COLLEGE of AMERICAN PATHOLOGISTS

Surveys and Anatomic Pathology Education Programs

Comprehensive Hematology with Automated Differential
FH9-C 2017

Participant Summary

0.5 Hours of Self-Reported Training Available

This document is available on e-LAB Solutions.

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2017 FH9-C
PARTICIPANT SUMMARY

Program Update

Don't Miss Out on this Educational Opportunity!
With your participation in CAP's Surveys programs, *every member of your team* can take part in education activities: earn Continuing Education (CE) credits or receive Self-Reported Training* at no additional charge.

This Survey mailing includes a Self-Reported Training activity. By reviewing the discussion that begins on page 36, your laboratory staff can earn **0.5 education hours** that can be used towards fulfilling education and certification of maintenance requirements. For your convenience, a form has been included to document your staff's participation in the activity. See page 46.

**CAP Self-Reported Training activities do not offer CE credit, but can be used towards fulfilling requirements for certification of maintenance by agencies such as the American Society of Clinical Pathology (ASCP). Please verify with your certifying agency to determine your education requirements.*

Evaluation Criteria

As published in the January 24, 2003 Federal Register, (42 CFR Part 493, Medicare, Medicaid, and CLIA Programs; Laboratory Requirements Relating to Quality Systems and Certain Personnel Qualifications; Final Rule) effective April 24, 2003, proficiency-testing (PT) providers are required to grade all analytes regulated for PT at 80% participant or referee consensus. For information on criteria for grading analytes not regulated for PT, please review your Participant Summary.

Analytes regulated for proficiency testing appear in **bold** type.

Quantitative

Analyte	Target Value	Evaluation Criteria
Basophils*	Peer Group	± 3 SD or ±1.0 (whichever is greater)
Eosinophils*	Peer Group	± 3 SD or ±1.0 (whichever is greater)
Hematocrit	Peer Group	± 6%
Microhematocrit (waived)	Peer Group	± 6% or 2 SD (whichever is greater)
Hemoglobin	Peer Group	± 7%
IG	Not Graded	Educational
Immature Platelet Fraction	Not Graded	Educational
Lymphocytes*	Peer Group	± 3 SD or ±1.0 (whichever is greater)
MCV	Peer Group	± 3 SD
MCH	Peer Group	± 3 SD
MCHC	Peer Group	± 3 SD
Monocytes*	Peer Group	± 3 SD or ±1.0 (whichever is greater)
MPV	Peer Group	± 3 SD
Neutrophils/Granulocytes*	Peer Group	± 3 SD or ±1.0 (whichever is greater)
nRBC	Not Graded	Educational
Platelet Count	Peer Group	± 25%
RDW	Peer Group	± 3 SD
Red Blood Cell Count	Peer Group	± 6%
White Blood Cell Count	Peer Group	± 15%

Evaluation Criteria (continued)

Results for IG, Immature Platelet Fraction, and nRBC are **not** formally evaluated; however, statistics appear in the participant summary for your information.

Your results are evaluated based upon a range of acceptability. The range is determined using a target value and a limit. There must be at least 10 laboratories in the peer group. If a peer group of 10 is not established, your results may be evaluated against the instrument group mean.

Qualitative

Analyte	Evaluation Criteria
Blood Cell Identification*	80% referee or participant consensus

*Blood Cell Identification results are included in the CMS performance summary. In the event that Blood Cell Identification is not performed, results from the flow through differential will be reported.

The quantitative data tables provided in the Participant Summary report include the mean, SD, and %CV. Data are not included for methods used by fewer than 10 laboratories. The limits of acceptability are located on your participant evaluation report.

To provide a timely evaluation of your results, statistics presented in this participant summary report reflect participant data received by the due date.

The CAP is required to submit PT results to the Centers for Medicare and Medicaid Services (CMS) for all labs that have provided a CLIA identification number. If you do not notify the CAP that your lab has discontinued testing of a regulated analyte, **a score of zero will be given**. Your reporting preferences are outlined on the CMS Analyte Reporting Selections document. If new products are ordered and/or canceled, this may affect your reporting selections, so it is recommended that you periodically check this report on e-*LAB* Solutions™, which will always reflect the most up-to-date information. This information can also be obtained by calling the Customer Contact Center at 800-323-4040, Option 1 (domestic) or 001-847-832-7000, Option 1 (international).

In the event a result is not graded, a numeric code will appear next to your result. A definition of the code will appear on the first page of your evaluation.
Please see "Actions Laboratories Should Take when a PT Result is Not Graded" on page 45.

White Blood Cell Count – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	190	17.72	0.41	2.3
	Sysmex XE-2100C,XE2100DC	28	17.62	0.49	2.8
	Sysmex XE-2100 D/L (Bld Ctr)	57	17.64	0.52	2.9
	Sysmex XE-5000	349	17.65	0.41	2.3
	Sysmex XN-L Series	31	18.43	0.58	3.2
	Sysmex XN-Series	1744	17.57	0.27	1.5
	Sysmex XN-Series (RL App)	28	17.47	0.27	1.5
	Sysmex XS (Except RL App)	753	18.53	0.39	2.1
	Sysmex XS-1000iC (RL App)	52	18.55	0.32	1.7
	Sysmex XT-1800i/2000i	304	17.90	0.49	2.8
	Sysmex XT-4000i	160	17.86	0.43	2.4
FH9-12	Sysmex XE-2100,2100 D/L	190	2.86	0.09	3.3
	Sysmex XE-2100C,XE2100DC	28	2.86	0.11	4.0
	Sysmex XE-2100 D/L (Bld Ctr)	56	2.84	0.11	3.8
	Sysmex XE-5000	350	2.86	0.10	3.5
	Sysmex XN-L Series	31	2.82	0.10	3.6
	Sysmex XN-Series	1733	2.74	0.07	2.6
	Sysmex XN-Series (RL App)	28	2.70	0.08	3.0
	Sysmex XS (Except RL App)	756	2.88	0.09	3.0
	Sysmex XS-1000iC (RL App)	53	2.88	0.09	3.2
	Sysmex XT-1800i/2000i	304	2.87	0.10	3.5
	Sysmex XT-4000i	164	2.87	0.10	3.4
FH9-13	Sysmex XE-2100,2100 D/L	190	7.72	0.19	2.5
	Sysmex XE-2100C,XE2100DC	27	7.63	0.18	2.4
	Sysmex XE-2100 D/L (Bld Ctr)	57	7.73	0.23	2.9
	Sysmex XE-5000	353	7.72	0.22	2.8
	Sysmex XN-L Series	31	7.94	0.22	2.8
	Sysmex XN-Series	1750	7.74	0.15	2.0
	Sysmex XN-Series (RL App)	28	7.73	0.19	2.4
	Sysmex XS (Except RL App)	755	8.14	0.20	2.5
	Sysmex XS-1000iC (RL App)	52	8.15	0.18	2.2
	Sysmex XT-1800i/2000i	305	7.79	0.21	2.6
	Sysmex XT-4000i	162	7.78	0.20	2.6
FH9-14	Sysmex XE-2100,2100 D/L	188	6.50	0.21	3.3
	Sysmex XE-2100C,XE2100DC	27	6.50	0.18	2.8
	Sysmex XE-2100 D/L (Bld Ctr)	57	6.46	0.24	3.7
	Sysmex XE-5000	353	6.51	0.20	3.1
	Sysmex XN-L Series	31	6.61	0.19	2.8
	Sysmex XN-Series	1742	6.37	0.13	2.1
	Sysmex XN-Series (RL App)	28	6.34	0.14	2.2
	Sysmex XS (Except RL App)	755	6.79	0.17	2.5
	Sysmex XS-1000iC (RL App)	53	6.81	0.16	2.4
	Sysmex XT-1800i/2000i	303	6.75	0.19	2.8
	Sysmex XT-4000i	161	6.75	0.17	2.5
FH9-15	Sysmex XE-2100,2100 D/L	188	2.90	0.09	2.9
	Sysmex XE-2100C,XE2100DC	28	2.87	0.09	3.3
	Sysmex XE-2100 D/L (Bld Ctr)	57	2.85	0.12	4.2
	Sysmex XE-5000	352	2.89	0.09	3.2
	Sysmex XN-L Series	31	3.12	0.08	2.5
	Sysmex XN-Series	1745	3.01	0.08	2.5
	Sysmex XN-Series (RL App)	28	3.00	0.08	2.8
	Sysmex XS (Except RL App)	760	3.21	0.10	3.0
	Sysmex XS-1000iC (RL App)	53	3.22	0.09	3.0
	Sysmex XT-1800i/2000i	307	2.90	0.10	3.5
	Sysmex XT-4000i	161	2.90	0.11	3.7

