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Peripheral Smear Evaluation

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Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

The purpose of this procedure is to supply the technologist with instructions on how to perform a comprehensive peripheral smear evaluation.

II. CLINICAL SIGNIFICANCE:

A. Good hematologic diagnosis and practice begin with a careful examination of the peripheral blood smear. The findings on the smear can be used to establish probable diagnoses and the direction for further investigation. The examination includes a white blood cell differential, white cell, red cell, and platelet morphology evaluation and an estimate of the white cell and platelet counts.

B. The white cell differential is performed in order to determine the relative number of each type of white cell present in the blood. In disease, a particular white cell type may show an increase in number.

C. Normal erythrocytes, when not crowded together, appear as circular, homogeneous disks of nearly uniform size, ranging from 6-8 µm in diameter. The center of each cell is paler than the periphery. In disease, erythrocytes vary in their hemoglobin content, size, shape, staining properties and structure.

D. Platelets are thin disks, 2-4 µm in diameter and well separated from one another. They contain fine purple granules which usually fill the cytoplasm. In disease states, they may increase or decrease in number and/or increase in size.

III. ACRONYMS:

A. White Blood Cell (WBC)
B. Red Blood Cell (RBC)
C. Potassium Ethylenediaminetetraacetic acid (K2EDTA)
D. High Power Field (hpf)
E. Nucleated Red Blood Cells (NRBC)
F. Hematology Pathology Consult (BM/PC)
G. Laboratory Information System (LIS)
H. Instrument Identification Number (ID#)
I. Millimeter (mm)
J. Micrometer (µm)

IV. SPECIMEN COLLECTION AND HANDLING:

A. Sample stability at room temperature is 24 hours. Stored at 2-8°C, EDTA peripheral blood samples with normal results may be analyzed up to 72 hours without significant loss of differential stability. Allow refrigerated samples to come to room temperature and mix well before analysis. Samples stored at room temperature may exhibit an increase in MCV after 24 hours, which may be minimized by refrigeration.

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V. EQUIPMENT:

A. Microscope
B. Slide Stainer

VI. SUPPLIES:

A. Microscope slide
B. Diff-Safe adapter or wooden sticks

VII. QUALITY CONTROL (QC):

A. Daily stain quality control is performed. Document per site procedure.

VIII. PROCEDURE:

A. Making a quality peripheral blood smear:
    1. Place a moderate sized drop of well mixed blood approximately 2 mm in diameter at the frosted end of a clean, grease free slide.
    2. Place a smooth edged spreader slide at a 40 degree angle, touching the drop of blood. If the angle is smaller than this, a thin film is made. If the angle is greater, a

thick film is produced. The angle may be adjusted according to the hematocrit of the specimen (high hematocrit-decreased angle, low hematocrit-increased angle). As the blood spreads along the edge of the spreader slide, push the spreader evenly and quickly away from the drop.

3. Films should be air dried.
4. The value of the differential depends on the quality of the smear made.
5. Label the slide as follows using indelible marking: Patient name, Instrument ID#, Date.
6. Stain with Wright or Wright-Giemsa stain per procedure.

B. Criteria for a good blood smear:

1. Smears should have a minimum length of one inch.
2. Reasonable thickness with a gradual transition from thick to thin, terminating in a feathered edge.
3. Smooth appearance, evenly distributed cells, free of precipitate, holes, and scratches.
4. Red blood cells should be pink.
5. The nuclei of leukocytes are blue to purple.
6. Eosinophil granules are red-orange and each distinctly discernible.
7. Basophils have dark blue to purple granules.
8. The cytoplasmic neutrophil granules are tan in color.
9. Platelets have dark lilac granules.
10. Lymphocyte cytoplasm is generally robin's egg blue; monocyte cytoplasm generally has a faint bluish tinge.
11. The absence of a tail.
12. Clear labeling.

C. Examination of the smear:

1. Scan the slide using the low power objective (10x magnification) for even distribution of cells and quality of stain. If cells show poor distribution or poor staining, make a new smear.
2. Change to the high power objective (50x oil magnification) and examine the area of the film in which the red cells lie side by side with no overlapping.
3. Perform a WBC Estimation.
   a. Count the WBCs in 10-20 fields under 50x oil magnification.
   b. Multiply the average number of WBCs counted per field by 3.
   c. Average # of WBCs per field x 3 = Estimate # of WBCs x bill/L
   d. WBC estimates should agree with the hematology analyzer count within +/- 25%.

