#### 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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| 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

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| 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
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|  | **If**  | **Then** |  |
| BF background check passes | * Proceed to step 5
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| BF background check does not pass | * Use back up XN analyzer
* Or troubleshoot and resolve background check failure before proceeding
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| 5 | Click manual analysis button in the analyzer menu |

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| Procedure, cont |

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| Step | Action |
| 6 | Select the desired parameter for each field below |   |
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|  | 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
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| Patient ID | * Enter patient MRN if manually entering sample ID
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| Cap Open | * Ensure cap open is checked and run body fluid sample with cap off
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| 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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| Flagged Results |

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| 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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| Error Messages |

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| 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 |

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| 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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| Reviewing Body Fluid Results | Refer to the table below for body fluid review instructions

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| 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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| Reporting CSF Automated Cell Counts |

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| 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 |
| CWBCCTCWBCDFCWBCSQCWBCV | Enter HIDE at each prompt |
| CWBC | Enter analyzer WBC count in /cumm |
| CRBCCT CRBCDF CRBCSQCRBCV | 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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| Reporting Synovial fluid Automated Cell Count |

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| Prompt | Action |
| Worksheet | RVSFM |
| ACC No. | Enter the ACC No. |
| SFSORC | Enetr fluid source |
| SFCOL | Enter specimen color |
| SFAPP | Enter Specimen appearance |
| SWBCCTSWBCDFSWBCSQSWBCV | Enter HIDE at each prompt |
| SFWBC | Enter analyzer WBC count in /cumm |
| SRBCCT SRBCDF SRBCSQSRBCV | 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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| Reporting Other Body Fluid (Misc BF) Automated Cell Count |

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| 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 |
| FWBCCTFWBCDFFWBCSQFWBCV | Enter HIDE at each prompt |
| FWBC | Enter analyzer WBC count in /cumm |
| FRBCCT FRBCDF FRBCSQFRBCV | 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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