Red Blood Cell Count – x 10^{12}/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	190	5.247	0.076	1.5
	Sysmex XE-2100C,XE2100DC	28	5.196	0.051	1.0
	Sysmex XE-2100 D/L (Bld Ctr)	58	5.247	0.053	1.0
	Sysmex XE-5000	349	5.239	0.076	1.5
	Sysmex XN-L Series	31	5.381	0.062	1.2
	Sysmex XN-Series	1735	5.283	0.060	1.1
	Sysmex XN-Series (RL App)	29	5.313	0.067	1.3
	Sysmex XS (Except RL App)	751	5.284	0.052	1.0
	Sysmex XS-1000iC (RL App)	50	5.269	0.048	0.9
	Sysmex XT-1800i/2000i	308	5.269	0.068	1.3
	Sysmex XT-4000i	162	5.270	0.059	1.1
FH9-12	Sysmex XE-2100,2100 D/L	189	2.344	0.030	1.3
	Sysmex XE-2100C,XE2100DC	28	2.331	0.029	1.2
	Sysmex XE-2100 D/L (Bld Ctr)	58	2.342	0.028	1.2
	Sysmex XE-5000	350	2.345	0.033	1.4
	Sysmex XN-L Series	31	2.257	0.027	1.2
	Sysmex XN-Series	1743	2.238	0.031	1.4
	Sysmex XN-Series (RL App)	29	2.256	0.038	1.7
	Sysmex XS (Except RL App)	761	2.274	0.027	1.2
	Sysmex XS-1000iC (RL App)	50	2.313	0.046	2.0
	Sysmex XT-1800i/2000i	305	2.339	0.028	1.2
	Sysmex XT-4000i	163	2.348	0.031	1.3
FH9-13	Sysmex XE-2100,2100 D/L	190	2.486	0.035	1.4
	Sysmex XE-2100C,XE2100DC	27	2.461	0.029	1.2
	Sysmex XE-2100 D/L (Bld Ctr)	57	2.485	0.028	1.1
	Sysmex XE-5000	348	2.486	0.034	1.4
	Sysmex XN-L Series	31	2.396	0.029	1.2
	Sysmex XN-Series	1735	2.369	0.031	1.3
	Sysmex XN-Series (RL App)	29	2.391	0.040	1.7
	Sysmex XS (Except RL App)	761	2.409	0.028	1.2
	Sysmex XS-1000iC (RL App)	50	2.445	0.046	1.9
	Sysmex XT-1800i/2000i	304	2.476	0.028	1.1
	Sysmex XT-4000i	164	2.479	0.031	1.2
FH9-14	Sysmex XE-2100,2100 D/L	191	4.417	0.066	1.5
	Sysmex XE-2100C,XE2100DC	27	4.377	0.046	1.1
	Sysmex XE-2100 D/L (Bld Ctr)	57	4.417	0.041	0.9
	Sysmex XE-5000	348	4.412	0.057	1.3
	Sysmex XN-L Series	31	4.407	0.050	1.1
	Sysmex XN-Series	1733	4.345	0.049	1.1
	Sysmex XN-Series (RL App)	29	4.363	0.063	1.4
	Sysmex XS (Except RL App)	757	4.368	0.046	1.0
	Sysmex XS-1000iC (RL App)	49	4.381	0.037	0.8
	Sysmex XT-1800i/2000i	304	4.434	0.049	1.1
	Sysmex XT-4000i	165	4.436	0.048	1.1
FH9-15	Sysmex XE-2100,2100 D/L	191	5.316	0.083	1.6
	Sysmex XE-2100C,XE2100DC	28	5.266	0.049	0.9
	Sysmex XE-2100 D/L (Bld Ctr)	58	5.305	0.065	1.2
	Sysmex XE-5000	347	5.293	0.073	1.4
	Sysmex XN-L Series	31	5.404	0.058	1.1
	Sysmex XN-Series	1730	5.316	0.060	1.1
	Sysmex XN-Series (RL App)	29	5.353	0.059	1.1
	Sysmex XS (Except RL App)	753	5.326	0.055	1.0
	Sysmex XS-1000iC (RL App)	49	5.319	0.041	0.8
	Sysmex XT-1800i/2000i	305	5.325	0.063	1.2
	Sysmex XT-4000i	163	5.319	0.056	1.1

