Regional Laboratory Network Workshop on Strengthening of the Laboratory and Field Epidemiology Linkage

20 – 31 May 2013

Bangkok, Thailand

Summary Report

Contents

1. List of Acronyms

AAHL	Australian Animal Health Laboratory
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPT	Emerging Pandemic Threat Programme
FAO	Food and Agriculture Organization of the United Nations
HPAI	Highly Pathogenic Avian Influenza
HPEDs	Highly Pathogenic Emerging Diseases
OIE	World Organization for Animal Health
pH1N1	Pandemic Influenza A H1N1 2009
PPE	Personal Protective Equipment
SARS	Severe Acute Respiratory Syndrome
TADs	Transboundary Animal Diseases
USDA	United States Department of Agriculture
USAID	United States Agency for International Development
WHO	World Health Organization

2. Executive Summary

The training workshop program (Appendix 1) was designed to provide participants from each 'sector' (laboratory and field/epidemiology) with a better understanding of the activities and responsibilities of their counterparts in the other sector. The training covered diagnostic test evaluation, steps in outbreak investigation, quality assurance, surveillance planning, test interpretation, diagnostic assays, biosafety, laboratory information management systems (LIMS), quality assurance, proficiency testing, sample handling and transport and test validation. The training combined lectures with a number of disease investigation and surveillance scenarios using the regional diagnostic algorithms (Influenza, Classical Swine Fever (CSF), Foot and Mouth Disease (FMD)) highlighting the importance of linkages and communication between sectors, with participants from each sector working together and in their own sectors to better understand each other's responsibilities and the advantages of working together for disease control. Additionally a visit to the Chonburi Laboratory (Eastern Veterinary Research and Development Centre) was incorporated into the schedule and included lectures and discussions on user experience with LIMS, sample handling and a tour of the laboratory facilities.

The workshop concluded with a 4-way linkage scenario which was based on a outbreak of H5N1 in humans (human/animal health/laboratory/epidemiology). This scenario has previously been conducted in Vietnam and Indonesia, but was augmented with additional diagnostic test results and a H7N9 component. The scenario was an ideal conclusion to a workshop on inter-sector collaboration, and it was evident that even more detail and components can be added to it if it is again used in this format, thereby drawing even further upon the knowledge gained throughout the workshop.

The training activities also represented a unique inter-sector and inter-country networking opportunity. On conclusion of the workshop it was clearly apparent to the facilitators that the participants had successfully established contacts - synergistic relationships that will undoubtedly form the basis of a sustainable and long-term professional collaboration in the region.

The workshop was well received by all participants and formal feedback confirmed that the ambitious schedule of activities was highly successful. AAHL staff, with the assistance of FAO staff as facilitators, acted as trainers and mentors and very successfully engaged with all the course participants – individuals who are likely to become their country's leaders in the field of animal health.

The concept note and all training workshop materials have been supplied with this report as attachments. ***The Influenza 4 way linking scenario and workshop scenarios are for internal information and use only and are to be kept in-house and not distributed so this material can be used again.***

3. Background

Organisms circulating in the domestic and wild animal populations can potentially pose a threat to both animal and human health as the relationship between animal infectious diseases and emerging human diseases is now well established. The changes in ecosystems resulting from human activity may result in the emergence and spread of novel pathogens coupled with the increased risk of exposure to previously unknown pathogens resulting from increased human activities in areas that are only sparsely populated. The impact of these Highly Pathogenic Emerging Diseases (HPEDs) on health and livelihoods, either in humans or livestock, cannot be exaggerated as seen from Severe Acute Respiratory Syndrome (SARS), Highly Pathogenic Avian Influenza (HPAI) and pandemic H1N1 influenza. Because the majority of emerging diseases in humans originate from animals, both the animal health and human health sectors have an interest in, and responsibility for, monitoring and controlling these pathogens.

Many parts in Asia have shown to be hotspots of HPEDs due to a variety of contributing factors. The region has the highest rate of human and animal population growth in the world. The farming systems are rapidly intensifying with often poor biosecurity. Forests are being rapidly encroached and large populations of domestic livestock and dense human populations are increasingly coming into close contact with wild animals and their alien pathogens. Thus, it is expected that HPEDs with epidemic and pandemic potential in animals and humans will regularly emerge in the region, threatening the global community. While HPEDs may emerge in any one of the countries in the region, it is imperative that HPEDs are addressed on a regional basis given their transboundary nature.

