



## In-Service Training – Hematology Module Four – month Training Program (August – November 2019)

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### **RATIONALE:**

In 2017, the Bureau of Medical Laboratory Services (BMLS), in a collaborative agreement between the Department of Hospital Services (DHS) and Fondation Mérieux (FMX), has established a national continuous training plan to strengthen capacity of laboratory professionals to conduct clinical laboratory testing. The plan is composed of 12 modules, including hematology. BMLS is collaborating with FMX and Diagnostic Microbiology Development Program (DMDP) to conduct a blended approach training for hematology; i.e., face-to-face and online learning. The goal is to implement international standards in verification and validation of hematology testing results.

**OBJECTIVES:** Participants will be able to –

1. Conduct proper techniques for performing blood collection and hematology testing.
2. Review and validate automated instrument results by performing manual blood smear examination.
3. Identify morphology of peripheral blood cells associated with blood syndromes and diseases.

### **CONTENTS:**

1. Blood collection and specimen rejection criteria
2. Preparation of peripheral blood smear and staining
3. How to use and adjust a microscope
4. Steps in performing microscopic examination of peripheral blood smears
  - Detecting poor quality slides and artifacts
  - Reporting complete results including positive smear findings
  - Normal and abnormal red blood cell and platelets
  - Leukocytosis – malignant and benign
  - Anemia
5. Use of the International Society for Laboratory Hematology (ISLH) criteria in reviewing the results from a hematology analyzer
  - Verify and report hematologic parameters and differential counts
  - Actions taken for validating the results
  - Parameters and suspect flags
  - Reference intervals (normal values)
  - Reporting imminent life-threatening test results or critical values
  - Linearity ranges of the instrument
  - Limitations in the testing methodology, including interfering substances e.g., lipidemia
6. Microscopy for the detection of malaria parasites on stained thin blood films in clinical laboratory settings

## **LEARNING OUTCOMES:**

The end of this training, the participant will be able to:

1. Verify and report hematologic parameters, differential counts and positive smear findings
2. Describe how to apply the criteria for reviewing automated instrument results
3. Define each abnormality on a blood cell smear and specify the particular clinical conditions associated with these abnormalities
4. List the proper technique for blood collection and steps in preparing a good quality blood smear
5. Describe the importance of maintaining competency in morphological identification
6. Describe how to use and adjust a microscope
7. Describe artifacts and explain reasons for any technical errors
8. Describe the lineage of red blood cell, white blood cell and Platelet
9. List the terms referring to abnormal red cell distribution, variation in red blood cell size and color or hemoglobin content
10. Describe normal platelet morphology and specify some platelet abnormalities seen in pathologic conditions
11. List conditions showing leukocytosis and explain the changes in white blood cell morphology

**LEARNING METHODS:** We use active learning methods, i.e., interactive lecture, discussion, case study, role-playing, group exercise, simulation games, brainstorming, and demonstration. We will provide training materials, i.e., guideline documents and other publications to participants in advance for self-training. The following is reading materials required for self-study and group discussion:

1. The International Consensus Group for Hematology Review: Suggested Criteria for Action Following Automated CBC and WBC Differential Analysis, published by The International Society for Laboratory Hematology (ISLH), 2005.
2. Criteria for Blood Smear Review by Gulati et al., 2002.
3. Proper QC of Hematology Critical Values, Pamela Sun (2016)
4. Evaluation of Cell Morphology and Introduction to Platelet and White Blood Cell Morphology by Kathy W. Jones. Hematology and Fundamentals of Hemostasis – Chapter 5.
5. Malignant or benign leukocytosis, Tracy George (2012).

**TRAINERS:** A team of 10 - 12 Cambodian laboratory professionals led by Dr. Thanyanan Chaowanachan (Expert Mentor, DMDP).

**PARTICIPANTS:** We will select 30 – 35 laboratory staff in public hospitals – CPA 1,2 and 3 and enroll them in the online training sessions. Participants who regularly attend the online sessions and submit the assignment on time will be selected to attend the onsite training session (November 18<sup>th</sup> to 22<sup>nd</sup>, 2019) at Technical School for Medical Care (TSMC), University of Health Sciences, Phnom Penh.

