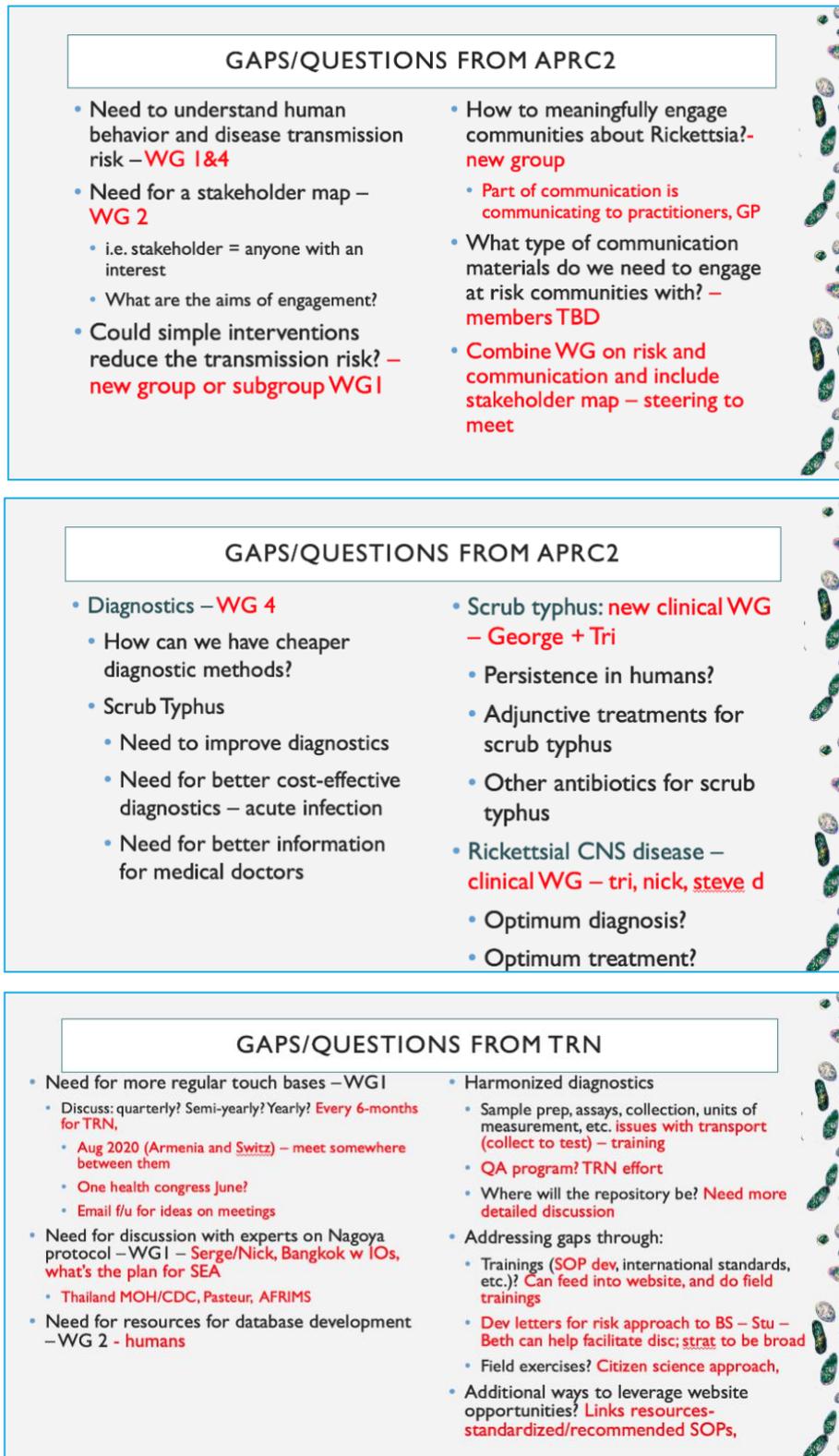
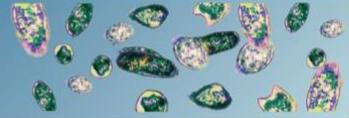
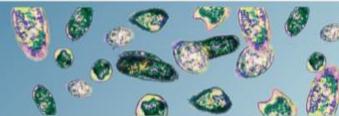


