



ALBERTA LABORATORY **QUALITY** ENHANCEMENT PROGRAM
College of Physicians and Surgeons of Alberta

Hematology Morphology Program Guide

**College of Physicians and Surgeons of
Alberta**

Table of Contents

Introduction	3
Mandate	3
Terms of Reference	4
Committee Structure	4
Objectives of the Morphology Program	5
Registration	5
Laboratory and Method Registration	5
Surveys	6
Frequency of Surveys	6
Composition of Surveys	6
Selection of Cases	6
Criteria for Screening	7
Shipments	7
Calendar of Events	7
Instructions for Analysis	8
Glass Slides	8
Photomicrographs	9
Submission of Results	10
Glass Slides	10
Photomicrographs	10
Assessment of Results	11
Glass Slides	11
Photomicrographs	11
Critique	12
Glass Slides	12
Photomicrographs	12
Appendix A	13
Appendix B	14
Appendix C	15

Introduction

Mandate

To monitor individual laboratory performance to ensure the highest standard of laboratory service in the interest of patient care.

The Alberta Laboratory Quality Enhancement Program (ALQEP) is operated under the auspices of the College of Physicians and Surgeons. The long term objective of the ALQEP is to ensure that laboratories can produce precise, accurate and timely test results in accordance with standard practice and in the interest of accomplishing quality patient care.

Our short-term goals are to:

- monitor laboratory performance by proficiency testing, and
- assist laboratories experiencing difficulty in attaining good performance.

ALQEP's goals are achieved by:

- the presentation of standardized specimens relevant to clinical practice, for analysis and reporting by laboratories on a prescribed schedule,
- the tabulation and evaluation of results by ALQEP Committees and the reporting of assessments to participants,
- professional assistance, where appropriate, to promote the performance of the laboratory to an acceptable standard, and
- providing educational resources to assist laboratories in enhancing quality of laboratory services.

The intent of a survey is to assess the laboratory's overall performance, not the proficiency of individual laboratory technologists/technicians. Therefore, it is essential that proficiency specimens received from the ALQEP be processed at the receiving laboratory as if they were routine patient samples. Proficiency samples must not be sent to another laboratory and results must not be compared with those obtained in other laboratories. The quality control methods employed in producing results from proficiency samples should be the same for patient samples. Repeat testing should be performed only in accordance with in-house criteria for patient results.

This program guide provides a general overview of the ALQEP and more specifically, information related to the Hematology Morphology Program.

Terms of Reference

The ALQEP Committee functions in parallel with the Advisory Committee on Laboratory Accreditation and Quality Control. It liaises with the Advisory Committee on matters relating to the level of proficiency in public and independent medical diagnostic facilities within the province of Alberta.

The ALQEP Committee performs functions and considers issues related to quality assurance which may include, but are not restricted to, the following:

1. Selection of quality control material and programs for proficiency testing
2. Monitoring the proficiency level of laboratories through assessment of survey testing results
3. Communication with laboratories regarding non-proficient performance
4. Recommendations to the Advisory Committee regarding the suspension of testing
5. Review of scope of activities versus needs
6. Participation in promoting a national quality assurance program

Out of province participants will continue to liaise with their accrediting agency regarding performance.

Committee Structure

Dr. J. L. Hannon
Director

Ms. S. Hanington
Manager, Quality of Care

Ms. E. McBride
Program Manager

Ms. E. Behr
Technical Analyst

CONSULTANTS

CHEMISTRY:	Dr. F. Bamforth
CYTOLOGY:	Dr. G. Johnson
HEMATOLOGY:	Dr. G. Clarke
MICROBIOLOGY:	Dr. D. Church
TRANSFUSION MEDICINE:	Dr. J.L. Hannon Ms. B. Padget

Objectives of the Morphology Program

The objective of the ALQEP Morphology Program is to ensure that “front-line” technologists/technicians are competent in detecting significant abnormalities in peripheral blood smears. The survey cases are carefully selected to include a range of specific morphological features, including abnormalities that have previously been noted to be problematic for many laboratories. In this way, enhancement of performance can be monitored, and identification of weakness will allow participants to work at improving in these areas. Technologists/technicians are not required to make a diagnosis on any of the surveys; however, it is important that they recognize significant morphological findings so that appropriate referral can be made.

Registration

Laboratory and Method Registration

The registering laboratory records its shipping address, contact name, telephone and FAX number on the *Registration Form* (Appendix A).

Address/Contact - determines where and to whom the samples are shipped.