Hemoglobin

		NO.	g/dL			g/L	
		LABS	MEAN	S.D.	C.V.	MEAN	S.D.
FH9-11	**Instrument**						
	Sysmex XE-2100,2100 D/L	188	16.60	0.19	1.1	166.04	1.85
	Sysmex XE-2100C,XE2100DC	28	16.50	0.22	1.4	165.00	2.24
	Sysmex XE-2100 D/L (Bld Ctr)	65	16.54	0.16	1.0	165.45	1.65
	Sysmex XE-5000	350	16.54	0.19	1.1	165.43	1.86
	Sysmex XN-L Series	31	16.69	0.11	0.6	166.87	1.06
	Sysmex XN-Series	1733	16.50	0.15	0.9	165.00	1.48
	Sysmex XN-Series (RL App)	28	16.61	0.14	0.9	166.11	1.42
	Sysmex XS (Except RL App)	765	16.66	0.16	0.9	166.63	1.56
	Sysmex XS-1000iC (RL App)	49	16.68	0.12	0.7	166.82	1.20
	Sysmex XT-1800i/2000i	307	16.44	0.20	1.2	164.42	1.99
	Sysmex XT-4000i	163	16.39	0.17	1.0	163.90	1.70
FH9-12	**Instrument**						
	Sysmex XE-2100,2100 D/L	190	5.85	0.07	1.2	58.46	0.72
	Sysmex XE-2100C,XE2100DC	28	5.82	0.08	1.4	58.18	0.82
	Sysmex XE-2100 D/L (Bld Ctr)	64	5.83	0.07	1.2	58.31	0.69
	Sysmex XE-5000	351	5.84	0.08	1.4	58.42	0.80
	Sysmex XN-L Series	31	5.78	0.06	1.0	57.77	0.56
	Sysmex XN-Series	1743	5.70	0.07	1.2	57.05	0.71
	Sysmex XN-Series (RL App)	28	5.71	0.08	1.3	57.07	0.77
	Sysmex XS (Except RL App)	764	5.69	0.07	1.3	56.87	0.74
	Sysmex XS-1000iC (RL App)	50	5.68	0.07	1.2	56.84	0.71
	Sysmex XT-1800i/2000i	305	5.76	0.08	1.3	57.58	0.77
	Sysmex XT-4000i	162	5.74	0.07	1.2	57.43	0.68
FH9-13	**Instrument**						
	Sysmex XE-2100,2100 D/L	189	6.07	0.07	1.2	60.69	0.73
	Sysmex XE-2100C,XE2100DC	27	6.04	0.06	1.0	60.37	0.63
	Sysmex XE-2100 D/L (Bld Ctr)	65	6.07	0.07	1.2	60.66	0.73
	Sysmex XE-5000	350	6.06	0.08	1.4	60.64	0.82
	Sysmex XN-L Series	31	5.97	0.05	0.9	59.68	0.54
	Sysmex XN-Series	1742	5.91	0.07	1.3	59.05	0.75
	Sysmex XN-Series (RL App)	28	5.89	0.06	1.1	58.89	0.63
	Sysmex XS (Except RL App)	758	5.89	0.07	1.2	58.95	0.71
	Sysmex XS-1000iC (RL App)	50	5.90	0.07	1.1	58.96	0.67
	Sysmex XT-1800i/2000i	307	5.98	0.08	1.3	59.80	0.78
	Sysmex XT-4000i	163	5.96	0.07	1.2	59.64	0.72
FH9-14	**Instrument**						
	Sysmex XE-2100,2100 D/L	191	12.57	0.14	1.1	125.74	1.39
	Sysmex XE-2100C,XE2100DC	27	12.53	0.15	1.2	125.30	1.46
	Sysmex XE-2100 D/L (Bld Ctr)	64	12.57	0.11	0.8	125.70	1.06
	Sysmex XE-5000	349	12.54	0.14	1.1	125.39	1.44
	Sysmex XN-L Series	31	12.56	0.09	0.7	125.65	0.88
	Sysmex XN-Series	1731	12.41	0.12	0.9	124.12	1.17
	Sysmex XN-Series (RL App)	28	12.46	0.10	0.8	124.57	0.96
	Sysmex XS (Except RL App)	762	12.50	0.12	1.0	124.95	1.20
	Sysmex XS-1000iC (RL App)	50	12.51	0.10	0.8	125.10	1.04
	Sysmex XT-1800i/2000i	303	12.57	0.13	1.0	125.73	1.32
	Sysmex XT-4000i	163	12.54	0.11	0.9	125.36	1.15
FH9-15	**Instrument**						
	Sysmex XE-2100,2100 D/L	191	16.43	0.19	1.2	164.32	1.95
	Sysmex XE-2100C,XE2100DC	28	16.32	0.21	1.3	163.21	2.06
	Sysmex XE-2100 D/L (Bld Ctr)	65	16.40	0.16	1.0	163.97	1.63
	Sysmex XE-5000	349	16.37	0.18	1.1	163.70	1.84
	Sysmex XN-L Series	31	16.47	0.12	0.7	164.68	1.19
	Sysmex XN-Series	1739	16.28	0.15	0.9	162.77	1.46
	Sysmex XN-Series (RL App)	28	16.37	0.15	0.9	163.68	1.47
	Sysmex XS (Except RL App)	758	16.45	0.14	0.9	164.46	1.41
	Sysmex XS-1000iC (RL App)	50	16.46	0.16	1.0	164.62	1.58
	Sysmex XT-1800i/2000i	305	16.32	0.18	1.1	163.23	1.76
	Sysmex XT-4000i	162	16.25	0.16	1.0	162.47	1.64