Figure 2 Gaps/Questions slides from TRN Meeting



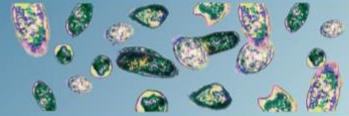
The TRN refined the collated gaps down to the following six areas:

1. *Orientia* genetic diversity – incorporated into WG 1
2. Species/chigger identification – incorporated into WG 3
3. Genetic diversity and epidemiology – incorporated into WGs 1 & 4
4. Scrub typhus and rickettsial central nervous system disease – *new WG*
5. Risk factors for disease transmission – *new WG*
6. Community engagement and communication – *new WG*

Gaps were incorporated into ongoing WG activities where possible. Those that did not readily align will be developed into new focus areas. The TRN saw the need for two new Working Groups. The first will be on “**Clinical Study and Treatment,**” which will be led by Drs. Tri Wangrangsimakul, Nick Day, and Stephen Dumler. The second will be on “**Risk Factors, Communication, and Community Engagement,**” which will be led by experts the TRN-RP steering committee identify.

In addition to research and scientific gaps, the group discussed gaps within the TRN and its community. Gaps and associated mitigation, as determined by the TRN, include:

Identified Gap	TRN Determined Mitigation
Need for more frequent TRN meetings	TRNs to be held semiannually
Need for more frequent WG meetings	Meetings to be held in alternating 6-month timeframe from TRN meetings
Discussion with experts on Nagoya protocol	Serge Morand and Nick Day volunteered to be the points of contact and help organize
Training on sample transport, from collection site to test point	BTRP to organize training series
Quality assurance program/training	BTRP to organize training series – to be led by TRN members
Follow-up discussion on a SEA biobank/reference database	Half day meeting (<i>potentially separate meeting</i>) to be added to next TRN meeting
Need to develop SOP for sample collection and incorporate them into the website	SOP discussion to be held at upcoming WG meeting
Need to encourage international community to adopt a risk-based approach to biosafety and eliminate the proliferation of BSL3 labs	Stuart Blacksell will facilitate TRN members sending letters to officials, following the publication of the new WHO guidelines
Need to identify links and resources to include on Rickettsia website	Follow-on discussion at next WG meeting



Working Group Conclusions

At the end of the meeting, the TRN concluded that they had achieved their objectives. New TRN attendees were told they will be required to join Working Groups in the coming weeks to be granted full entree into the TRN-RP community. The meeting concluded with a recap of the day, highlighting the newly formed Working groups, Clinical Study and Treatment and Risk Factors, Communication, and Community Engagement. The TRN community agreed to meet semi-annually to keep the momentum from workshop meetings.

Participant Feedback

An after-event survey was sent to TRN members who participated in the November meeting to collect feedback on the meeting and thoughts on the TRN itself. Members were asked the following questions:

1. How clear were the objectives of this workshop?
2. Is this your first interaction with the Rickettsial-Pathogen TRN?
3. Would you say that this meeting was interactive?
4. How much of the information presented at this meeting was new to you?
5. In terms of your research, how valuable was the networking opportunity of this meeting?
6. Overall, how satisfied were you with the event?
7. Did you make any new connections at this event that you will follow-up with for professional questions or projects?
8. As a researcher, what would you like to see as additions to the Rickettsial Pathogens TRN Website?
9. Other than funding, what do you think is necessary for sustaining research-based networks?
10. Do you have any other comments / suggestions that would help us make future BTRP-funded TRN activities better?

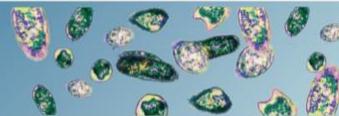
Nearly half of the participants (24/45) responded. Overall, the feedback was positive and constructive.