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4. Choose that portion of the blood smear where there is only slight overlapping of the red cells. Place a drop of oil on the slide and change to the oil immersion objective (100x magnification).
5. Review the hematology analyzer results for CBC parameter validity, differential percentages/absolute values, histogram/scattergrams, and definitive flags.

D. Perform a scan of the slide:

1. Scan the slide for the following:
    a. Immature cells or abnormal nucleated cells (e.g., blasts, promyelocytes, myelocytes, metamyelocytes, nucleated red blood cells, etc.)
    b. Abnormal cells along the lateral edges of the smear and feathered edge.
    c. Smudge cells and artifacts.
    d. Platelet clumps.
    e. RBC distribution.
    f. The following questions must be answered in the middleware for every slide that is reviewed.
        i. Instrument flag - 'Reviewed'
        ii. Red Blood Cell (RBC) Morphology - 'Unremarkable' or 'See Below' with appropriate morphology selected.
        iii. White Blood Cell (WBC) Estimate - 'Confirmed'
        iv. Platelet (PLT) Estimate - 'Increased', 'Adequate' or 'Decreased'.

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E. Perform a White Blood Cell Differential:

1. Perform a manual differential when any of the following is present.
    a. WBC <1.0 bill/L, once per admission. Count as many WBCs as possible (up to 100) from two peripheral smears. If unable to count 100 cells, report the differential from as many WBCs as possible.
    b. >10% Reactive lymphocytes observed on scan.
    c. WBC ABNORMAL (Abn) Scattergram flag with dashes (---) in Sysmex or #NM (not measured) in the middleware.
    d. SUSPECT BLAST/ABN LYMPHO? flag in Sysmex. Blasts observed on scan.
    e. IG PRESENT >10%/IMMATURE GRAN? flag in Sysmex.
    f. SUSPECT, LEFT SHIFT? flag with dashes (---) in Sysmex or #NM (not measured) in middleware.
    g. SUSPECT, ATYPICAL LYMPHO? flag with dashes (---) in Sysmex or #NM (not measured) in middleware.
2. Traverse the smear thin to thick and from side to side (Battlement pattern).
3. Identify WBCs first by chromatin pattern and second by cytoplasm.

4. In the laboratory information system middleware, use the manual differential keyboard to keep a running total of each type of white cell that is present until 100 WBCs have been counted. A manual counter may also be used.
5. Document any abnormalities present in the cells.
    a. Toxic granulation or Dohle bodies are reported as present.
        i. If greater than 40% of cells have toxic granules, consider either bad stain or 'AlderReilly anomaly'.
        ii. If greater than 30% of cells have Dohle bodies, consider May-Hegglin and check for abnormal platelets.
    b. Vacuolization, Pelgeroid neutrophils, Auer Rods, and Hypersegmented neutrophils (>6 lobes) are reported as present.
    c. If vacuolization is 'Present', make sure to scan the slide for the presence of bacteria.
    d. If intracellular organisms are 'Present', send slide directly to Microbiology for confirmation.
    e. If hypersegmented neutrophils (6+ lobes) are 'Present', check for elevated MCV.

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6. Nucleated red blood cells (NRBCs) are reported on the XN analyzers. NRBCs are not a reportable parameter on the XN-L 450 analyzers. Refer to the CBC Correction Procedure and attachment to ensure that a corrected WBC count and corrected absolute differential parameters are calculated. This is done through the middleware or by manual calculation and reported correctly based on the analyzer model.
7. If more than 10 smudge cells are noted on the differential an albumin slide must be made if a differential is to be performed. RBC morphology, WBC estimate and platelet estimates are made on the original slide.
    a. Place 1 drop of albumin and 4-6 drops of patient specimen into a tube, mix and make slides. Add 'ALB' to the label indicating they are albumin slides. Fragile lymphocytes should remain intact and smudge cells should not be present.
    b. Perform a differential on the stained albumin slide. Add the following comment “Differential performed on albumin treated smear.”
    c. For more detail, refer to the 'Albumin Smear for Smudge Cells' procedure for making albumin slides.
8. The following questions must be answered in the middleware for every slide that is reviewed.
    a. Instrument flag - 'Reviewed'
    b. RBC Morphology - 'Unremarkable' or 'See Below' with appropriate morphology selected.

    c. WBC Estimate - 'Confirmed'
    d. PLT Estimate - 'Increased', 'Adequate' or 'Decreased'.

