#### Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer

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| Background | This procedure describes how to perform an automated body fluid cell count using the Sysmex XN-3100 Hematology Analyzer. |

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| Policy | * Body Fluid cell counts will only be run on the Sysmex XN A (primary) and XN B (back-up) * The following Body fluid types are approved to run on the Sysmex XN 3100: * CSF * Synovial fluid * Serous fluid ( peritoneal, pleural, pericardial) * Manual cell count and/or differential will be performed when: * Specimen is unsuitable for automated cell count (i.e. bronch wash, marked clumped or clotted, etc) * Automated WBC and/or RBC count and/or differential has abnormal error flags * For CSF only: automated WBC and/or RBC count is below lower reportable limit * If the automated WBC-BF is less than or equal to 5, the differential will not be reported ( append ETC NODIF as fluid comment) * A slide will always be prepared and reviewed for malignant or abnormal cells and as a procedural control to correlate analyzer cell count. Order Pathologist Review if suspect malignant/abnormal cells. |

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| Supplies | * Test tubes or microcups * Disposable pipettes * Wooden applicator sticks * Hyaluronidase - store frozen |

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| Specimen Requirements | * For CSF, anticoagulant is not required or recommended. Note: CSF collection tubes cannot be used on the analyzer. Place aliquot into labeled microcup (without anticoagulant - Stago microcups are approved for use) or plain test tube * Serous and synovial fluid should be placed into EDTA tube to prevent clotting * It is recommended that all synovial fluid (or other viscous fluid) aliquots be treated with a small amount of hyaluronidase before analyzing |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Specimen Requirements,cont | • All specimens must be checked for clots prior to analyzing.   * Specimens that are markedly clumped or clotted will not be run on the analyzer. * Clotted and sub-optimal specimens are handled on a case-by-case basis. If cell count is performed on clotted, sub-optimal, and/or older than desired limit, then add the ETC comment FCLOT (Cell count and differential may be inaccurate due to clot in specimen) to the Comment field   • Specimen stability:   * CSF should be tested within 4 hrs. If >4 hours ,use good judgement before reporting results * All other body fluids should be tested within 24 hours of collection   • Minimum volume:   * Normal tube cap off is 300 uL * Microcup is 160 uL * Raised bottom tubes cannot be used for body fluid analysis |

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| Quality Control | Refer to *Running and Evaluating BF Quality Control on the Sysmex XN-3100 Hematology Analyzer* procedure |