- Most respondents found the meeting's objectives to be clear (22/24)
- For over half the respondents, this was their first interaction with the TRN (14/24)
- All respondents thought the meeting was interactive (24/24)
- Most respondents thought some or all of the presented material was new (23/24)
- Most respondents found the meeting to be extremely valuable for networking (18/24)
- Nearly all respondents formed new connections because of the meeting (23/24)

Qualitatively, participants provided actionable suggestions to improve the TRN. They suggested that having regular in-person meetings will sustain the network. They suggested that "increased communication between members" would be useful in forming lasting relationships and creating a "platform for communication" could facilitate this. They also suggested having trainings and workshops to train researchers and clinicians in SEA.

Action Items and 2020 Schedule

Following the conclusion of the meeting, meeting facilitators reviewed the meeting proceedings, identified actions items, and created a 2020 TRN-RP schedule of activities.

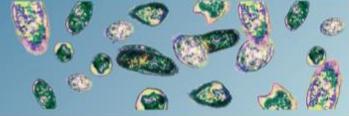


Action Items

- Update participant information and Working Group membership
- Communicate with new members to identify desired Working Group affiliation
- Work with Working Group leads to discuss how to incorporate newly added focus areas and what resources are required, if any
- Determine next date of full TRN meeting

2020 TRN-RP Schedule

Month	Meeting/Activity	Objectives
February	Steering Group meeting	-Finalize objectives for new WGs; identify needed experts -Discuss website timeline and resources -Discuss how to move forward on Nagoya Protocol and SEA Biobank, to include outlining an agenda for both meetings/discussions -Discuss sample transport and quality assurance trainings, to include identifying trainers, targeting participants
March/April	Working Group meeting	-Formalize new WGs and objectives -Determine how to meet objectives -Discuss website, to include data collection/solicitation -Discussion on literature review prioritization -In depth discussion on how to move forward as a TRN
June	TRN meeting	-Group updates -Review of website status, to include feedback, solve lingering problems -SEA Biobank - potential for separate event -Nagoya Protocol expert discussion – potential for separate event
July	Sample Transport Training series 1	-From collection to testing, including packaging & cold chain
August	Initial Quality Assurance Training 1	-Standardize lab practices to meet International standards (ISO)
August / September	Working Group meeting	-Update on progress -Day on clinician SOP development – convene experts
October	Sample Transport Training series 2	-From collection to testing, including packaging & cold chain
November	Quality Assurance Training 2	-Standardize lab practices to meet International standards (ISO)
December	TRN Meeting	-Website launch and utility discuss -Training planning coordination -Update of WG progress



Network Overview

Defense Threat Reduction Agency, Biological Threat Reduction Program (DTRA BTRP) is sponsoring a disease surveillance Threat Reduction Network (TRN) to mitigate the threat of rickettsial pathogens of security concern in Southeast Asia. This threat reduction network aims to identify and connect interdisciplinary expertise, convening an agile group to adapt to a wide spectrum of arising challenges and threats.

Background

Rickettsial pathogens are under-recognized with wide distribution across Southeast Asia and are considered some of the most understudied emerging and re-emerging diseases. While not on the World Health Organization's list of neglected tropical diseases, they account for the second most frequently reported infections for non-malarial febrile illnesses among residents in the region (dengue ranks as the first). Rickettsial infections are difficult to treat and if left untreated can have fatality rates as high as 30-45 percent. Thus, rickettsial pathogens pose a significant global threat; BTRP employs the TRN to dramatically minimize this threat nationally, regionally, and globally.

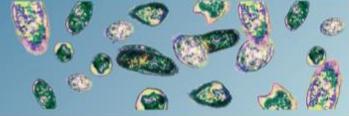
BTRP plans to facilitate a series of discussions and workshops to identify current research, discuss critical needs, and prioritize gaps and needs for the rickettsial research and at-risk communities (which include U.S. and Coalition forces). BTRP will assist the TRN-RP with developing short and long-term work plans to meet identified requirements. Other U.S. Government agencies and non-governmental entities with an invested interest in the output of the network are invited to observe and advise on the TRN-RP sustainment goals.