Surveys

Frequency of Surveys

Bimonthly

- ♦ January, March, May, July, September, November

Composition of Surveys

Each challenge consists of one **glass slide**, which is prepared from bona fide clinical material.

*Alternate surveys contain a series of **photomicrographs** (color laser copies) taken from bonafide clinical case material.

Selection of Cases

Glass Slides

The cases for the morphological surveys are chosen to assess the ability of the participants to detect a range of morphological abnormalities and to monitor areas of suboptimal performance identified in previous surveys.

The morphological criteria used by the ALQEP Hematology Committee in selecting cases for surveys is included in both the Canadian Society of Medical Laboratory Science (CSMLS) and Canadian Laboratory and X-ray Technology (CLXT) syllabuses (included in Appendix B). All technologists/technicians, regardless of location or size of laboratory, must maintain an acceptable level of expertise and should be able to identify these morphological features.

Photomicrographs

Photomicrographs are included as an educational supplement to enhance the ability of the participants to detect a range of morphological abnormalities. They are sent every second survey and remain ungraded. Features noted as challenges for facilities from the glass slide program are considered for potential photomicrograph series. Participants are expected to indicate the individual cell/features using the provided key. Results are summarized and returned to participants with a brief description and discussion of the illustrated features and associated disease state / condition.

Criteria for Screening

Glass Slides

Prior to sending survey slides to participating laboratories, each slide is screened to ensure good quality.

Factors considered in screening:

1. stain,
2. cell distribution,
3. morphology of WBCs, RBCs and platelets,
4. that the WBC and platelet counts roughly correspond to automated counts provided,
5. overall quality of slide (e.g. scratches, artifact).

Photomicrographs

Photomicrographs are screened by four independent physician reviewers. Consensus amongst the expert panel is required for the inclusion of the photomicrograph in the set.

Shipments

All shipments are sent by courier service with a guaranteed delivery of 2 - 3 days. The shipments are sent on Monday afternoon and should be received in the laboratory by Wednesday of the same week. If packages are not received when expected, ALQEP must be contacted immediately so the package can be traced.

Calendar of Events

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	Samples shipped from ALQEP		Samples received by laboratories		
2					
3		Results due date	Results assessed		
4	Smear / Photomicrograph Assessment				
5	Results sent to laboratories				

Instructions for Analysis

Glass Slides

Following is a sample of the instructions included with each glass slide survey.

Enclosed in this package is one stained peripheral smear slide _____.

History: _____.

WBC:	×	$10^9/L$
RBC:	×	$10^{12}/L$
Hgb:		g/L
Hct:		L/L
MCV:		fL
MCH:		pg
MCHC:		g/L
RDW:		%
Retic:	×	$10^9/L$

Perform a white cell differential count and peripheral blood morphologic assessment **based on your own laboratory/regional criteria**.

Record your results for this smear on the enclosed *Hematology Morphology Report Form*.

- *WBC must be recorded in both relative and absolute numbers **using the above WBC count or a corrected WBC count when appropriate**.*
- *Indicate whether the absolute WBC value is high or low by checking the appropriate box.*
- *To record the erythrocyte, leukocyte and platelet morphology, refer to the accompanying Reporting Codes and specify the applicable 3-digit code(s).*
- *To record the platelet estimate, refer to the accompanying Reporting Codes and specify the applicable statement code and in addition, indicate the actual estimated number.*
- *Indicate whether or not this slide would be referred to a pathologist and specify the referral criteria in the space provided.*

FAX your results **by <due date>** to:

College of Physicians and Surgeons of Alberta
Attention: Alberta Laboratory Quality Enhancement Program (ALQEP)

FAX: (780) 428-2712 (**Alternate Fax: (780) 420-0651**)

NOTE: It is imperative that you **VERIFY THAT YOUR FAX TRANSMISSION IS SUCCESSFUL** to ensure that your results are received by the College. Please do not forward originals by mail, retain for your own records.

If this sample was not delivered by courier on or before **<ship date plus three days>**, please call the Technical Analyst at (780) 969-5011.

Photomicrographs

Following is a sample of the instructions included with each photomicrograph survey.

Enclosed in this package are 3 challenges:

1x-Kxxx

1x-Kxxx

1x-Kxxx

- **Review** the attached color laser photomicrographs to identify the cellular components as specified for each challenge. **Multiple images are now being included for each challenge** to provide additional context.
- **Select** the identification code from the list on the reverse side of the reporting form that best describes the cellular component highlighted in the series.
- **Record** the code for each photomicrograph challenge series on the enclosed reporting form.