Using a One-Health Approach, the World Organization for Animal Health (OIE), the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) are coordinating global activities to address health risk at human-animal-ecosystem interface through multi-sectoral cooperation and strong partnership. Currently, two programs allow the tripartite organization (FAO, OIE, WHO) to address emerging infectious diseases in Asia including the Emerging Pandemic Threat Program (EPT) supported by the United States Agency for International Development (USAID) and the Regional Collaborative Program on HPEDs supported by the European Commission. Despite different approaches to addressing emerging infectious diseases, both programs recognize the significance of the Regional Laboratory Network (RLN) in supporting surveillance and response to disease outbreak.

The Food and Agriculture Organization of the United Nations (FAO) is providing technical assistance to the member countries in Asia on the regional laboratory capacity building programme which aims to assist the national laboratories within the region in fulfilling their roles and responsibilities related to diagnosis and reporting of the occurrence of the animal and/or potentially zoonotic diseases in a reliable and timely manner. In Southeast Asia (SEA), the FAO programme for strengthening of veterinary diagnostic services has been implemented through the existing SEA RLN Framework. The

main technical objectives of the laboratory capacity building programme are to 1) strengthen laboratory diagnostic capacity; 2) assure the quality of laboratory services; 3) improve laboratory biosafety; and 4) facilitate laboratory networking at national and regional level. The FAO regional laboratory capacity building programme is supported by the United States Agency for International Development Emerging Pandemic Threat Programme (USAID-EPT, IDENTIFY) and the European Commission Regional Collaborative Programme on Highly Pathogenic Emerging Diseases (EU-HPED).

Quality laboratory services require adequate laboratory capacity, as well as effective communication between the field and laboratory staff. Efficient linkage between the laboratory and field epidemiology components is essential for both effective surveillance and outbreak response activities. Recognizing the importance of the linkage between veterinary field epidemiology and laboratory components, FAO, in collaboration with the Australian Animal Health Laboratory (AAHL), conducted the Regional Laboratory Network Workshop on Strengthening of the Laboratory and Field Epidemiology Linkage. The laboratory-field linkage workshop provided an opportunity to incorporate the necessary patterns of communication between the two groups through the use of scenarios structured to encourage appropriate interaction and understanding. The workshop also provided an overview of appropriate selection of samples and diagnostic tests, as well as the application of test results to surveillance and outbreak investigation. Emphasis was placed on the importance of linkage between laboratory and epidemiology field staff for the effective planning and implementation of surveillance and outbreak investigation activities as well as communication to strengthen the linkage between the laboratory and field epidemiology staff at the country level.

4. Objectives

1. To foster appreciation for the communication required between laboratory and epidemiology field staff for the effective planning and implementation of surveillance and outbreak investigation activities.

2. To enhance the understanding of current diagnostic tests including the selection of appropriate assays and associated sample requirements.

3. To further the competency of participants in the interpretation of diagnostic test results and how this relates to the assessment of risk and subsequent decision making or provision of policy advice.

5. Dates and Venue

20 – 31 May 2013

Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand

6. Participants

Twenty-five participants (See Appendix 2 for List of Participants) - a roughly equal split of veterinary laboratory and field epidemiology staff - were nominated by the national animal health services from the Regional Laboratory Network. The nominated people met the following criteria:

- Age between 25 - 45 years old
- Hold at least a Bachelor Degree in Veterinary Medicine or equivalence
- Have at least 5 years of practical working experiences in veterinary laboratory diagnosis or veterinary epidemiology or related fields
- Epidemiologists with background of the field epidemiology training program are highly preferred.
- Have his/her current assignment in national veterinary institution
- Recommended by his/her superior at the national government
- Demonstrate proficiency in English, such as certification of attendance in English courses or internally accepted English test score

7. Expected Outcomes

1. Participants gain knowledge and understanding in the key features related to the laboratory-field epidemiology interface
2. Participants recognizing the importance of linkage between laboratory and epidemiology field staff for the effective planning and implementation of surveillance and outbreak investigation activities
3. Enhanced communication and linkage between the laboratory and field epidemiology staff at the country level

8. Main Findings

The training workshop provided participants from each 'sector' (laboratory and field/epidemiology) with a better understanding of the activities and responsibilities of their counterparts in the other sector. The workshop highlighted that there was a lack of understanding by each sector in what the other sector did and that better communication between the sectors would benefit both sectors and improve the surveillance and diagnostic testing carried out in each sector.