The BTRP mission limits its funding to research for pathogens of security concern that are listed on the U.S. Select Agent List; however, in the case of rickettsial agents, national and international policy makers require better characterization and understanding of the full scope of geographical distribution, for the entire genus of *Rickettsia*, to produce better diagnostics and standards of practice. To this end, TRN-RP focuses on all rickettsial and related rickettsial pathogens with a heavy emphasis on *Rickettsia typhi* (typhus group), *Rickettsia prowazekii** (typhus group), *Rickettsia rickettsii* (spotted fever group), *Orientia tsutsugamushi*, and *Coxiella burnetii**. (*Indicates a US Department of Health and Human Services and Department of Agriculture Select Agent. <https://www.selectagents.gov/selectagentsandtoxinslist.html>)

TRN-RP Network Objectives

The network established and refined the following network objectives to guide the development of short and long-term projects and activities.

- Convene multi-disciplinary researchers, health implementers, policy makers, and funding authorities to identify and prioritize *Rickettsia* research needs and gaps



- Characterize the distribution and prevalence of rickettsial pathogens and their vectors in Southeast Asia to better understand and address the human and animal health burden using statistical analysis and other best practices for assessing the global burden of other neglected infectious diseases
- Employ, monitor, and evaluate the consistent use of “gold standard” diagnostics and community accepted case definitions to determine if better standards are needed for detection in lab and clinical settings
- Increase awareness for *Rickettsia* amongst at-risk populations, clinicians, laboratory staff, national decision makers for better prevention, detection and response

TRN-RP Network Output

The TRN-RP organizers have set the following metrics as indicators of success for its efforts. These “end-states” in addition to the Network Objectives should guide all activities and projects for the TRN-RP.

- Characterization of geographical distribution of rickettsial pathogens and their vectors, to include vectors and reservoir hosts in Southeast Asia (and beyond)
- Understand pathogen diversity and the full spectrum of rickettsial disease epidemiology in Southeast Asia (and beyond)
- Improved or enhanced technology for diagnostics
- Improved access to accurate and affordable diagnostics and countermeasures
- Improved or enhanced standard operating procedures for diagnostics and clinical recognition
- Increased interest in *Rickettsia* research
- Improved global surveillance

TRN-RP Focus Areas

Focus Area 1: Regional Risk and Burden

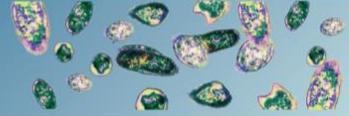
Epidemiological studies of the disease have not fully captured the prevalence and variance of rickettsioses throughout Southeast Asia. This focus area may:

- Conduct consolidated studies across the region
- Define at risk locations and populations
- Research regional burdens and economic impact of infections

Focus Area 2: Detection and Diagnosis

The most commonly used tests to diagnose *Rickettsia* infections lack sensitivity and specificity and are not particularly useful for acute diagnosis in an endemic setting; however, they are commonly employed because they are the cheapest and quickest option for low-resourced settings. This focus area may:

- Survey available diagnostics

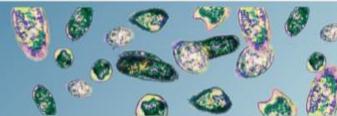


- Test and evaluate current diagnostics
- Survey national case definitions for rickettsial pathogens

Focus Area 3: Pathogenicity and Immune Response, Treatment, and Prevention

Clinical recognition is a challenge due to vast variability and non-specific presentation of symptoms for rickettsial infections. This focus area may:

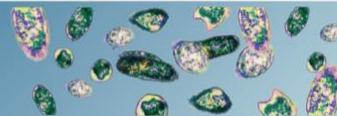
- Research human susceptibility
- Research current and new treatments
- Research host-pathogen interaction
- Research pathogen diversity for vaccine development