9. Save slide for review if indicated by the 'Smear Review Checklist' criteria in attachment A.

F. Evaluate red blood cell morphology:

1. Perform a scan of RBC morphology when any of the following is present.
    a. A scan or differential for WBC is required.
    b. RBC ABNORMAL (Abn) DISTRIBUTION flag is present with asterisk (*) and/or dashes (---) in Sysmex or #NM (not measured) in the middleware.
    c. DIMORPHIC POPULATION flag is present with asterisk (*) and/or dashes (---) in Sysmex or #NM (not measured) in the middleware for RDW-SD or RDW-CV.
    d. SUSPECT, RBC AGGLUTINATION? flag is present with asterisk (*) next to RBC, HGB, HCT, MCV, MCH, MCHC and RET# parameters.
    e. SUSPECT, FRAGMENTS? flag is present.
    f. NRBC PRESENT flag is present.
    g. MCV < 60 or >114 with no previous history.
2. Using the oil immersion objective (100x magnification), examine erythrocytes in a thin area of the slide in which the cells either do not overlap or slightly overlap (three fields inward from feathered edge). Avoid the thin area of the smear in which the cells appear completely filled with hemoglobin and show no area of central pallor; the cells in this area are generally distorted and do not show a true morphologic picture.
3. View at least 20 oil immersion fields. Observe for variations in color, size, shape, and structure, inclusions, and the presence of rouleaux.
4. Result as 'Unremarkable" if abnormalities seen are less than the guidelines below.
5. If any of the abnormalities listed below are observed in all fields, report 'See Below' for the red blood cell morphology result along with appropriate morphology selected.
    a. Hypochromasia
        i. 11-20% = 2+
        ii. >20% = 3+
    b. Acanthocytes, Echinocytes (Burr Cells), Ovalocytes, Elliptocytes, Polychromasia, Spherocytes, Stomatocytes, Target Cells (Codocytes), Teardrop Cells (Dacryocytes)
        i. 5-10% = 1+
        ii. 11-20% = 2+
        iii. >20% = 3+

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c. Schistocytes, Bite Cells (Helmet Cells)
   i. <1/hpf
   ii. 1-2/hpf
   iii. 3-5/hpf
   iv. 6-10/hpf
   v. 11-20/hpf
   vi. >20/hpf

d. Report RBC inclusions as present:
   i. Dual RBC population
   ii. RBC agglutination
   iii. Rouleaux

   iv. Hemoglobin Crystals (CC/SC)
   v. Basophilic Stippling
   vi. Howell Jolly Bodies

   vii. Pappenheimer Bodies
   viii. Sickle Cells

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6. If morphology is in agreement with MCV, no notation is necessary.. If microcytes or macrocytes are noted and the MCV is in the reference range, check RBC histogram for dual population.
7. Save slide for review if indicated by the “Smear Review Checklist” criteria in attachment A.

G. Estimate platelet count and evaluate platelet morphology:
   1. Perform an estimate or a scan of platelet morphology when any of the following is present.
      a. A scan or differential for WBC is required.
      b. PLT ABNORMAL (Abn) SCATTERGRAM flag is present.
      c. SUSPECT, PLT CLUMPS? flag is present with an asterisk (*) next to the PLT, Mean Platelet Volume (MPV), and Immature Platelet Fraction (IPF) results and the fluorescent platelet results.
      d. ABNORMAL, PLT ABNORMAL (Abn) DISTRIBUTION flag is present with an asterisk (*), dashes (---) in Sysmex, or #NM (not measured) in the middleware for MPV.
      e. If the platelet result is <75 bill/L or >10000 bill/L.
   2. Examine twenty fields and observe for the presence or absence of platelet clumping. If clumps are observed on smear, collect a blue top (sodium citrate) if possible. Run

on the Sysmex analyzer, and multiply the results by 1.1.

3. If greater than 5 clumps (containing 5 or more platelets per clump) are seen, delete the analyzer PLT result. Report with comment, 'Platelets clumped in EDTA, appear _________ (decreased, adequate, or increased) on smear'.
4. If the platelets are adhering to the neutrophils, delete the analyzer PLT result. Report with comment, 'Platelet satellitosis present, appear _________ (decreased, adequate, or increased) on smear'.
5. If there is a platelet delta check (decrease only), check specimen for a clot. It is not necessary to review the smear unless other instrument flags are present.
6. Using the oil immersion objective (100x magnification), examine platelets in a thin area of the slide in which the red cells either do not overlap or slightly overlap. You must also scan the feathered edge and the peripheral edge of smear for signs of platelet clumping.
7. Perform a platelet estimate.
    a. Count the PLTs in 10-20 fields under 100x oil magnification.
    b. Average # of PLTs per field x 10 = Estimate # of PLTs bill/L
    c. PLT estimates should agree with the hematology analyzer count within +/- 25%.
8. If the platelet estimate from the slide does not agree with the electronic count, resolve the discrepancy (i.e. look for clumped platelets, giant platelets, microcytic RBCs or cell fragments counted as platelets).
9. Report 'Giant Platelets Present' when at least 2 platelets larger than a normal red blood cell are present per field.
10. Save slide for review if indicated by the 'Smear Review Checklist' criteria in attachment A.
11. Refer to the following table for platelet estimate guidance:

# of platelets/oil immersion field	Estimate
0 - 14	Platelets appear decreased
15 - 40	Platelets appear adequate
> 40	Platelets appear increased

IX. INTERPRETATIONS:

A. Normal Leukocyte Morphology
Certain characteristics should be kept in mind when cells are to be classified; these are related to size, the nucleus, and the cytoplasm. Whether the cell is small, medium, or large and how it compares to a normal red blood cell, which is approximately 7 µm in diameter, should be noted. Characteristics of the nucleus that should be considered are; shape, size compared to the rest of the cell the chromatin pattern (smooth or coarse), and the presence of nucleoli. Characteristics of the cytoplasm that should be considered include; presence or absence of

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granules, their staining characteristics and whether they are specific or nonspecific, as well as the staining properties and relative amount of the cytoplasm. These properties should be noted for all types of cells that may be encountered in the peripheral blood.

B. Myeloblast (Blast Cell)
Myeloblasts are the most immature cells in the myeloid series. They are normally confined to the bone marrow, where they constitute less than 3 percent of the nucleated cells. They may be present in peripheral blood in leukemic states, myelodysplasias, and, rarely, in leukemoid reactions. The myeloblast is a fairly large cell, 15 to 20 μm in diameter with a high nuclear to cytoplasmic (N:C) ratio, usually 7:1 to 5:1. The cell and nucleus are usually round. The nucleus has a finely reticulated chromatin with distinct nucleoli present. The cytoplasm is basophilic and agranular. Several variant forms can be seen in pathologic states.

C. Promyelocyte
Promyelocytes are round to oval cells that are generally slightly larger than a myeloblast, the diameter is 12 to 24 μm. They are normally confined to bone marrow, where they constitute less than 2 percent of nucleated cells, but, like the myeloblast, can be seen in peripheral blood in pathologic states. The nuclear to cytoplasmic ratio is high, 5:1 to 3:1. The nucleus is round to oval, has a fine chromatin, and contains distinct nucleoli. The cytoplasm is basophilic, but is more plentiful than a myeloblast and contains distinct azurophilic (primary) granules. In leukemic states, both hypogranular and microgranular forms of promyelocytes can be observed.

D. Myelocyte
The transition from promyelocyte to myelocyte occurs with the end of production of azurophilic (primary) granules and the beginning of production of lilac (secondary) granules. Myelocytes are usually confined to the marrow, where they constitute approximately 10 percent of the nucleated cells. In pathologic states, myelocytes are seen in peripheral blood. The myelocyte is smaller than the earlier precursors, usually 10 - 18 μm. The cells are round to oval and have a nuclear to cytoplasmic ratio of 2:1 to 1:1. The nucleus is slightly eccentric, lacks a nucleolus, and begins to demonstrate chromatin clumping; one side often shows slight flattening. Sometimes a clear hof is seen adjacent to the nucleus, indicating the location of the Golgi apparatus. The cytoplasm is relatively more abundant than earlier precursors and is amphophilic. Both azurophilic and lilac granules are present in the cytoplasm, with lilac granules coming to predominate as maturation progresses.

E. Metamyelocyte
Metamyelocytes, also known as juveniles, are the first of the post-mitotic myeloid precursors. They constitute 15-20 percent of nucleated cells in the bone marrow and may be seen in peripheral blood in pathologic states and in response to stress. They are approximately 10-18 μm in diameter, slightly smaller than myelocytes. They are round to oval with a nuclear to cytoplasmic ratio of 1.5:1 to 1:1. The nuclear chromatin is clumped and the nucleus is indented to less than half of the potential round nucleus (i.e., the indentation is smaller than half of the distance to the farthest nuclear margin). The cytoplasm is amphophilic and contains rare azurophilic (primary) granules and many fine lilac (specific) granules).