Hematocrit

	Instrument	NO. LABS	% MEAN	% S.D.	% C.V.	L/L MEAN	L/L S.D.
FH9-11	Sysmex XE-2100,2100 D/L	191	46.634	0.719	1.5	0.466	0.007
	Sysmex XE-2100C,XE2100DC	28	44.607	0.567	1.3	0.446	0.006
	Sysmex XE-2100 D/L (Bld Ctr)	68	46.676	0.762	1.6	0.467	0.008
	Sysmex XE-5000	351	46.630	0.740	1.6	0.466	0.007
	Sysmex XN-L Series	30	46.867	1.008	2.2	0.469	0.010
	Sysmex XN-Series	1749	46.536	0.767	1.6	0.465	0.008
	Sysmex XN-Series (RL App)	28	45.571	0.959	2.1	0.456	0.010
	Sysmex XS (Except RL App)	761	48.121	0.715	1.5	0.481	0.007
	Sysmex XS-1000iC (RL App)	49	48.265	0.861	1.8	0.483	0.009
	Sysmex XT-1800i/2000i	302	47.556	0.730	1.5	0.476	0.007
	Sysmex XT-4000i	163	47.656	0.706	1.5	0.477	0.007
FH9-12	Sysmex XE-2100,2100 D/L	190	17.532	0.500	2.9	0.175	0.005
	Sysmex XE-2100C,XE2100DC	28	17.000	0.000	0.0	0.170	0.000
	Sysmex XE-2100 D/L (Bld Ctr)	68	17.618	0.490	2.8	0.176	0.005
	Sysmex XE-5000	355	17.589	0.493	2.8	0.176	0.005
	Sysmex XN-L Series	30	16.700	0.466	2.8	0.167	0.005
	Sysmex XN-Series	1750	16.723	0.464	2.8	0.167	0.005
	Sysmex XN-Series (RL App)	28	16.357	0.559	3.4	0.164	0.006
	Sysmex XS (Except RL App)	763	17.507	0.503	2.9	0.175	0.005
	Sysmex XS-1000iC (RL App)	49	17.673	0.474	2.7	0.177	0.005
	Sysmex XT-1800i/2000i	306	17.683	0.473	2.7	0.177	0.005
	Sysmex XT-4000i	164	17.811	0.408	2.3	0.178	0.004
FH9-13	Sysmex XE-2100,2100 D/L	176	18.000	0.000	0.0	0.180	0.000
	Sysmex XE-2100C,XE2100DC	27	17.111	0.320	1.9	0.171	0.003
	Sysmex XE-2100 D/L (Bld Ctr)	64	18.000	0.000	0.0	0.180	0.000
	Sysmex XE-5000	325	18.000	0.000	0.0	0.180	0.000
	Sysmex XN-L Series	26	17.000	0.000	0.0	0.170	0.000
	Sysmex XN-Series	1750	17.064	0.318	1.9	0.171	0.003
	Sysmex XN-Series (RL App)	28	16.821	0.548	3.3	0.168	0.005
	Sysmex XS (Except RL App)	762	17.909	0.457	2.6	0.179	0.005
	Sysmex XS-1000iC (RL App)	45	18.000	0.000	0.0	0.180	0.000
	Sysmex XT-1800i/2000i	283	18.000	0.000	0.0	0.180	0.000
	Sysmex XT-4000i	147	18.000	0.000	0.0	0.180	0.000
FH9-14	Sysmex XE-2100,2100 D/L	191	36.377	0.644	1.8	0.364	0.006
	Sysmex XE-2100C,XE2100DC	27	35.185	0.396	1.1	0.352	0.004
	Sysmex XE-2100 D/L (Bld Ctr)	68	36.471	0.503	1.4	0.365	0.005
	Sysmex XE-5000	354	36.381	0.601	1.7	0.364	0.006
	Sysmex XN-L Series	30	35.900	0.712	2.0	0.359	0.007
	Sysmex XN-Series	1746	35.735	0.630	1.8	0.357	0.006
	Sysmex XN-Series (RL App)	28	35.000	0.943	2.7	0.350	0.009
	Sysmex XS (Except RL App)	760	36.734	0.577	1.6	0.367	0.006
	Sysmex XS-1000iC (RL App)	49	37.163	0.717	1.9	0.372	0.007
	Sysmex XT-1800i/2000i	303	36.591	0.612	1.7	0.366	0.006
	Sysmex XT-4000i	164	36.646	0.583	1.6	0.366	0.006
FH9-15	Sysmex XE-2100,2100 D/L	190	46.711	0.814	1.7	0.467	0.008
	Sysmex XE-2100C,XE2100DC	28	44.857	0.651	1.5	0.449	0.007
	Sysmex XE-2100 D/L (Bld Ctr)	68	46.691	0.738	1.6	0.467	0.007
	Sysmex XE-5000	352	46.605	0.716	1.5	0.466	0.007
	Sysmex XN-L Series	30	46.700	0.915	2.0	0.467	0.009
	Sysmex XN-Series	1749	46.620	0.777	1.7	0.466	0.008
	Sysmex XN-Series (RL App)	28	45.643	1.026	2.2	0.456	0.010
	Sysmex XS (Except RL App)	761	48.043	0.727	1.5	0.480	0.007
	Sysmex XS-1000iC (RL App)	49	48.388	0.885	1.8	0.484	0.009
	Sysmex XT-1800i/2000i	301	47.661	0.682	1.4	0.477	0.007
	Sysmex XT-4000i	160	47.669	0.670	1.4	0.477	0.007

MCV – Femtoliters (fL)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	189	88.71	1.08	1.2
	Sysmex XE-2100C,XE2100DC	28	85.90	0.94	1.1
	Sysmex XE-2100 D/L (Bld Ctr)	46	88.84	0.90	1.0
	Sysmex XE-5000	352	88.91	1.07	1.2
	Sysmex XN-L Series	30	87.05	1.38	1.6
	Sysmex XN-Series	1740	87.99	0.87	1.0
	Sysmex XN-Series (RL App)	28	85.51	1.48	1.7
	Sysmex XS (Except RL App)	753	90.97	0.91	1.0
	Sysmex XS-1000iC (RL App)	50	91.59	1.20	1.3
	Sysmex XT-1800i/2000i	299	90.17	0.96	1.1
	Sysmex XT-4000i	160	90.42	0.82	0.9
FH9-12	Sysmex XE-2100,2100 D/L	188	74.49	0.93	1.2
	Sysmex XE-2100C,XE2100DC	28	72.11	0.80	1.1
	Sysmex XE-2100 D/L (Bld Ctr)	46	74.74	0.74	1.0
	Sysmex XE-5000	352	74.67	0.89	1.2
	Sysmex XN-L Series	30	73.81	1.12	1.5
	Sysmex XN-Series	1741	74.24	0.77	1.0
	Sysmex XN-Series (RL App)	28	72.46	1.36	1.9
	Sysmex XS (Except RL App)	765	76.73	0.88	1.1
	Sysmex XS-1000iC (RL App)	50	75.77	1.23	1.6
	Sysmex XT-1800i/2000i	302	75.15	0.83	1.1
	Sysmex XT-4000i	163	75.35	0.69	0.9
FH9-13	Sysmex XE-2100,2100 D/L	189	72.01	0.92	1.3
	Sysmex XE-2100C,XE2100DC	27	69.89	0.80	1.1
	Sysmex XE-2100 D/L (Bld Ctr)	46	72.30	0.73	1.0
	Sysmex XE-5000	352	72.12	0.87	1.2
	Sysmex XN-L Series	30	71.28	1.12	1.6
	Sysmex XN-Series	1740	71.88	0.76	1.1
	Sysmex XN-Series (RL App)	28	69.96	1.28	1.8
	Sysmex XS (Except RL App)	759	73.92	0.79	1.1
	Sysmex XS-1000iC (RL App)	50	73.37	1.06	1.5
	Sysmex XT-1800i/2000i	302	72.50	0.76	1.0
	Sysmex XT-4000i	162	72.66	0.68	0.9
FH9-14	Sysmex XE-2100,2100 D/L	189	82.22	1.02	1.2
	Sysmex XE-2100C,XE2100DC	27	80.38	0.82	1.0
	Sysmex XE-2100 D/L (Bld Ctr)	46	82.51	0.75	0.9
	Sysmex XE-5000	353	82.36	0.96	1.2
	Sysmex XN-L Series	30	81.21	1.21	1.5
	Sysmex XN-Series	1739	82.11	0.79	1.0
	Sysmex XN-Series (RL App)	28	79.95	1.48	1.9
	Sysmex XS (Except RL App)	756	83.99	0.78	0.9
	Sysmex XS-1000iC (RL App)	50	84.76	1.09	1.3
	Sysmex XT-1800i/2000i	298	82.42	0.78	0.9
	Sysmex XT-4000i	161	82.53	0.67	0.8
FH9-15	Sysmex XE-2100,2100 D/L	188	87.80	1.13	1.3
	Sysmex XE-2100C,XE2100DC	28	85.05	0.87	1.0
	Sysmex XE-2100 D/L (Bld Ctr)	46	87.97	0.85	1.0
	Sysmex XE-5000	353	87.98	1.02	1.2
	Sysmex XN-L Series	30	86.38	1.26	1.5
	Sysmex XN-Series	1743	87.54	0.86	1.0
	Sysmex XN-Series (RL App)	28	84.98	1.60	1.9
	Sysmex XS (Except RL App)	752	90.12	0.93	1.0
	Sysmex XS-1000iC (RL App)	50	90.81	1.22	1.3
	Sysmex XT-1800i/2000i	297	89.41	0.93	1.0
	Sysmex XT-4000i	159	89.68	0.88	1.0