The training covered diagnostic test evaluation, steps in outbreak investigation, quality assurance, surveillance planning, test interpretation, diagnostic assays, biosafety, laboratory information management systems (LIMS), quality assurance, proficiency testing, sample handling and transport and test validation. It was clear that both sectors lacked the knowledge and skills in how to interpret laboratory results and how to use laboratory results and field data to improve disease control.

The training combined lectures with a number of disease investigation and surveillance scenarios using the regional diagnostic algorithms (Influenza, Classical Swine Fever (CSF), Foot and Mouth Disease (FMD)) highlighting the importance of linkages and communication between sectors, with participants from each sector working together and in their own sectors to better understand each other's responsibilities and the advantages of working together for disease control. The exercises again highlighted the need for both sectors to have further training in how to analyse laboratory results and in the use of field information in interpretation of laboratory results. The scenarios in particular, when participants were working in groups, highlighted to the facilitators and the participants the need for laboratory results to be looked at with field data but importantly the need for surveillance to be planned with the laboratory to ensure the correct tests are used and the capacity of the laboratory to deliver results in real time is important so gaps in field data can be followed up quickly.

The visit to the Chonburi Laboratory (Eastern Veterinary Research and Development Centre) discussed user experience with LIMS, sample handling and included a tour of the laboratory facilities. The visit highlighted the importance of a good information system for storage and access to data and laboratory results to allow compiling of data for reporting. It also gave the epidemiology participants a better understanding of the limitations in the laboratory for testing large number of samples.

The workshop concluded with a 4-way linkage scenario which was based on an outbreak of H5N1 in humans (human/animal health/laboratory/epidemiology). This scenario has previously been conducted in Vietnam and Indonesia, but was augmented with additional diagnostic test results and a H7N9 component. The scenario was an ideal conclusion to a workshop on inter-sector collaboration, and it was evident that even more detail and components can be added to it if it is again used in this format, thereby drawing even further upon the knowledge gained throughout the workshop. The scenario highlighted to the participants how they could use data and laboratory results they already have to investigate a new outbreak and that communication between sectors allows access to information that previously was not known to exist. Between sector communication and between laboratory and field offices at different levels (e.g. province, regional & national) was highlighted as a gap in countries that lead to duplication of surveillance activities in some cases and information about diseases not being shared. A better understanding of what each part of the animal health network in a country was doing through improved communication was critical to improved disease control.

9. Conclusions and recommendations

At the onset of the workshop participants identified the role and activities of their sector (epidemiology/field or laboratory) to the other group, and created a list of structural, technical and communication issues that impact on successful work relationships between the two groups. These included broad-ranging issues such as poor communication and variable laboratory expertise, to more specific factors such as the difficulty of successfully transporting samples from the field to the laboratory over long distances, lack of knowledge of the tests available and their sensitivity/specificity, uncertainty over the correct samples to take and the lack of accreditation of

some laboratories. These issues were revisited throughout the workshop as solutions were identified in response to presentations, activities and communication between the groups.

The groups also identified what information or services they required from the other sector. The field vets/epidemiologists listed a requirement for accurate results and a quick turn-around, in addition to factors suggested above such as tests available, samples to collect and information on the sensitivity/specificity of the tests. Participants from the laboratory sector identified the need for appropriate (good quality) samples, detailed outbreak information reports accompanying the samples, a schedule of planned submissions (particularly for surveillance), specific test requests and information about the conditions of sample storage.

By the end of the workshop participants understood and agreed on the need for regular communication between field staff, epidemiologists and laboratory personnel. The importance of collaboration between the sectors and the impact of this on improved outcomes for investigation of outbreaks and testing of surveillance samples was evident. Each group also had an enhanced understanding of and respect for the other group's responsibilities and the influence that each group has on the ability of the other to do their job effectively. As an example, whilst the field personnel require "accurate results" this is potentially impacted by the submission of inappropriate or poor quality samples.