**LANGUAGES:** English + Khmer

### **COLLABORATORS:**

BUREAU OF MEDICAL LABORATORY SERVICES

Dr. Sokunna SAU, Deputy Director of DHS and Head of Laboratory Network

Ph. Monipheap Uch

FONDATION MERIEUX

Dr. Youlet By, Cambodia Manager

Dr. Valentina Picot, DVM Scientific Conferences & Public Health Initiatives Manager)

Cindy Grasso (Scientific and Public Health Conferences Management Officer)

DIAGNOSTIC MICROBIOLOGY DEVELOPMENT PROGRAM

Ms. Joanne Letchford (Country Director)

Dr. Thanyanan Chaowanachan (Expert Mentor)

## Training Agenda

Day 1: Monday November 18<sup>th</sup>, 2019

TIME	TOPIC	FORMAT/ORGANIZATION
08:00-08:30 30 min	<b>REGISTRATION</b>	BMLS, UHS, FMX, DMDP
08:30-09:15 45 min	<ul style="list-style-type: none"> <li>Greetings from the organizers</li> <li>Opening Remark</li> <li>Group photos</li> </ul>	BMLS, UHS, FMX, DMD
09:15-09:30	<b>COFFEE BREAK</b>	
09:30-10:30 60 min	<ul style="list-style-type: none"> <li>Introductions: name, role, participant expectations (1- 2 min each)</li> <li>Review workshop objectives and agenda (10 min)</li> </ul>	Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan
10:30-11:15 45 min	<b>Pre-test</b>	Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan
11:15-12:00 45 min	<p><b>Quality Management System: A model for CBC testing process</b></p> <ul style="list-style-type: none"> <li>Framework for the process: An integrated model based on 12 quality system essentials (QSEs)</li> <li>Ensuring the laboratory's quality management system (QMS) drives the highest quality of patient care</li> </ul>	<p>Presentation and discussion</p> <p>Presenter: Leak Lamleav &amp; Sourn Sothearoth</p> <p>Facilitator: Thanya Chaowanachan</p>
12:00-13:30	<b>LUNCH</b>	
13:30-15:15 105 min	<p><b>Specimen collection and specimen quality</b></p> <ul style="list-style-type: none"> <li>Proper technique in performing blood collection for CBC testing</li> <li>Specimen rejection criteria</li> </ul>	<p>Group exercise/discussion</p> <p>Facilitators: Leak Lamleav, Sourn Sothearoth and Thanya Chaowanachan</p>
15:15-15:30	<b>COFFEE BREAK</b>	
15:30-17:00 90 min	<ul style="list-style-type: none"> <li>Common errors in pre-analytical phase of CBC testing process</li> </ul>	<p>Group exercise/discussion</p> <p>Facilitator: Thanya Chaowanachan</p>

	<ul style="list-style-type: none"> <li>Risks and impact of the specimen quality on automated analysis, validation and interpretation</li> </ul>	
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**Day 2: Tuesday November 19<sup>th</sup>, 2019**

<b>TIME</b>	<b>TOPIC</b>	<b>FORMAT/ORGANIZATION</b>
08:00-08:30 30 min	<b>REGISTRATION</b>	BMLS, UHS, FMX, DMDP
08:30-09:00 30 min	<ul style="list-style-type: none"> <li>Start the day</li> <li>Questions from previous sessions</li> </ul>	ROUNDTABLE
09:00-10:30 90 min	<b>Verification and Quality Assurance of Automated Hematology Analyzer – Part 1</b> <ul style="list-style-type: none"> <li>Quantitative Quality Control: Using IQC samples to monitor CBC analytical phase</li> <li>Review SOP</li> <li>Evaluate IQC – LJ control charts</li> <li>Actions taken if Westgard rules were violated</li> </ul>	Presentation, group work and discussion  Presenter: Leak Lamleav & Sourn Sothearoth  Facilitator: Thanya Chaowanachan
10:30-10:45	<b>COFFEE BREAK</b>	
10:45-12:15 90 min	<b>Verification and Quality Assurance of Automated Hematology Analyzer – Part 2</b> <ul style="list-style-type: none"> <li>Proficiency testing or EQA</li> <li>Reviewing EQA results</li> <li>Actions taken when results out of acceptable limits</li> </ul>	Presentation and discussion  Presenter: Leak Lamleav & Sourn Sothearoth  Facilitator: Thanya Chaowanachan
12:15-13:45	<b>LUNCH</b>	
13:45-15:15 90 min	<b>Post Analytical Phase Management</b> <ul style="list-style-type: none"> <li>Review automated instrument test results</li> <li>Verify and validate – What to do after automated CBC results have been performed</li> <li>Write comments on the automated results</li> <li>List the following up actions</li> </ul>	Group exercise/discussion  Facilitators: Leak Lamleav, Sourn Sothearoth and Thanya Chaowanachan
15:15-15:30	<b>COFFEE BREAK</b>	