MCH – Picograms (pg)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	187	31.63	0.36	1.1
	Sysmex XE-2100C,XE2100DC	28	31.75	0.45	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	38	31.54	0.37	1.2
	Sysmex XE-5000	350	31.58	0.38	1.2
	Sysmex XN-L Series	30	31.00	0.33	1.1
	Sysmex XN-Series	1729	31.22	0.37	1.2
	Sysmex XN-Series (RL App)	28	31.28	0.44	1.4
	Sysmex XS (Except RL App)	747	31.51	0.33	1.1
	Sysmex XS-1000iC (RL App)	49	31.67	0.29	0.9
	Sysmex XT-1800i/2000i	303	31.19	0.39	1.2
	Sysmex XT-4000i	159	31.08	0.34	1.1
FH9-12	Sysmex XE-2100,2100 D/L	186	24.92	0.34	1.3
	Sysmex XE-2100C,XE2100DC	27	24.93	0.30	1.2
	Sysmex XE-2100 D/L (Bld Ctr)	38	24.96	0.25	1.0
	Sysmex XE-5000	351	24.92	0.36	1.4
	Sysmex XN-L Series	30	25.59	0.32	1.2
	Sysmex XN-Series	1735	25.48	0.36	1.4
	Sysmex XN-Series (RL App)	28	25.31	0.43	1.7
	Sysmex XS (Except RL App)	742	25.00	0.33	1.3
	Sysmex XS-1000iC (RL App)	49	24.59	0.52	2.1
	Sysmex XT-1800i/2000i	299	24.62	0.39	1.6
	Sysmex XT-4000i	163	24.50	0.42	1.7
FH9-13	Sysmex XE-2100,2100 D/L	188	24.41	0.38	1.6
	Sysmex XE-2100C,XE2100DC	27	24.54	0.36	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	38	24.47	0.30	1.2
	Sysmex XE-5000	350	24.39	0.33	1.4
	Sysmex XN-L Series	30	24.91	0.31	1.3
	Sysmex XN-Series	1732	24.93	0.35	1.4
	Sysmex XN-Series (RL App)	28	24.66	0.41	1.7
	Sysmex XS (Except RL App)	746	24.49	0.33	1.3
	Sysmex XS-1000iC (RL App)	49	24.12	0.50	2.1
	Sysmex XT-1800i/2000i	301	24.17	0.39	1.6
	Sysmex XT-4000i	162	24.06	0.40	1.7
FH9-14	Sysmex XE-2100,2100 D/L	188	28.47	0.36	1.3
	Sysmex XE-2100C,XE2100DC	27	28.63	0.40	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	38	28.44	0.30	1.1
	Sysmex XE-5000	353	28.41	0.36	1.2
	Sysmex XN-L Series	30	28.49	0.35	1.2
	Sysmex XN-Series	1731	28.56	0.35	1.2
	Sysmex XN-Series (RL App)	28	28.54	0.41	1.4
	Sysmex XS (Except RL App)	742	28.60	0.32	1.1
	Sysmex XS-1000iC (RL App)	50	28.57	0.29	1.0
	Sysmex XT-1800i/2000i	301	28.36	0.37	1.3
	Sysmex XT-4000i	161	28.27	0.31	1.1
FH9-15	Sysmex XE-2100,2100 D/L	187	30.93	0.36	1.2
	Sysmex XE-2100C,XE2100DC	28	31.00	0.42	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	38	30.93	0.43	1.4
	Sysmex XE-5000	352	30.92	0.36	1.2
	Sysmex XN-L Series	30	30.45	0.33	1.1
	Sysmex XN-Series	1737	30.61	0.38	1.2
	Sysmex XN-Series (RL App)	28	30.60	0.44	1.4
	Sysmex XS (Except RL App)	739	30.88	0.31	1.0
	Sysmex XS-1000iC (RL App)	49	30.95	0.33	1.1
	Sysmex XT-1800i/2000i	303	30.67	0.39	1.3
	Sysmex XT-4000i	160	30.55	0.33	1.1