FAX your results **by <due date>** to:

College of Physicians and Surgeons of Alberta

Attention: Alberta Laboratory Quality Enhancement Program

FAX: (780) 428-2712 (Alternate Fax: (780) 420-0651)

NOTE: It is imperative that you **VERIFY THAT YOUR FAX TRANSMISSION IS SUCCESSFUL** to ensure that your results are received by the College. Please do not forward originals by mail, retain for your own records.

If this sample was not delivered by courier on or **before <ship date plus three days>**, please call the Technical Analyst at (780) 969-5011 or send email to eve.behr@cpsa.ab.ca .

Submission of Results

Glass Slides

Instructions for Completing the Report Form - The laboratory must complete the Hematology Report Form for the smear check sample in its entirety, before returning it to the ALQEP. Information for all areas of the Report Form must be completed. For a sample of the Report Form, please visit the Forms and Code Listings of the website at:

<http://www.cpsa.ab.ca/>
>> [Programs & Services \(top bar\)](#)
>> [Accreditation/Quality of Care](#)
>> [Alberta Laboratory Quality Enhancement Program \(side bar\)](#)
>> [Hematology \(side bar\)](#)
>> [Report Form & Reporting Codes \(in Hematology Morphology section\)](#)

If you are unable to submit results for a particular test due to technical difficulties, please comment on the Report Form and return to ALQEP.

It is essential that ALQEP smear check samples be handled in exactly the same manner as patient samples. Therefore, the established criteria used by laboratories in evaluating and reporting an ALQEP smear check sample, should be the same as those used for patient samples. Laboratories are encouraged to count >100 cells when any rare or uncommon elements are encountered to account for distribution issues. Neither the ALQEP smear check samples nor the Report Form should be sent outside the laboratory and a participant must not consult with another laboratory in the completion of the *ALQEP Hematology Report Form*.

Photomicrographs

The laboratory must view the photomicrographs and assign the correct codes to the indicated features using the provided key. The completed form is returned to the ALQEP along with the computed smear check sample report form. A sample photomicrograph form is included in Appendix C.

Assessment of Results

Glass Slides

Grading Key

In preparation for assessing the survey results, 15-20 technologists with varying degrees of experience, at designated reference laboratories, perform a leukocyte differential count and provide a morphological assessment of the slide. A total of two to three thousand cells are counted. A summary of the results is then compiled. For each cell type in the differential, a mean and standard deviation are calculated. The morphological assessment is based on the majority or consensus of the technologists' results. All technologists must detect the significant feature(s) of each case before the slide is accepted for a survey. The technologist summary is used in preparing a grading key.

In addition to the technologist assessment, two ALQEP Hematology Consultants independently evaluate the slide. A grading key is then prepared which is based on the consultants observation with consideration given to the summary of the technologists' findings. The grading key outlines a set of grading criteria for Acceptable, Acceptable with Review, and Unacceptable. The final grading key is a consensus of the two ALQEP Hematology Consultants' grading criteria. Each morphological assessment is reviewed and assigned a grade based on the grading key criteria for Acceptable, Acceptable with Review, and Unacceptable.

Assessment and Follow-up Criteria

Results are compared with the grading key and a grade is assigned. Those laboratories with results falling in the "grey area" between acceptable and unacceptable, receive an acceptable with review (AR) grade. This grade encourages laboratories to review the slide with their pathologist/consultant and to take necessary corrective action. An unacceptable grade is assigned only if significant features have been missed or if the submitted results could be clinically misleading. Before a final grade is assigned, the results are reviewed by the ALQEP Hematology Committee. Laboratories receiving an unacceptable grade on two of the last three surveys are notified by ALQEP.

Out of province participants will continue to liaise with their accrediting agency regarding performance.

Photomicrographs

Grading Key

Feature identification is initially determined by four independent physician reviewers. Lack of consensus amongst the expert panel results in the exclusion of the photomicrograph from the set.

Assessment and Follow-up Criteria

As the photomicrographs are intended to be an educational supplement, they remain ungraded. However, group results are summarized and returned to participants with a brief description and discussion of the illustrated feature.