In a practical sense, workshop participants developed relationships with their counterparts in other SE Asian countries and, perhaps more importantly, with participants of the other sector in their own country. An expected outcome of this is that participants now have not only an improved knowledge of the other sector's day-to-day activities, limitations and responsibilities, but they also have a key contact within the other sector with which they feel comfortable and confident in contacting.

Participants were required to answer a quiz before and after the workshop (Appendix 4). The mean score pre-workshop was 9.2/15, and this increased to 12.5/15 post-workshop. Evaluation and feedback from the group suggests that the format of mixed presentations and activities was well-received, with the mean overall score (out of a maximum score of 5) for Week 1 at 4, and at 4.2 for Week 2. The workshop evaluation questions are listed in Appendix 5 and comprehensive results of the evaluation are presented in Appendix 6. Overall, the use of activities and scenarios to reinforce knowledge gained during lectures was seen as a positive component of the course by both participants and facilitators. These group activities also strengthened collaboration and communication between participants.

The 4-way linkage scenario incorporated new elements (additional detailed disease investigation and surveillance test results and a H7N9 component) on top of the already established components previously used when running this as a stand-alone element in Vietnam and Indonesia *(WHO, FAO and OIE four-way linking project to address gaps in surveillance and control of both human and animal avian influenza, and improve cross-sectoral working to reduce the burden of human and poultry disease and to rapidly detect and respond to emergence of potentially human-infectious strains*) as part of the 4 way linking program in these countries. The scenario was well regarded by participants and received significant positive feedback. The facilitators noted that participants in this group were keen to use concepts that they had learnt earlier in the workshop, such as diagnostic

test interpretation and surveillance techniques. This provides scope for further additions to the scenario in the future.

As presenters, we hope that this workshop can be provided again within the region. In order to improve the workshop, the course material and activities can be fine-tuned and reviewed in response to participant feedback received. Given the objectives and nature of the workshop, it is considered essential that any further workshops maintain the approximately 1:1 laboratory:field/epidemiology ratio that made this course successful, preferably with both individual/s from both sectors available from each invited country. Two weeks was considered an appropriate period of time for presentation of this workshop, although it is possible that in specific circumstances it can be shortened, dependent on the background of participants. It would be possible to run the workshop for participants from one country only, although the inter-country collaborations resulting from this workshop are likely to be highly productive.

Whilst individual elements of the course material are perhaps suitable for presentation to one or the other sector, the aim of the workshop is to improve collaborations and understanding between the groups. The facilitators therefore do not recommend aligning the workshop specifically to laboratory OR field/epidemiology staff. The material also can be used in the 4-way linking concept already used in Vietnam and Indonesia both in regional and country training to improve communication and linkages between laboratory and field/epidemiology in human and animal health sectors, this workshop had a greater focus on what each sector did and in interpretation of both laboratory and field information and the advantages of linkages between the sectors in planning, implementing and in interpretation of results and data from disease investigation and surveillance.

With regards to numbers of training staff required to lecture/facilitate, it is recommended that if the workshop is to be maintained as a 2 week program, 3 people are required to present the lectures (absolute minimum of 2). This allows for appropriate coverage of the necessary areas of expertise. Additionally, alternating between presenters is considered beneficial for participants, particularly on days which encompass a significant theory component. Dependent on the number of participants, additional (in-country) facilitators may also be needed for assisting with group activities and with the 4-way linkage scenario. The extra facilitators at this workshop were extremely helpful and their assistance was greatly appreciated. The use of extra facilitators allows input from key FAO, WHO or CDC staff as well as from key regional and country experts who can take part as well as provide input into the program.