MCHC

		NO.	g/dL			g/L	
		LABS	MEAN	S.D.	C.V.	MEAN	S.D.
FH9-11	**Instrument**						
	Sysmex XE-2100,2100 D/L	189	35.67	0.52	1.5	356.75	5.19
	Sysmex XE-2100C,XE2100DC	28	36.99	0.70	1.9	369.86	7.00
	Sysmex XE-2100 D/L (Bld Ctr)	38	35.52	0.61	1.7	355.16	6.09
	Sysmex XE-5000	347	35.53	0.50	1.4	355.32	5.00
	Sysmex XN-L Series	31	35.62	0.68	1.9	356.19	6.79
	Sysmex XN-Series	1738	35.49	0.54	1.5	354.95	5.39
	Sysmex XN-Series (RL App)	28	36.60	0.77	2.1	366.00	7.69
	Sysmex XS (Except RL App)	754	34.64	0.46	1.3	346.40	4.63
	Sysmex XS-1000iC (RL App)	50	34.57	0.52	1.5	345.70	5.17
	Sysmex XT-1800i/2000i	299	34.60	0.55	1.6	346.01	5.47
	Sysmex XT-4000i	160	34.42	0.46	1.3	344.16	4.61
FH9-12	**Instrument**						
	Sysmex XE-2100,2100 D/L	186	33.46	0.58	1.7	334.63	5.81
	Sysmex XE-2100C,XE2100DC	28	34.60	0.63	1.8	346.00	6.33
	Sysmex XE-2100 D/L (Bld Ctr)	38	33.36	0.49	1.5	333.63	4.91
	Sysmex XE-5000	350	33.37	0.60	1.8	333.71	5.96
	Sysmex XN-L Series	31	34.68	0.71	2.0	346.81	7.05
	Sysmex XN-Series	1740	34.32	0.61	1.8	343.21	6.13
	Sysmex XN-Series (RL App)	28	34.94	0.74	2.1	349.39	7.40
	Sysmex XS (Except RL App)	752	32.58	0.53	1.6	325.76	5.27
	Sysmex XS-1000iC (RL App)	48	32.45	0.44	1.4	324.54	4.39
	Sysmex XT-1800i/2000i	298	32.71	0.61	1.9	327.11	6.14
	Sysmex XT-4000i	162	32.50	0.63	1.9	324.95	6.26
FH9-13	**Instrument**						
	Sysmex XE-2100,2100 D/L	187	33.92	0.58	1.7	339.24	5.79
	Sysmex XE-2100C,XE2100DC	27	35.17	0.47	1.3	351.74	4.68
	Sysmex XE-2100 D/L (Bld Ctr)	38	33.86	0.51	1.5	338.58	5.14
	Sysmex XE-5000	348	33.83	0.56	1.7	338.26	5.63
	Sysmex XN-L Series	31	34.94	0.62	1.8	349.39	6.24
	Sysmex XN-Series	1739	34.67	0.63	1.8	346.74	6.34
	Sysmex XN-Series (RL App)	28	35.23	0.75	2.1	352.32	7.50
	Sysmex XS (Except RL App)	757	33.10	0.54	1.6	331.02	5.36
	Sysmex XS-1000iC (RL App)	50	32.89	0.54	1.6	328.86	5.41
	Sysmex XT-1800i/2000i	297	33.30	0.58	1.7	332.95	5.81
	Sysmex XT-4000i	161	33.11	0.57	1.7	331.14	5.74
FH9-14	**Instrument**						
	Sysmex XE-2100,2100 D/L	188	34.64	0.55	1.6	346.35	5.49
	Sysmex XE-2100C,XE2100DC	27	35.62	0.58	1.6	356.19	5.78
	Sysmex XE-2100 D/L (Bld Ctr)	38	34.48	0.46	1.3	344.76	4.61
	Sysmex XE-5000	351	34.49	0.53	1.5	344.94	5.26
	Sysmex XN-L Series	31	35.09	0.66	1.9	350.87	6.56
	Sysmex XN-Series	1745	34.78	0.55	1.6	347.78	5.49
	Sysmex XN-Series (RL App)	28	35.71	0.80	2.3	357.07	8.05
	Sysmex XS (Except RL App)	755	34.05	0.46	1.4	340.47	4.64
	Sysmex XS-1000iC (RL App)	50	33.75	0.55	1.6	337.54	5.50
	Sysmex XT-1800i/2000i	297	34.41	0.53	1.5	344.05	5.31
	Sysmex XT-4000i	161	34.25	0.46	1.3	342.52	4.55
FH9-15	**Instrument**						
	Sysmex XE-2100,2100 D/L	187	35.23	0.56	1.6	352.32	5.59
	Sysmex XE-2100C,XE2100DC	28	36.45	0.68	1.9	364.50	6.83
	Sysmex XE-2100 D/L (Bld Ctr)	38	35.16	0.54	1.5	351.58	5.44
	Sysmex XE-5000	350	35.13	0.49	1.4	351.35	4.92
	Sysmex XN-L Series	31	35.26	0.62	1.7	352.58	6.16
	Sysmex XN-Series	1740	34.97	0.54	1.5	349.67	5.38
	Sysmex XN-Series (RL App)	28	36.02	0.80	2.2	360.21	8.00
	Sysmex XS (Except RL App)	751	34.27	0.46	1.4	342.68	4.64
	Sysmex XS-1000iC (RL App)	50	34.06	0.54	1.6	340.62	5.41
	Sysmex XT-1800i/2000i	298	34.29	0.52	1.5	342.87	5.20
	Sysmex XT-4000i	161	34.08	0.49	1.4	340.83	4.87

Platelet Count – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	189	518.0	18.7	3.6
	Sysmex XE-2100C,XE2100DC	28	539.7	13.9	2.6
	Sysmex XE-2100 D/L (Bld Ctr)	67	542.4	15.3	2.8
	Sysmex XE-5000	349	515.4	15.7	3.1
	Sysmex XN-L Series	31	577.1	17.7	3.1
	Sysmex XN-Series	1731	551.6	14.7	2.7
	Sysmex XN-Series (RL App)	28	559.4	12.0	2.2
	Sysmex XS (Except RL App)	753	534.1	11.6	2.2
	Sysmex XS-1000iC (RL App)	50	539.0	13.8	2.6
	Sysmex XT-1800i/2000i	303	503.5	19.5	3.9
	Sysmex XT-4000i	159	500.3	17.4	3.5
FH9-12	Sysmex XE-2100,2100 D/L	189	62.2	3.1	4.9
	Sysmex XE-2100C,XE2100DC	28	64.5	3.5	5.5
	Sysmex XE-2100 D/L (Bld Ctr)	68	67.0	3.8	5.6
	Sysmex XE-5000	350	62.0	3.1	4.9
	Sysmex XN-L Series	31	64.5	3.7	5.8
	Sysmex XN-Series	1738	59.5	3.4	5.6
	Sysmex XN-Series (RL App)	27	62.8	4.5	7.1
	Sysmex XS (Except RL App)	758	64.9	3.7	5.7
	Sysmex XS-1000iC (RL App)	50	67.0	4.1	6.1
	Sysmex XT-1800i/2000i	302	67.1	4.6	6.9
	Sysmex XT-4000i	162	66.0	3.7	5.5
FH9-13	Sysmex XE-2100,2100 D/L	189	353.7	9.1	2.6
	Sysmex XE-2100C,XE2100DC	26	363.9	7.7	2.1
	Sysmex XE-2100 D/L (Bld Ctr)	67	363.3	8.0	2.2
	Sysmex XE-5000	353	353.8	9.4	2.7
	Sysmex XN-L Series	31	355.5	9.6	2.7
	Sysmex XN-Series	1742	335.1	8.8	2.6
	Sysmex XN-Series (RL App)	28	340.8	8.2	2.4
	Sysmex XS (Except RL App)	755	375.2	9.1	2.4
	Sysmex XS-1000iC (RL App)	49	381.0	13.1	3.4
	Sysmex XT-1800i/2000i	304	357.2	9.6	2.7
	Sysmex XT-4000i	163	356.7	10.9	3.1
FH9-14	Sysmex XE-2100,2100 D/L	187	231.1	7.2	3.1
	Sysmex XE-2100C,XE2100DC	27	240.6	6.9	2.9
	Sysmex XE-2100 D/L (Bld Ctr)	68	243.7	7.0	2.9
	Sysmex XE-5000	349	231.1	7.2	3.1
	Sysmex XN-L Series	31	251.5	11.3	4.5
	Sysmex XN-Series	1731	237.9	7.4	3.1
	Sysmex XN-Series (RL App)	27	242.2	8.0	3.3
	Sysmex XS (Except RL App)	759	235.9	7.0	3.0
	Sysmex XS-1000iC (RL App)	49	238.2	7.5	3.1
	Sysmex XT-1800i/2000i	299	231.0	7.6	3.3
	Sysmex XT-4000i	162	229.8	7.7	3.4
FH9-15	Sysmex XE-2100,2100 D/L	185	133.1	6.2	4.7
	Sysmex XE-2100C,XE2100DC	27	136.1	6.0	4.4
	Sysmex XE-2100 D/L (Bld Ctr)	68	142.9	7.6	5.3
	Sysmex XE-5000	350	132.9	6.2	4.7
	Sysmex XN-L Series	29	147.0	7.5	5.1
	Sysmex XN-Series	1734	144.5	7.2	5.0
	Sysmex XN-Series (RL App)	28	148.9	7.1	4.8
	Sysmex XS (Except RL App)	756	137.7	6.8	5.0
	Sysmex XS-1000iC (RL App)	49	139.3	7.5	5.4
	Sysmex XT-1800i/2000i	304	134.3	8.5	6.3
	Sysmex XT-4000i	162	132.9	8.7	6.5