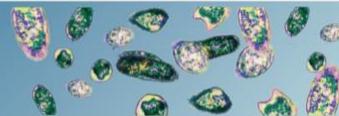
Annex 1: Agenda

November 7, 2019

0830 – 0900	Registration
0900 – 0920	<p>Welcome and Introductions <i>Martha Stokes, Biological Threat Reduction Network</i> <i>Nick Day, Director of Mahidol Oxford Tropical Medicine Research Unit</i></p>
0920 – 0930	<p>Overview of the Network <i>Martha Stokes, Biological Threat Reduction Network</i></p>
0930 – 1000	<p>Group 1 – Standardizing Field Sampling Protocols <i>Jeffrey Hertz and Serge Morand</i></p> <p>Objective: provide an overview of the group's key areas of work, status on activities, and way ahead for accomplishment of its objective to establish protocols for field sampling and develop platform for communicating protocols.</p> <p>0930 – 0950 – Presentation 0950 – 1000 – Questions and Answers</p>
1000 – 1030	<p>Group 3 – Literature Review <i>Kartika Saraswati</i></p> <p>Objective: provide an overview of the group's key areas of work, status on activities, and way ahead for accomplishment of its objective to set literature review foci and bounds.</p> <p>1000 – 1020 – Presentation 1020 – 1030 – Questions and Answers</p>
1030 – 1045	Tea Break
1045 – 1130	<p>Group 4 – Surveying Existing Molecular and Serological Diagnostics <i>Stuart Blacksell, Matt Robinson, and Cecilia Kato</i></p> <p>Objective: provide an overview of the group's key areas of work, status on activities, and way ahead for accomplishment of its objective to survey existing molecular and serological tests and survey available reagents and SOPs.</p> <p>1045 – 1120 – Presentation 1120 – 1130 – Questions and Answers</p>
1130 – 1240	<p>Group 2 – Rickettsial Pathogens Website <i>Nick Day and Parporn Pakdee-asa</i></p> <p>Objective: provide an overview of the group's key areas of work, status on activities, and way ahead for accomplishment of its objective to develop a website.</p>



	<p>1130 – 1220 – Presentation and live demonstration 1220 – 1240 – Questions and Answers</p>
1240 – 1400	Group Photo and Lunch
1400 – 1430	<p>Climate Variability and Disease Outbreak Patterns <i>Assaf Anyamba</i></p> <p>Objective: Geographic Information Systems analyze location by layering data and 3D displays, certain applications could inform disease surveillance efforts. During this presentation, Dr. Anyamba will discuss his experiences incorporating GIS applications for disease surveillance of Rift Valley Fever in South Africa and discuss potential applications for other diseases with climate associated drivers.</p> <p>1400 – 1420 – Presentation 1420 – 1430 – Questions and Answers</p>
1430 – 1500	<p>Bridging the Gap between Reservoir Ecology and Pathogen Occurrence <i>Alan Hitch</i></p> <p>Objective: The relationship between habitat and species distribution changes can affect where rickettsia reservoirs occur. Dr. Hitch will speak to the effects of climate change / land use change on species occurrences and distributions. He will describe the CamBatRat project (funded by BTRP), which started (on the reservoir ecology side) with the question: how does climate change / land use change affect species distribution and subsequently pathogen distribution?</p> <p>1430 – 1450 – Presentation 1450 – 1500 – Questions and Answers</p>
1500 – 1520	Tea Break
1520 – 1645	<p>Open Discussion – Gaps and Needs for the Network</p> <p>Objective: Poll the audience with a series of questions about the objectives of the network. Inquire of them whether or not we are moving in the right direction, are there areas that we are not covering? Are there individuals that we should be including? Is a network necessary?</p>
1645 – 1700	Meeting Close-out
1700 – 1730	Closed-door Meeting with MORU and Steering Committee (e.g., working group leads) on Next Steps for the Network



Annex 2: TRN-RP Source Material for Focus Area Working Groups

The following information, which includes questions, resources, and output from previous meetings, was provided to help each group start discussions for projects they identified at a previous Strategy Development meeting in Singapore (March 2018).