Appendix 1 Workshop Schedule

Week One Schedule

Day 1		Day 2		Day 3		Day 4		Day 5	
Mon 20		**Tues 21**		**Wed 22**		**Thurs 23**		**Fri 24**	
		8:30	Preview	**8:30**	Preview	**8:30**	Preview	**8:30**	Preview
		8:45	Applied Epi-Diagnostic Tests	**8:45**	Outbreak Investigation Scenario	**8:45**	Outbreak Investigation Scenario	**8:45**	Quality Assurance
		10:30	**Morning Tea**	**10:30**	**Morning Tea**	**10:30**	**Morning Tea**	**10:30**	**Morning Tea**
10:30	Facilitator Session	**10:45**	Applied Epi-Diagnostic Tests	**10:45**	Outbreak Investigation Scenario	**10:45**	Outbreak Investigation Scenario	**10:45**	Test Validation
12:30	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**
1:30	Registration Welcome and Introductions	**1:30**	Applied Epi-Diagnostic Tests	**1:30**	Outbreak Investigation Scenario	**1:30**	Outbreak Investigation Scenario	**1:30**	Proficiency Testing & Laboratory Networks
3:00	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**3:00**	**Afternoon Tea**
	Understanding Sectoral Needs	**3:15**	Field Investigation	**3:15**	Outbreak Investigation Scenario	**3:15**	Biosafety	**3:15**	Proficiency Testing Exercise
5:00	**End of Day 1**	**5:00**	**End of Day 2**	**5:00**	**End of Day 3**	**5:00**	**End of Day 4**	**5:00**	**End of Day 5**

Week Two Schedule

Day 6		Day 7		Day 8		Day 9		Day 10	
Mon 27		**Tues 28**		**Wed 29**		**Thurs 30**		**Fri 31**	
8:30	Travel to Lab	**8:30** **8:45**	Preview Serology/PCR	**8:30** **8:45**	Preview Planning a Surveillance Program	**8:30** **8:45**	Preview Lab- Epi Linkage Outbreak Scenario	**8:30** **8:45**	Preview Lab- Epi Linkage Outbreak Scenario
10:30	**Morning Tea**	**10:30**	**Morning Tea**	**10:30**	**Morning Tea**	**10:30**	**Morning Tea**	**10:30**	**Morning Tea**
10:45	LIMS Lab Tour	**10:45**	Test Algorithms	**10:45**	Planning a Surveillance Program	**10:45**	Lab- Epi Linkage Outbreak Scenario	**10:45**	Lab- Epi Linkage Outbreak Scenario
1:00	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**	**12:30**	**Lunch**
1:30	Sample Handling	**1:30**	Sequencing/ Next Generation	**1:30**	Interpretation of Surveillance Data	**1:30**	Lab- Epi Linkage Outbreak Scenario	**1:30**	Wrap Up/ Exit Survey
3:00	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**3:00**	**Afternoon Tea**	**2:30**	**End Day 10**
3:15 **4:15**	TDG Travel Home	**3:15**	Test Algorithms	**3:15**	Interpretation of Surveillance Data	**3:15**	Lab- Epi Linkage Outbreak Scenario		
6:15	**End of Day 6**	**5:00**	**End of Day 7**	**5:00**	**End of Day 8**	**5:00**	**End of Day 9**		

Appendix 2: List of Participants

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Appendix 4 Workshop Knowledge Questionnaire

Choose the Best Answer

1. What is term for the number of disease positive animals that test positive in a diagnostic test?
    a. Positive predictive value
    b. Diagnostic sensitivity
    c. Analytical specificity
    d. All of the above

2. Which of the following are advantages of a LIM system?
    a. Electronic Data Transfer
    b. Sample Tracking
    c. Time Tracking
    d. All the above
    e. None of the above

3. Which of these statements about biosafety and biosecurity is correct?
    a. Biosafety & biosecurity are only important in the laboratory
    b. PPE is an important part of biosafety
    c. BSL 3 laboratory is critical for handling H5N1
    d. Calibration of equipment is not important for biosafety

4. Which of these is not a step in an outbreak investigation?
    a. Develop working hypotheses
    b. Verify the existence of an outbreak
    c. Release test results to the media
    d. Establish a working case definition
    e. All of the above

5. Horizontal audits are more important than vertical audits?
    a. True
    b. False

6. Continual improvement is an important part of quality assurance?
    a. True
    b. False

7. What factors should be considered when determining the cut-off of a diagnostic test?
    a. The purpose for which the test is to be applied
    b. The desired sensitivity

c. The number of tests the laboratory is likely to run each year
d. Both a and b

8. When is validation important?
    a. In development of a new test
    b. During an outbreak
    c. When carrying out a diagnostic test
    d. When establishing a reference test for an external laboratory
    e. All of the above

9. Proficiency testing is an important aspect of maintaining test validation?
    a. True
    b. False

10. What of the following is an antigen detection test?
    a. PCR
    b. Direct ELISA
    c. Virus isolation
    d. All of the above
    e. None of the above