F. Segmented or Band Neutrophil
Band Neutrophils, also known as stabs, constitute 10-15 percent of the nucleated cells in the bone marrow and 5-10 percent of the nucleated cells in the blood under normal conditions. Increased numbers of bands appear in peripheral blood in a number of physiologic and

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pathologic states. The band is round to oval and 10-18 µm in diameter. The nuclear to cytoplasmic ratio is 1:1.5 to 1:2 and the nuclear chromatin is clumped. The nucleus is indented to more than half the distance to the farthest nuclear margin, but in no area is the chromatin condensed to a single filament. The nucleus can assume many shapes: it can be band-like; sausage-like; S, C, or U-shaped; and it may be twisted and folded on itself. The cytoplasm is similar to that of other post-mitotic myeloid cells, with lilac specific granules predominating in the pale cytoplasm. The segmented neutrophil, the mature cell of the myeloid series and the predominant white cell in blood, mimics its immediate precursors in size (10-15 µm), shape (round to oval), and cytoplasmic appearance (pale pink cytoplasm with numerous lilac granules). The N:C ratio is 1:3, the lowest of any cell in the myeloid series, and the nuclear chromatin is clumped. The nucleus is segmented or lobated (2-5 lobes normally). The lobes are connected by a thin filament that contains no internal chromatin, giving it the appearance of a solid, thread-like dark line. The presence of these thread-like filaments is the basis for distinguishing the segmented neutrophil from its precursor, the band neutrophil. At times, the nucleus may be so folded or twisted that the presence of filaments may be difficult or impossible to establish.

G. Eosinophil, any stage
Eosinophils are round to oval leukocytes that are present in peripheral blood, bone marrow, and tissues of normal individuals. They are generally easily recognized due to their characteristic granulation. They are the same size as neutrophilic cells, 10-15 µm for mature forms and 10-18 µm for immature forms. The N:C ratio ranges from 1:3 for mature forms to 2:1 for immature forms. Their abundant cytoplasm is generally evenly filled by numerous coarse, orange-red granules of uniform size. These granules rarely overlie the nucleus and exhibit a refractile appearance with light microscopy due to their crystalline structure. Discoloration may give these granules a blue, brown, or pink tint. Nonetheless, the uniform, coarse nature of eosinophilic granules is characteristic and differs from the smaller, finer granules of neutrophilic cells. Occasionally, eosinophils can become degranulated with only a few orange-red granules remaining visible within the faint pink cytoplasm.

H. Basophil, any stage
Cells in the basophil line have a maturation sequence analogous to the neutrophil line. At the myelocyte stage, when specific granules begin to develop, basophil precursors can be identified. All basophils, from the basophilic myelocyte to the mature segmented basophil, are characterized by the presence of a moderate number of coarse and densely stained granules of varying sizes and shapes. The granules are larger than neutrophilic granules and most are roughly spherical. The predominant color of the granules in Wright stained preparations is blue-black, but some may be purple to red. The granules are unevenly distributed and frequently overlay and obscure the nucleus. Basophils are increased in the blood in several states, including myeloproliferative disease, hypersensitivity reactions, myxedema, tuberculosis, diabetes and the onset of menses.

I. Monocyte
Monocytes are slightly larger than neutrophils being 12-20 µm in diameter. The majority are round with smooth edges, but some have pseudopod-like cytoplasmic extensions. The cytoplasm is abundant and gray to gray-blue (ground-glass appearance), and may contain fine, evenly distributed, azurophilic granules or vacuoles. The nuclear to cytoplasmic ratio is 4:1 to 2:1. The nucleus is usually indented, often resembling a three-pointed hat, but can be folded or band-like. The chromatin is clumped, but less dense than that of a neutrophil or lymphocyte.

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There are no visible nucleoli.

J. Lymphocyte
While most lymphocytes seen in a blood film are fairly homogeneous, they do exhibit a range of normal morphology. These small, round to ovoid cells range in size from 7-15 µm and their N:C ratio varies from 5:1 to 2:1. Most lymphocytes are small with round to oval nuclei that may be slightly indented or notched. Some normal lymphocytes are medium sized due to an increased amount of cytoplasm. The chromatin is diffusely dense or coarse and clumped. Nucleoli are not visible. Some cells may exhibit a small, pale chromocenter that may be mistaken for a nucleolus. The majority of lymphocytes have scant amount of pale blue to moderately basophilic, agranular cytoplasm. Occasionally, the edges may be slightly frayed or pointed due to artifacts induced during smear preparation. Some cells show a perinuclear clear zone or halo that surrounds the nucleus. Occasionally lymphocytes will have a small clear zone, or hof, adjacent to one side of the nucleus. Reference books are available for assistance in identifying toxic changes, immature forms and other abnormalities.