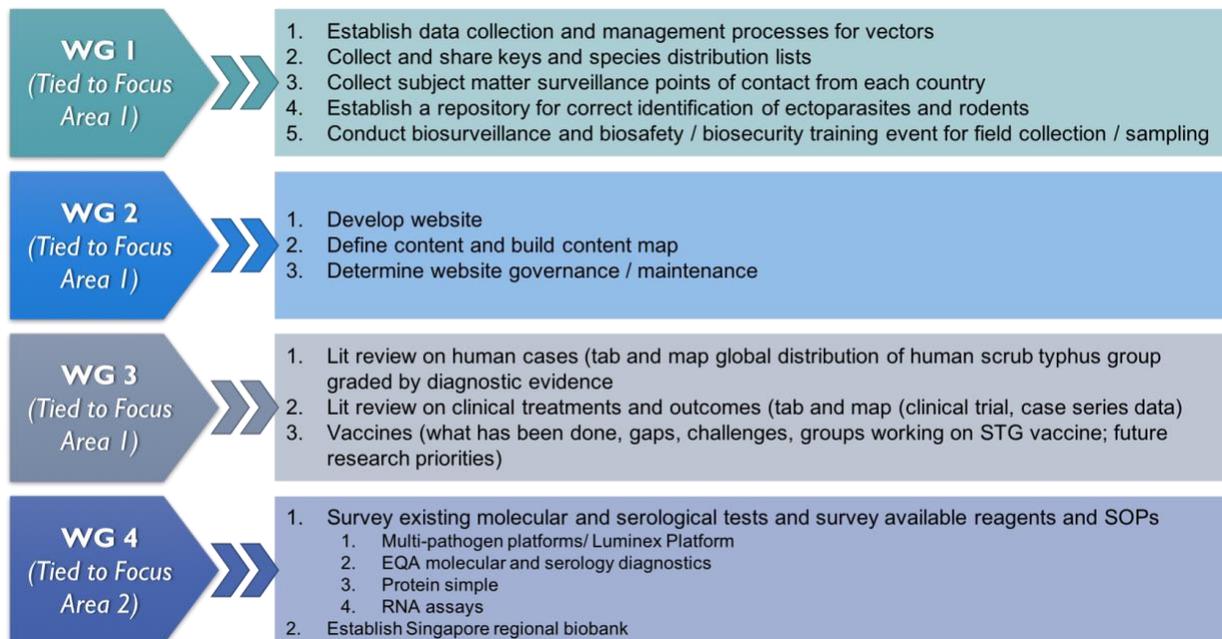


Figure 2 TRN-RP Working Group summary; each group is tied to the focus area of the TRN

Working Group 1

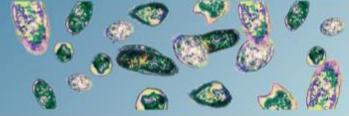
Objective: Establish protocols for field sampling and develop a platform for communicating protocols

Members: Hertz, Davidson, Bakar, Robinson, and Moran

Proper field sampling is required for documentation and preservation. Therefore, protocol for field sampling and communication of these protocols is necessary. The result of this Working Group meeting will be a brief-out of a workplan (including milestones, responsibilities, etc.) for which the group will be responsible for reporting the progress on at our November meeting.

Key Questions:

- *What information is needed to form a detailed sampling protocol?*
- *What are the preferred methods of collecting and sampling?*
- *Are there risks of contamination that should be considered?*
- *What safety procedures should be considered?*



- *How can the protocol be communicated effectively? What delivery method should be used?*

Resources

- Tick-, mosquito-, and rodent-borne parasite sampling designs for the National Ecological Observatory Network: <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.1271>
- Field Sampling Guide: <https://www.aabb.org/tm/eid/Documents/184s.pdf>

Working Group 2

Objective: Transition melioidosis website and integrate other website data

Members: Stokes, Day, and Richards

Transition of information and the development of a website database is key for communication of the TRN's objectives. Therefore, the transition of the *melioidosis* website and development of a similar rickettsial database is necessary. The result of this Working Group meeting should be a brief-out of a workplan (including milestones, responsibilities, etc.) for which the group will be responsible for reporting the progress on at our November meeting.