11. What is most important for surveillance for proof of freedom of disease?
    a. Sensitivity
    b. Specificity

12. What is important for disease investigation (investigation of disease)?
    a. Sensitivity
    b. Specificity

13. An animal was sick 3 weeks ago and you have been asked to do testing for a specific disease. You asked for:
    a. PCR
    b. Antigen ELISA
    c. Virus isolation
    d. Antibody ELISA
    e. All of the above

14. Packaging of samples from the field is unimportant if the samples aren't going on a plane?
    a. True
    b. False

15. When conducting surveillance the laboratory requires which of the following information?
    a. Species
    b. Location of sample collection
    c. Type of sample collected

d. Number of samples to be tested
e. All of the above
f. None of the above

Appendix 5 Workshop Evaluation

Please evaluate the case study by circling the number on the scale which corresponds to your opinion. Your written comments are greatly appreciated.

		Very Low	Low	Moderate	High	Very High
1.	Please rate the overall value of Week 2 of the Workshop.	1	2	3	4	5

2. Please rate the value of the following workshop components (headings) in increasing your understanding of linking field epidemiology and laboratory.

		Very Low	Low	Moderate	High	Very High
Day 6	Lab Tour	1	2	3	4	5
Day 6	LIMS	1	2	3	4	5
Day 6	Sample Handling	1	2	3	4	5
Day 6	Transport of Dangerous goods	1	2	3	4	5
Day 7	Serology /PCR	1	2	3	4	5
Day 7	Test Algorithms	1	2	3	4	5
Day 7	Sequencing Next Gen Tests	1	2	3	4	5
Day 8	Planning Surveillance	1	2	3	4	5
Day 8	Interpreting Surveillance	1	2	3	4	5
Day 9	Lab-Epi Linkage Scenario	1	2	3	4	5
Day 10	Lab-Epi Linkage Scenario	1	2	3	4	5

3. Which of the above components were the ***least*** beneficial? Why?

4. Which of the above components were ***most*** beneficial? Why?

5. In your opinion, what were the good points about the Week?

6. In your opinion, what was lacking in Week Two?

7. How would you improve the Week Two? What changes would you suggest?

8. Were you happy with the arrangements for group activities – in other words, are you happy that we kept the groups the same for the 2 weeks, or do you think it would be better to mix groups up for each activity?