K. Smudge Cells
Smudge Cells are remnants of cells that lack identifiable cytoplasmic membranes or nuclear structures. They are usually artifacts produced by the rupture of fragile cells during blood smear preparation. Most often associated with abnormally fragile lymphocytes in disorders such as chronic lymphocytic leukemia (CLL), smudge cells can also be seen in degenerating samples, and their origin may not be lymphocytic. Smudge cells may also be common, in infectious mononucleosis, pertussis and lymphomas.

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X. CALCULATIONS:

A. Platelet Estimate

PLT = average # of platelets seen in 10-20 oil immersion fields (100x)

B. Correction for Nucleated Red Blood Cells

$$\text{Corrected WBC} = \frac{\text{Uncorrected WBC} \times 100}{100 + \text{NRBC (Counted/100 WBC)}}$$

C. Calculation of the Absolute Differential Count

$$\text{Absolute \#} = \frac{\text{\% of cells} \times \text{WBC count}}{100}$$

D. Absolute (#) Neutrophil example:
WBC = 5.0, Neutrophil % = 50%
Absolute (#) Neutrophil = (50 x 5.0) / 100
Absolute (#) Neutrophil = 250.0 / 100
Absolute (#) Neutrophil = 2.5

XI. EXPECTED VALUES:

A. WBC Differential

Parameter (bill/L)	Female	Male
Neutrophils	1.6 - 7.2	1.6 - 7.2

Parameter (bill/L)	Female	Male
Lymphocytes	1.1 - 4.0	1.1 - 4.0
Monocytes	0.0 - 0.8	0.0 - 0.9
Eosinophils	0.0 - 0.5	0.0 - 0.4
Basophils	0.0 - 0.03	0.0 - 0.04

B. RBC Morphology: Unremarkable

C. Platelet Estimate: Adequate

D. WBC Estimate: Confirmed

XII. LIMITATIONS:

A. When evaluating a stained smear:

1. Do not progress too far into the thick area of the slide. The morphologic characteristics of the cells are difficult to distinguish in this area.
2. Make sure the smear is properly made and stained to assess the blood film. A poorly made smear or stained blood film may result in erroneous patient results and missed or incorrect categorizing of the cells.

XIII. SPECIAL NOTES:

A. Erythrocytes are liable to be crenated when the blood film has dried too slowly.

B. Repeating abnormal manual differentials is dependent on the expertise of the technologist.

1. If the automated differential agrees with the manual differential, a repeat does need not be performed.
2. If the automated differential does not agree with the manual differential, have the differential repeated by a second technologist.
3. Consider the possibility that the smear and the automated blood count may not be from the same specimen.
4. Repeat testing as necessary.

C. A secondary review for slides with a "Blast" flag is always required. Refer to the 'Second Level Hematology Review Work Flow' procedure for more details.

D. If the WBC is 1,000/mm^3 or less, it is permissible to adjust (decrease) the total count for the differential in the LIS or middleware. The absolute values for the differential will be automatically calculated. It may be necessary to make and read more than one slide to enumerate the necessary number of cells.

E. If a request for Pathologist Consult (BM/PC) is ordered, complete the CBC, differential, and reticulocyte count in the usual manner.

F. If a pathologist review is needed, refer to the 'Criteria For Review of Peripheral Blood and Body Fluid Smears' procedure for more details.

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XIV. REFERENCES:

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Attachments

Attachment A – Smear Review Checklist

Approval Signatures

Step Description	Approver	Date
Medical Director	Muhammad Arshad: Chief, Pathology	8/14/2023
Medical Director	Jeremy Powers: Chief, Pathology	8/8/2023
Policy and Forms Steering Committee Approval (if needed)	Kristin Murphy: Medical Technologist Lead	8/8/2023
	Kimberly Geck: Dir, Lab Operations B	8/6/2023
	Helga Groat: Supv, Laboratory	8/4/2023
	Kristen DiCicco: Mgr, Laboratory	7/28/2023
	Katherine Persinger: Mgr, Laboratory	7/27/2023

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Ashley Beesley: Mgr, Laboratory	7/27/2023
Kristin Murphy: Medical Technologist Lead	7/27/2023

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