15:30-17:00 90 min	<b>Post Analytical Phase Management (Cont.)</b> <ul style="list-style-type: none"> <li>List key points in reporting</li> <li>Practice reporting results to lab supervisors and clinicians (role-playing)</li> <li>Summarize knowledge and skills gained from role-playing</li> </ul>	Group exercise/discussion  Facilitators: Leak Lamleav, Sourn Sothearoth and Thanya Chaowanachan
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**Day 3: Wednesday November 20<sup>th</sup>, 2019**

TIME	TOPIC	FORMAT/ORGANIZATION
08:00-08:30 30 min	<b>REGISTRATION</b>	BMLS, UHS, FMX, DMD
08:30-09:00 30 min	<ul style="list-style-type: none"> <li>Start the day</li> <li>Questions from previous sessions</li> </ul>	ROUNDTABLE
09:00-10:30 90 min	<b>Checking CBC results given by automated hematology analyzers</b> <ul style="list-style-type: none"> <li>How to use the ISLH criteria</li> <li>Reference intervals (normal values)</li> <li>Critical values</li> <li>Linearity ranges</li> <li>Limitations in the test methodology, including interfering substances e.g., lipidemia</li> </ul>	Presentation and discussion  Presenters: Leak Lamleav & Sourn Sothearoth  Facilitator: Thanya Chaowanachan
10:30-10:45	<b>COFFEE BREAK</b>	
10:45-12:00 75 min	<b>Managing imminent life-threatening test results or panic/alert values</b> <ul style="list-style-type: none"> <li>Verify the results</li> <li>Critical values – Hematologic parameters</li> <li>Report – Read back of critical values</li> </ul>	Presentation and discussion  Presenter: Leak Lamleav & Sourn Sothearoth  Facilitator: Thanya Chaowanachan
12:00-13:30	<b>LUNCH</b>	
13:30-15:30 120 min	<b>Case study: Use of ISLH Criteria</b> <ul style="list-style-type: none"> <li>Review automated instrument test results</li> <li>List justifications for performing a manual morphology review</li> </ul>	Group exercise/discussion  Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan

	<ul style="list-style-type: none"> <li>• Perform microscopic examination of blood smears</li> <li>• Conclude the case and write complete laboratory reports</li> </ul>	
15:30-17:00 90 min	<b>Microscopic examination of peripheral blood smear</b> <ul style="list-style-type: none"> <li>• SOP for preparing slides and staining</li> <li>• Steps in preparing quality blood smears</li> <li>• Proper technique to investigate RBC, WBC, and PLT</li> <li>• Common problems &amp; solutions to prevent failure in maintaining a microscopy</li> </ul>	Group exercise/discussion  Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan

**Day 4: Thursday November 21<sup>st</sup>, 2019**

TIME	TOPIC	FORMAT/ORGANIZATION
08:00-08:30 30 min	<b>REGISTRATION</b>	BMLS, UHS, FMX, DMD
08:30-09:00 30 min	<ul style="list-style-type: none"> <li>• Start the day</li> <li>• Questions from previous sessions</li> </ul>	ROUNDTABLE
09:00-10:30 90 min	<b>Proper QA/QC of CBC testing process</b> <ul style="list-style-type: none"> <li>• Verify specimen integrity</li> <li>• Ensure performance of the analyzer</li> <li>• Use of delta check</li> <li>• Perform manual intervention</li> <li>• Repeat or recollect</li> <li>• Instrument flags</li> <li>• Spurious results</li> <li>• Check for transcription errors</li> </ul>	Presentation and discussion  Presenters: Leak Lamleav & Sourn Sothearoth  Facilitator: Thanya Chaowanachan
10:30-10:45	<b>COFFEE BREAK</b>	
10:45-12:00 75 min	<b>Commonly found cases and key findings</b> <ul style="list-style-type: none"> <li>• Anemia &amp; Thalassemia</li> <li>• Leukocytosis</li> <li>• Cytopenia</li> <li>• Malaria</li> </ul>	Presentation and discussion  Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan

12:00-13:30	<b>LUNCH</b>	
13:30-15:15 105 min	<b>Present Cases – Use of ISLH Criteria</b>	Group exercise/discussion Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan
15:15-15:30	<b>COFFEE BREAK</b>	
15:30-16:00 30 min	<b>Post-test</b>	Facilitators: Leak Lamleav, Sourn Sothearoth & Thanya Chaowanachan
16:00-16:30 30 min	<b>Wrap up &amp; Action items</b>	
16:30-17:00 30 min	<b>Closing remark &amp; Certificate presentation</b>	BMLS, UHS, FMX, DMD