9. Any other comments?

Appendix 6: Workshop Evaluation Results

Week 1

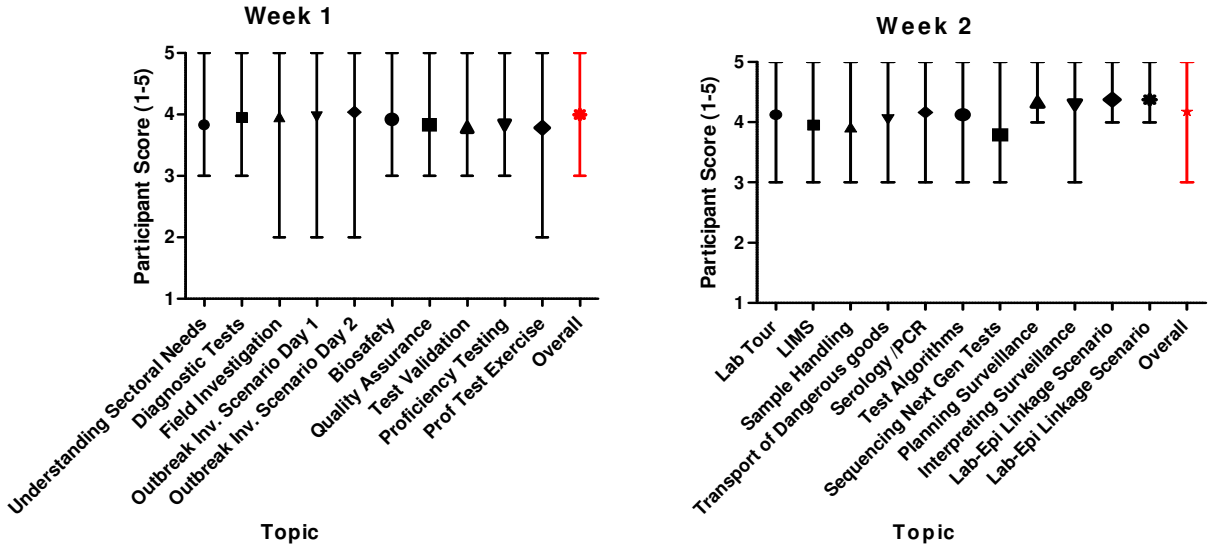
Score 1-5; 1 = very low, 5= very high

Day	Topic	Mean
Overall Week 1		**4**
1	Understanding Sectoral Needs	**3.83**
2	Diagnostic Tests	**3.96**
	Field Investigation	**3.96**
3	Outbreak Investigation Scenario 1	**3.96**
4	Outbreak investigation Scenario 2	**4.04**
	Biosafety	**3.92**
5	Quality Assurance	**3.83**
	Test Validation	**3.79**
	Proficiency Testing	**3.83**
	Proficiency Testing Exercise	**3.78**

Week 2

Score 1-5; 1 = very low, 5= very high

Day	Topic	Mean
Overall Week 2		**4.18**
6	Lab Tour	**4.13**
	LIMS	**3.96**
	Sample Handling	**3.92**
	Transport of Dangerous goods	**4.05**
7	Serology /PCR	**4.17**
	Test Algorithms	**4.13**
	Sequencing Next Gen Tests	**3.79**
8	Planning Surveillance	**4.33**
	Interpreting Surveillance	**4.29**
9	Lab-Epi Linkage Scenario	**4.38**
10	Lab-Epi Linkage Scenario	**4.38**



Symbol represents mean score for each topic; error bars represent range of scores.

Additional Comments – Week 1

(* reflects that a topic was listed by >1 participant for that question)

1. Which of the above components were the ***least*** beneficial? Why?
    - Biosafety**
    - Quality Assurance

2. Which of the above components were the ***most*** beneficial? Why?
    - Field investigation, test validation, proficiency testing**
    - Understanding sectoral needs **
    - Outbreak investigation****
    - Test selection & interpretation
    - Diagnostic test evaluation****
    - Quality Assurance*
    - Biosafety

3. In your opinion, what were the good points about Week One?
    - Activities/Breakout discussions***
    - Communication, discussions and collaboration between labs and epidemiologists****
    - Useful & realistic scenarios
    - Topics covered well

- Validation, quality assurance and audits**
- Biosafety**
- Facilitator explanations during discussions
- Good food

4. In your opinion, what was lacking in Week One?
    - Communication skills or sharing country experiences
    - Room to crowded, end too late**
    - Fact sheets/technical notes relating to each topic (to improve collaboration between lab/epi partners)
    - Activities for biosafety and quality assurance**
    - Field trip**
    - Learning to write an outbreak investigation report

5. How would you improve Week One? What changes would you suggest?
    - More introductions about veterinary epidemiology for the labs
    - Some topics presented too quickly
    - Quality Assurance – show how to implement in a laboratory setting

Additional Comments – Week 2

1. Which of the above components were the ***least*** beneficial? Why?
    - Sequencing**
    - TDG
    - Next Gen Tests
    - LIMS*

2. Which of the above components were ***most*** beneficial? Why?
    - 4 Way linkage Scenario****
    - Planning surveillance**
    - Test Algorithms
    - Group work
    - Lab tour because it was relaxed

3. In your opinion, what were the good points about the Week Two?
    - 4 Way linkage Scenario****
    - Lab Field trip
    - Communication between Lab and Epi
    - Planning surveillance**

4. In your opinion, what was lacking in Week Two?
    - Calibration
    - Lack of data analysis and result interpretation
    - Laboratory demonstration

- Expand discussion on implementing/selecting LIMS
- More exercises for investigation i.e. sample collection
- Facilitators should be experts for each topic i.e sequencing

5. How would you improve the Week Two? What changes would you suggest?

- Statistical software
- Provide model answers to improve understanding
- Suggest ½ day for theory ½ day for practical
- Data in Scenario could be more complete
- Better communication of how to participate in the scenario
- Further discussion about data analysis and measures of association
- More lab result interpretation
- More sequencing interpretation
- Field visit
- Reduce working hours per day – finish at 4pm

6. Were you happy with the arrangements for group activities – in other words, are you happy that we kept the groups the same for the 2 weeks, or do you think it would be better to mix groups up for each activity?

- Yes (majority) communicating was easier
- Should mix groups for each activity so we can learn from other