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| Procedure | Follow the steps below to perform an automated cell count on a body fluid   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Step | Action | | | | | 1 | Ensure analyzer is in Ready status then switch to Manual Mode | | | | | 2 | Click the Change Analysis Mode button on the control menu | | | | | 3 | Select body fluid then click OK | | | | | 4 | Review body fluid background check for acceptable limits   * WBC-BF ≤ 0.001 K/uL * RBC-BF ≤ 0.003 M/uL | | | | |  |  | | | | |  | **If** | **Then** |  | | BF background check passes | * Proceed to step 5 | | BF background check does not pass | * Use back up XN analyzer * Or troubleshoot and resolve background check failure before proceeding | |  | | | | | 5 | Click manual analysis button in the analyzer menu | | | | |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Procedure,cont | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Step | Action | | | | | 6 | Select the desired parameter for each field below | | | |  | |  |  | | | | |  | Read ID | * Check box for barcode ID read * Uncheck box to enter sample ID manually or use hand held barcode scanner in the sample number field * Samples in microcups, the ID must be manually entered by hand or hand held barcode scanner * Manual dilutions, ID must be programmed with dilution factor |  | | Patient ID | * Enter patient MRN if manually entering sample ID | | Cap Open | * Ensure cap open is checked and run body fluid sample with cap off | |  | | | | | 7 | Click OK | | | | | 8 | Mix specimen by gentle inversion. Remove cap if present | | | | | 9 | Place specimen in the tube holder. Note: Microcups must be placed in the rear holder | | | | | 10 | Press the blue start switch | | | | | 11 | After aspiration, remove the sample tube when tube holder slides out | | | | | 12 | Obtain printout and review for flags or errors | | | | | 13 | When body fluid analysis is complete, return the analyzer back to whole blood analysis mode   * To stay in manual mode, click change analysis mode on the control menu. Click whole blood then click OK * To return to sampler closed mode, press the mode switch | | | | |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Flagged Results | |  |  |  | | --- | --- | --- | | Message | Explanation | Action | | WBC Abn Scattergram | The WBC Abn Scattergram message is generated during body fluid analysis whenever clustering in the WDF scattergram is abnormal | * If dashes (---) appear in place of numeric data, possible actions may include: * Perform repeat analysis (if sufficient volume) * Perform sample dilution using CELLPACK DCL (use lowest dilution necessary to obtain valid result). Allow dilution to sit for 10 minutes before analyzing. * WBC-BF and RBC-BF must be manually calculated to correct for dilution factor. PMN% and MN% do not need correcting. * Perform manual hemacytometer count and/or manual differential if other actions do not resolve flagging. * If Asterisk (\*) next to results, possible actions may include: * Perform repeat analysis (if sufficient volume) * Perform sample dilution using CELLPACK DCL (use lowest dilution necessary to obtain valid result). Allow dilution to sit for 10 minutes before analyzing. * WBC-BF and RBC-BF must be manually calculated to correct for dilution factor. PMN% and MN% do not need correcting. * Perform manual hemacytometer count and/or manual differential if other actions do not resolve flagging. | |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Error Messages | |  |  |  | | --- | --- | --- | | Error Message | Explanation | Action | | **Analysis result is high** | When body fluid analysis was performed, analysis data with high values that may affect the next analysis results were obtained | * Remove the sample tube from the device. Click Execute in the help dialog box to perform a background check * Ensure background check is successful otherwise body fluid result is not valid and cannot be used ( BF displayed in white on red background and body fluid icon will appear darker in data browser) | |

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| Body Fluid Reportable Range | |  |  | | --- | --- | | Parameter | Reportable Range | | WBC-BF | 0.003 – 10.000 K/uL | | RBC-BF | 0.002 – 5.000 M/uL | |

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| Calculations | * Analyzer WBC-BF and RBC-BF results must be converted to cubic millimeter (cumm) units for reporting * To convert WBC-BF from x103/µL to cumm, move decimal 3 places to the right. * Example: WBC-BF = 0.900 x103/µL = 900 /cumm * To convert RBC-BF from x106/µL to cumm, move decimal 6 places to the right. * Example: RBC-BF = 0.007 x106/µL = 7,000 /cumm |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Reviewing Body Fluid Results | Refer to the table below for body fluid review instructions   |  |  | | --- | --- | | If ... | Then ... | | fluid is CSF and the WBC-BF less than lower reportable limit (i.e. <0.003 x103/µL) | Perform manual WBC count | | Fluid is CSF and the RBC-BF less than lower reportable limit (i.e. <0.002 x106/µL) | Perform manual RBC count | | All other body fluids (synovial, serous) and WBC-BF less than lower reportable limit | Report WBC count as <3 /cumm | | All other body fluids (synovial, serous) and RBC-BF less than lower reportable limit | Report RBC count as <2,000 /cumm | | WBC-BF and/or RBC-BF exceeds upper reportable limit (i.e. @) | * Prepare dilution of sample with CELLPACK DCL (use lowest dilution necessary to obtain valid result) * Allow dilution to sit for 10 minutes before analyzing * Correct analyzer results for dilution factor | |

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| Reference Ranges | • CSF WBC : >5 Years: 0-5 /cumm, 1 Month to 5 Years: 0-10 /cumm, <1 Month: 0-30 /cumm  • CSF RBC: All ages: 0 /cumm  • Reference ranges are not established for other body fluid types. |