Key Questions

- *What information needs to be transitioned from the melioidosis website?*
- *What kind of information database and what information needs to be collected for the Rickettsial Pathogen group?*
- *Who will be responsible for gathering and collecting the information? Who will long term be responsible for updating the information?*
- *What platform would be beneficial for this information (database, discussion boards, etc.)?*

Resources

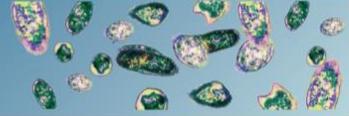
- Melioidosis Website: <http://www.melioidosis.info/infobox.aspx?pageID=101>
- Developing a Sitemap: <https://onlinestrategy.gwu.edu/developing-sitemap>
- Examples of Sitemaps: <https://realtimeboard.com/examples/sitemap/>

Working Group 3

Objective: Set literature foci and bounds

Members: Saraswati, Dumler, Newton, and Tuttle

A literature review will provide valuable data to establish needs and gaps in the Rickettsial Pathogen field. Setting literature foci and bounds is key for to establishing the goals of TRN and identifying what next steps are needed to sustain the group. The result of this Working Group



meeting will be a brief-out of a workplan (including milestones, responsibilities, etc.) for which the group will be responsible for reporting the progress on at our November meeting.

Key Questions

- *What is the purpose of goal of reviewing Rickettsia literature for this TRN?*
- *What has been established and accepted in the Rickettsial Pathogen field?*
- *What areas of controversy or conflict are there?*
- *What gaps/needs are we aware of and/or should focus on?*
- *What are new approaches or emerging trends?*
- *What types of literature will we focus on (empirical studies, journals, government reports, etc.)?*

Resources

- Literature Review Steps: <https://www.monash.edu/rlo/graduate-research-writing/write-the-thesis/introduction-literature-reviews>
- Organizing a Literature Review: https://www.dcu.ie/sites/default/files/students_learning/scientific_lit_review_workshop_u.g.pdf

Working Group 4

Objective: Survey existing molecular and serological test and survey available reagents and SOPs

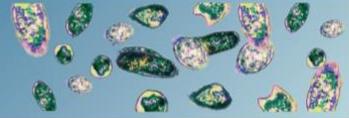
Members: Kato, Richards, Duggan, Robinson, Blacksell, Stenos, Abdad, and Dutt

Surveying existing molecular and serological test as well as available reagents and SOPs will be necessary in order to establish what gaps exist. By establishing a working database of molecular and serological test, reagents, and SOPs the TRN can work to address gaps and maintain a continuous database of new research. The result of this Working Group meeting will be a brief-out of a workplan (including milestones, responsibilities, etc.) for which the group will be responsible for reporting the progress on at our November meeting.

Key Questions

- *What molecular and serological test, reagents, and SOPs are currently available?*
- *What gaps or needs are there for these tests, reagents and/or SOPs?*
- *Is there current research into tests, reagents, or development of SOPs that should be considered?*
- *What type of database or collection would be necessary to survey the available tests, reagents, and SOPs?*
- *Who is responsible for collecting and maintaining the information?*

Resources



- State of the art of diagnosis of rickettsial diseases: the use of blood specimens for diagnosis of scrub typhus, spotted fever group rickettsiosis, and murine typhus: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5029442/>
- Assessment of Real-Time PCR Assay for Detection of Rickettsia spp. and Rickettsia rickettsii in Banked Clinical Samples: <http://jcm.asm.org/content/51/1/314.full>
- Molecular detection of Rickettsia bellii and Rickettsia sp. strain Colombianensi in ticks from Cordoba, Colombia: <https://www.ncbi.nlm.nih.gov/pubmed/24378078>
- Evaluation of a new serological test for the detection of anti-Coxiella and anti-Rickettsia antibodies: <https://www.ncbi.nlm.nih.gov/pubmed/26432518>