MPV – Femtoliters (fL)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	167	10.16	0.16	1.6
	Sysmex XE-2100C,XE2100DC	23	10.25	0.21	2.0
	Sysmex XE-2100 D/L (Bld Ctr)	35	9.99	0.18	1.8
	Sysmex XE-5000	339	10.10	0.18	1.8
	Sysmex XN-L Series	27	9.88	0.17	1.8
	Sysmex XN-Series	1672	10.06	0.13	1.3
	Sysmex XN-Series (RL App)	28	10.90	0.42	3.8
	Sysmex XS (Except RL App)	668	10.24	0.13	1.3
	Sysmex XS-1000iC (RL App)	41	10.50	0.28	2.6
	Sysmex XT-1800i/2000i	270	10.37	0.17	1.6
	Sysmex XT-4000i	153	10.41	0.12	1.2
FH9-12	Sysmex XE-2100,2100 D/L	167	9.70	0.23	2.4
	Sysmex XE-2100C,XE2100DC	23	9.83	0.24	2.4
	Sysmex XE-2100 D/L (Bld Ctr)	35	9.28	0.30	3.2
	Sysmex XE-5000	337	9.69	0.26	2.7
	Sysmex XN-L Series	27	10.43	0.37	3.6
	Sysmex XN-Series	1658	10.58	0.28	2.7
	Sysmex XN-Series (RL App)	28	11.44	0.57	5.0
	Sysmex XS (Except RL App)	668	9.54	0.29	3.1
	Sysmex XS-1000iC (RL App)	41	9.80	0.30	3.1
	Sysmex XT-1800i/2000i	270	9.58	0.27	2.9
	Sysmex XT-4000i	152	9.64	0.25	2.6
FH9-13	Sysmex XE-2100,2100 D/L	167	9.52	0.15	1.5
	Sysmex XE-2100C,XE2100DC	23	9.72	0.20	2.0
	Sysmex XE-2100 D/L (Bld Ctr)	35	9.43	0.17	1.8
	Sysmex XE-5000	336	9.49	0.16	1.7
	Sysmex XN-L Series	27	10.17	0.21	2.1
	Sysmex XN-Series	1673	10.35	0.15	1.4
	Sysmex XN-Series (RL App)	28	11.21	0.41	3.6
	Sysmex XS (Except RL App)	658	9.44	0.12	1.3
	Sysmex XS-1000iC (RL App)	39	9.65	0.19	2.0
	Sysmex XT-1800i/2000i	266	9.60	0.15	1.6
	Sysmex XT-4000i	148	9.62	0.12	1.2
FH9-14	Sysmex XE-2100,2100 D/L	168	10.05	0.19	1.9
	Sysmex XE-2100C,XE2100DC	23	10.17	0.22	2.2
	Sysmex XE-2100 D/L (Bld Ctr)	35	9.83	0.19	1.9
	Sysmex XE-5000	340	10.02	0.20	2.0
	Sysmex XN-L Series	27	10.19	0.32	3.2
	Sysmex XN-Series	1674	10.33	0.19	1.8
	Sysmex XN-Series (RL App)	28	11.14	0.48	4.4
	Sysmex XS (Except RL App)	669	10.04	0.18	1.8
	Sysmex XS-1000iC (RL App)	41	10.31	0.28	2.7
	Sysmex XT-1800i/2000i	272	10.17	0.20	1.9
	Sysmex XT-4000i	155	10.19	0.17	1.6
FH9-15	Sysmex XE-2100,2100 D/L	166	10.39	0.28	2.7
	Sysmex XE-2100C,XE2100DC	23	10.44	0.25	2.4
	Sysmex XE-2100 D/L (Bld Ctr)	35	9.95	0.29	3.0
	Sysmex XE-5000	339	10.37	0.28	2.7
	Sysmex XN-L Series	27	10.23	0.31	3.1
	Sysmex XN-Series	1673	10.44	0.29	2.8
	Sysmex XN-Series (RL App)	28	11.23	0.51	4.5
	Sysmex XS (Except RL App)	673	10.55	0.28	2.6
	Sysmex XS-1000iC (RL App)	41	10.85	0.42	3.8
	Sysmex XT-1800i/2000i	272	10.63	0.29	2.8
	Sysmex XT-4000i	154	10.61	0.24	2.3