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| Limitations | • Fat globules, crystals and high viscous synovial fluids may cause erroneous or misleading results.  • If any of the following are present, the system may erroneously report a high WBC-BF:  a) Liposome preparation (CSF)  b) Yeast-like fungi (CSF) |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Reporting CSF Automated Cell Counts | |  |  | | --- | --- | | Prompt | Action | | Worksheet | RVCSFM | | ACC No. | Enter the ACC No. | | CTUB | Enter the tube number used for cell count | | CTV | Enter total volume of fluid collected (i.e. all tubes) | | CCOL | Enter specimen color from supernatant | | CAPP | Enter Specimen appearance | | CWBCCT  CWBCDF  CWBCSQ  CWBCV | Enter HIDE at each prompt | | CWBC | Enter analyzer WBC count in /cumm | | CRBCCT CRBCDF CRBCSQ  CRBCV | Enter HIDE at each prompt | | CRBC | Enter analyzer RBC count in /cumm | | CPMN | Enter Sysmex PMN% count or HIDE if WBC-BF is ≤5 or enter manual count | | CLYM | Enter Sysmex MN% count or HIDE if WBC-BF is ≤5 or enter manual count Note: LIS auto appends the ETC comment CCL (Cells counted as lymphocytes includes all Mononuclear cells) if count reported. | | CMON | HIDE | | CCOM | Enter comment as applicable or HIDE. If WBC-BF is ≤5, enter the ETC comment NODIF (Diff not indicated). | |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Reporting Synovial fluid Automated Cell Count | |  |  | | --- | --- | | Prompt | Action | | Worksheet | RVSFM | | ACC No. | Enter the ACC No. | | SFSORC | Enetr fluid source | | SFCOL | Enter specimen color | | SFAPP | Enter Specimen appearance | | SWBCCT  SWBCDF  SWBCSQ  SWBCV | Enter HIDE at each prompt | | SFWBC | Enter analyzer WBC count in /cumm | | SRBCCT SRBCDF SRBCSQ  SRBCV | Enter HIDE at each prompt | | SFRBC | Enter analyzer RBC count in /cumm | | SFPMN | Enter Sysmex PMN% count or HIDE if WBC-BF is ≤5 or enter manual count | | SFLYM | Enter Sysmex MN% count or HIDE if WBC-BF is ≤5 or enter manual count Note: LIS auto appends the ETC comment CCL (Cells counted as lymphocytes includes all Mononuclear cells) if count reported. | | SFMON | HIDE | | SFOTH | HIDE | | CCOM | Enter comment as applicable or HIDE. If WBC-BF is ≤5, enter the ETC comment NODIF (Diff not indicated). | |

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Performing Body Fluid Cell Counts on the Sysmex XN-3100 Hematology Analyzer, Continued

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| Reporting Other Body Fluid (Misc BF) Automated Cell Count | |  |  | | --- | --- | | Prompt | Action | | Worksheet | RVFLDM | | ACC No. | Enter the ACC No. | | FTYPE | Enter the fluid type ( i.e pleural) | | FTV | Enter total volume of fluid collected | | FCOL | Enter specimen color | | FAPP | Enter Specimen appearance | | FWBCCT  FWBCDF  FWBCSQ  FWBCV | Enter HIDE at each prompt | | FWBC | Enter analyzer WBC count in /cumm | | FRBCCT  FRBCDF FRBCSQ  FRBCV | Enter HIDE at each prompt | | FRBC | Enter analyzer RBC count in /cumm | | FPMN | Enter Sysmex PMN% count or HIDE if WBC-BF is ≤5 or enter manual count | | FLYM | Enter Sysmex MN% count or HIDE if WBC-BF is ≤5 or enter manual count Note: LIS auto appends the ETC comment CCL (Cells counted as lymphocytes includes all Mononuclear cells) if count reported. | | FMON | HIDE | | FCOM | Enter comment as applicable or HIDE. If WBC-BF is ≤5, enter the ETC comment NODIF (Diff not indicated). | |  |

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| References | * Sysmex XN 3100 Operator’s manual, March 2017 * Sysmex XN series Automated Hematology Systems Flagging Interpretation Guide, March 2018 |

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