Critique

Glass Slides

The hematology morphology critique is a detailed summary of the smear check sample. Each laboratory receives a hematology morphology critique within four weeks of the shipment date, which includes the following:

- Patient history
- Complete patient data for all CBC parameters and other relevant laboratory/clinical data
- WBC Differential - relative and absolute counts based on the technologists summary
- Morphology - details the RBC, WBC and platelet findings for the smear
- Conclusion - Pathologist's interpretation of the smear
- Morphological Diagnosis - diagnosis based on the morphological features of the smear
- Significant Features for the smear
- Grade Assignment Parameters
- Summary of Results - a summary of participants grades assigned for the smear

Critiques can be viewed by going to:

<http://www.cpsa.ab.ca/>
>> [Programs & Services \(top bar\)](#)
>> [Accreditation/Quality of Care](#)
>> [Alberta Laboratory Quality Enhancement Program \(side bar\)](#)
>> [Hematology \(side bar\)](#)
>> [Glass Slides \(in Hematology Morphology section\)](#)

Photomicrographs

The photomicrograph critique is a detailed summary of the photomicrograph series. Each laboratory receives a critique within four weeks of the shipment date, which includes the following:

- Picture of the feature for reference purposes
- Correct cell feature
- Number of responses received
- Correct number of responses
- Description and discussion of the illustrated feature

Critiques can be viewed by going to:

<http://www.cpsa.ab.ca/>
>> [Programs & Services \(top bar\)](#)
>> [Accreditation/Quality of Care](#)
>> [Alberta Laboratory Quality Enhancement Program \(side bar\)](#)
>> [Hematology \(side bar\)](#)
>> [Photomicrographs \(in Hematology Morphology section\)](#)

Appendix A



College of Physicians & Surgeons of Alberta
2700, 10020 – 100 Street NW
Edmonton, Alberta, Canada T5J 0N3
Phone: (780) 423-4764 1-800-561-3899
Fax: (780) 428-2712

Alberta Laboratory Quality Enhancement Program

HEMATOLOGY MORPHOLOGY REGISTRATION/NOTIFICATION OF CHANGE FORM

LABORATORY INFORMATION:

Name: _____ Number: _____
Contact Name: _____
Address: _____
City: _____ Province: _____ Postal Code: _____
Phone: _____ Fax: _____

REGISTRATION:

Please list names in full. If this is a **Notification of Change**, only fill out relevant areas.

HEMATOLOGY MORPHOLOGY		
Method		Instrument
Manual Count Only	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Automated 3-Part Differential	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Automated 5-Part Differential	Yes <input type="checkbox"/> No <input type="checkbox"/>	

Date: _____
Name: _____
(Please Print)
Signature: _____

Appendix B

CSMLS and CLXT Syllabus - Morphology Requirements

To ensure an adequate level of competence, technologists are expected to be able to recognize normal and abnormal peripheral findings including the following features which are requirements in both the CSMLS and CLXT syllabuses.

A. Red Blood Cells

- Microcytosis
- Macrocytosis
- Hypochromia
- Polychromasia
- Dimorphism
- Elliptocytes
- Tear-drop Forms
- Schistocytes
- Pyknocytes (irregularly contracted cells)
- Spherocytes
- Echinocytes
- Acanthocytes
- Target cells
- Sickle cells
- Basophilic stippling
- Howell-Jolly bodies
- Pappenheimer bodies
- Other red cell inclusions including:
 - Malarial parasites
- Nucleated red cells
- Agglutination
- Rouleaux

B. White Blood Cells

- Neutrophils
- Band Neutrophils
- Lymphocytes
- Monocytes
- Eosinophils
- Basophils
- Myeloid Precursors
- Blast Cells
- Atypical Lymphocytes
- Plasma Cells
- “Smudge” Cells
- Absolute Increase or Decrease in any white cell type
- Shift to the Left
- Pelger - Huet change
- Hypersegmented Neutrophils
- Toxic Changes
- Dohle Bodies
- Auer Rods

C. Platelets

- Thrombocytopenia
- Thrombocytosis
- Giant Platelets
- Platelet Satellitism
- Platelet Clumps (leading to spurious thrombocytopenia)

Appendix C



«LabName»
«Contact»
«Address1»
«Address2»
«PostalCode»

«LabNumber»

HEMATOLOGY MORPHOLOGY – PHOTOMICROGRAPH REPORT FORM November 2010

Note: *This is an educational challenge and will not be graded. Results will be tabulated and included with a follow-up summary.*

Slide 10-K115

History: 17-year-old male being treated for dermatitis herpetiformis.

Identify the red blood cell abnormality indicated by the arrow on these photomicrographs

(Select the numerical code which best identifies the cell.)

Comments:

Slide 10-K116

History: 46-year-old male with hepatic disease.

Identify the red blood cell abnormality indicated by the arrows on these photomicrographs

(Select the numerical code which best identifies the cell.)

Comments:

Slide 10-K117

History: 50-year-old male with fatigue, poor appetite and splenomegaly.

Identify the red blood cell abnormality indicated by the arrow on these photomicrographs

(Select the numerical code which best identifies the cell.)

Comments:

Return the completed form to ALQEP

PHOTOMICROGRAPH IDENTIFICATION CODES

Erythrocytes

- 001 RBC, agglutination
- 002 RBC, dimorphic
- 003 RBC, hypochromic
- 004 RBC, normal
- 005 RBC, nucleated in peripheral blood
- 006 RBC, macrocyte
- 007 RBC, microcyte
- 008 RBC, polychromatophilic
- 009 RBC, rouleaux
- 010 Reticulocyte

Erythrocyte Abnormalities

- 011 Acanthocyte (spur cell)
- 012 Echinocyte (burr cell)
- 013 Blister cell
- 014 Macrotarget cell
- 015 Ovalocyte (elliptocyte)
- 016 Ring Sideroblast
- 017 Schistocyte, RBC fragment (Helmet cell)
- 018 Sickle cell (drepanocyte)
- 019 Siderocyte
- 020 Spherocyte
- 021 Stomatocyte
- 022 Target cell
- 023 Teardrop cell (dacrocyte)

Erythrocyte Inclusions

- 024 Basophilic Stippling
- 025 Cabot Ring
- 026 Heinz Bodies
- 027 Hemoglobin C Crystal
- 028 Howell-Jolly Bodies
- 029 Malarial Parasite
- 030 Malarial Pigment
- 031 Pappenheimer Bodies

Platelets

- 032 Abnormal Platelet
- 033 Clumped Platelets
- 034 Large Platelets
- 035 Giant Platelets (megathrombocytes)
- 036 Megakaryocyte
- 037 Normal Platelet
- 038 Platelet Satellitism

Artifacts

- 039 RBC, crenated
- 040 Smudge Cell
- 041 Stain Precipitate
- 042 Water Spots

Granulocytes

- 043 Basophil
- 044 Eosinophil
- 045 Hypersegmented neutrophil
- 046 Metamyelocyte
- 047 Myeloblast
- 048 Myelocyte
- 049 Neutrophilic band
- 050 Promyelocyte
- 051 Segmented neutrophil

Granulocytic Abnormalities

- 052 Alder-Reilly granulation
- 053 Auer Rods
- 054 Döhle bodies
- 055 Hypogranular neutrophil
- 056 May-Hegglin abnormality
- 057 Pelger-Huet neutrophil
- 058 Toxic Granulation
- 059 Toxic Vacuolization

Lymphocytes

- 060 Hairy Cell
- 061 Lymphoblast
- 062 Lymphocyte, cleaved
- 063 Lymphocyte, large, granular
- 064 Lymphocyte, normal
- 065 Lymphocyte, reactive (atypical, stimulated, variant)
- 066 Lymphoma cell, malignant
- 067 Plasma cell
- 068 Prolymphocyte
- 069 Sezary Cell

Monocytes

- 070 Monoblast
- 071 Monocyte
- 072 Promonocyte

Miscellaneous

- 073 Intracellular microorganism (except malaria), Specify
- 074 Extracellular microorganism (except malaria), Specify
- 075 Blast Cell
- 076 Microfilaria
- 077 Mitotic Cell
- 078 Referred, Abnormal/Immature cell
- 079 Other, Specify:



Hematology Morphology – Photomicrographs

Instructions for Reporting

Enclosed in this package are 3 challenges:

10-K115
10-K116
10-K117

- Review the attached color laser photomicrographs to identify the cellular components as specified for each challenge. Multiple images are now being included for each challenge to provide additional context.
- Select the identification code from the list on the reverse side of the reporting form that best describes the cellular component highlighted in the series.
- Record the code for each photomicrograph challenge series on the enclosed reporting form.

FAX your results **by November 24, 2010** to:

College of Physicians and Surgeons of Alberta
Attention: Alberta Laboratory Quality Enhancement Program

FAX: (780) 428-2712 (Alternate Fax: (780) 420-0651)

NOTE: It is imperative that you **VERIFY THAT YOUR FAX TRANSMISSION IS SUCCESSFUL** to ensure that your results are received by the College. Please do not forward originals by mail, retain for your own records.

If this sample was not delivered by courier on or **before November 12, 2010**, please call the Technical Analyst at (780) 969-5011 or send email to eve.behr@cpsa.ab.ca.