RDW-% (RDW-CV)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	133	13.41	0.12	0.9
	Sysmex XE-2100C,XE2100DC	28	13.79	0.15	1.1
	Sysmex XE-5000	274	13.38	0.14	1.1
	Sysmex XN-L Series	30	13.67	0.45	3.3
	Sysmex XN-Series (RL App)	28	14.17	0.42	3.0
	Sysmex XN-Series	1384	14.05	0.12	0.9
	Sysmex XS (Except RL App)	602	13.95	0.20	1.4
	Sysmex XS-1000iC (RL App)	47	15.41	1.13	7.3
	Sysmex XT-1800i/2000i	231	13.76	0.17	1.3
	Sysmex XT-4000i	133	13.73	0.14	1.0
FH9-12	Sysmex XE-2100,2100 D/L	133	16.68	0.16	0.9
	Sysmex XE-2100C,XE2100DC	28	16.91	0.16	0.9
	Sysmex XE-5000	272	16.68	0.15	0.9
	Sysmex XN-L Series	31	17.25	0.61	3.5
	Sysmex XN-Series (RL App)	25	17.52	0.10	0.6
	Sysmex XN-Series	1384	17.49	0.14	0.8
	Sysmex XS (Except RL App)	602	16.81	0.27	1.6
	Sysmex XS-1000iC (RL App)	47	18.37	1.25	6.8
	Sysmex XT-1800i/2000i	230	16.87	0.20	1.2
	Sysmex XT-4000i	133	16.84	0.20	1.2
FH9-13	Sysmex XE-2100,2100 D/L	134	18.07	0.17	1.0
	Sysmex XE-2100C,XE2100DC	27	18.36	0.18	1.0
	Sysmex XE-5000	271	18.06	0.17	1.0
	Sysmex XN-L Series	31	18.80	0.66	3.5
	Sysmex XN-Series (RL App)	26	19.12	0.26	1.4
	Sysmex XN-Series	1381	19.07	0.17	0.9
	Sysmex XS (Except RL App)	599	18.42	0.33	1.8
	Sysmex XS-1000iC (RL App)	47	20.17	1.28	6.4
	Sysmex XT-1800i/2000i	230	18.43	0.25	1.3
	Sysmex XT-4000i	132	18.37	0.23	1.2
FH9-14	Sysmex XE-2100,2100 D/L	133	14.37	0.12	0.8
	Sysmex XE-2100C,XE2100DC	27	14.84	0.13	0.9
	Sysmex XE-5000	272	14.34	0.12	0.8
	Sysmex XN-L Series	31	14.74	0.53	3.6
	Sysmex XN-Series (RL App)	28	15.18	0.41	2.7
	Sysmex XN-Series	1385	15.03	0.12	0.8
	Sysmex XS (Except RL App)	600	14.83	0.21	1.4
	Sysmex XS-1000iC (RL App)	47	16.44	1.24	7.5
	Sysmex XT-1800i/2000i	230	14.81	0.17	1.2
	Sysmex XT-4000i	133	14.78	0.15	1.0
FH9-15	Sysmex XE-2100,2100 D/L	133	13.87	0.12	0.9
	Sysmex XE-2100C,XE2100DC	28	14.06	0.16	1.1
	Sysmex XE-5000	274	13.85	0.12	0.9
	Sysmex XN-L Series	31	14.08	0.52	3.7
	Sysmex XN-Series (RL App)	25	14.66	0.17	1.2
	Sysmex XN-Series	1383	14.51	0.12	0.9
	Sysmex XS (Except RL App)	597	14.38	0.20	1.4
	Sysmex XS-1000iC (RL App)	47	15.76	1.05	6.7
	Sysmex XT-1800i/2000i	230	14.21	0.18	1.2
	Sysmex XT-4000i	133	14.17	0.14	1.0

RDW-fL (RDW-SD)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	51	42.71	0.59	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	32	43.08	0.49	1.1
	Sysmex XE-5000	76	42.91	0.65	1.5
	Sysmex XN-Series	312	44.35	0.77	1.7
	Sysmex XS (Except RL App)	150	44.07	0.90	2.0
	Sysmex XT-1800i/2000i	68	42.70	0.70	1.6
	Sysmex XT-4000i	30	42.57	0.37	0.9
FH9-12	**Instrument**				
	Sysmex XE-2100,2100 D/L	51	45.30	0.68	1.5
	Sysmex XE-2100 D/L (Bld Ctr)	32	45.60	0.65	1.4
	Sysmex XE-5000	75	45.43	0.59	1.3
	Sysmex XN-Series	310	46.56	0.58	1.2
	Sysmex XS (Except RL App)	146	45.77	0.73	1.6
	Sysmex XT-1800i/2000i	67	45.32	0.51	1.1
	Sysmex XT-4000i	31	45.28	0.53	1.2
FH9-13	**Instrument**				
	Sysmex XE-2100,2100 D/L	51	47.58	0.68	1.4
	Sysmex XE-2100 D/L (Bld Ctr)	32	47.77	0.64	1.3
	Sysmex XE-5000	76	47.60	0.72	1.5
	Sysmex XN-Series	310	49.25	0.53	1.1
	Sysmex XS (Except RL App)	149	48.89	0.84	1.7
	Sysmex XT-1800i/2000i	67	48.26	0.60	1.2
	Sysmex XT-4000i	30	48.16	0.59	1.2
FH9-14	**Instrument**				
	Sysmex XE-2100,2100 D/L	51	42.58	0.71	1.7
	Sysmex XE-2100 D/L (Bld Ctr)	32	42.96	0.46	1.1
	Sysmex XE-5000	76	42.66	0.61	1.4
	Sysmex XN-Series	311	43.90	0.51	1.2
	Sysmex XS (Except RL App)	149	43.58	0.70	1.6
	Sysmex XT-1800i/2000i	67	42.96	0.57	1.3
	Sysmex XT-4000i	30	42.86	0.52	1.2
FH9-15	**Instrument**				
	Sysmex XE-2100,2100 D/L	51	43.65	0.81	1.9
	Sysmex XE-2100 D/L (Bld Ctr)	32	44.20	0.68	1.5
	Sysmex XE-5000	76	43.87	0.81	1.9
	Sysmex XN-Series	310	45.34	0.73	1.6
	Sysmex XS (Except RL App)	150	44.97	0.88	2.0
	Sysmex XT-1800i/2000i	67	43.85	0.58	1.3
	Sysmex XT-4000i	31	43.75	0.47	1.1

Red cell distribution width (RDW-SD vs. RDW-CV) discussion:

The red cell distribution width (RDW) is a calculated value which quantitatively reflects the degree of anisocytosis, or variation in red blood cell size, in a given blood sample. The RDW, in conjunction with the mean cell volume (MCV) and other red cell indices, may be a useful parameter in the laboratory evaluation of anemia and other hematologic conditions. An elevated RDW generally conveys increased variation in red blood cell size, and is seen in a variety of clinical settings including iron deficiency, autoimmune hemolysis, and in some patients with myelodysplastic syndrome.

Many modern automated hematology analyzers produce two distinct RDW measurements. The most commonly used and reported in clinical practice is the coefficient of variation RDW (RDW-CV), which is based on the coefficient of variation of the red blood cell distribution volume. The RDW-CV is calculated using the formula below, and the reference range in adults is typically 11.0 - 15.0%.

$$\text{RDW} - \text{CV} = \frac{1\text{SD}}{\text{MCV}} \times 100$$

Another way of expressing the RDW is the red cell distribution width-standard deviation, or RDW-SD. The RDW-SD is an actual measurement of the width of the red cell distribution curve and provides an absolute value in femtoliters (fL). The RDW-SD more accurately reflects red cell anisocytosis because it is directly measured and is not influenced by the MCV. The reference range for RDW-SD in adults is typically 36 - 47 fL.

The RDW-CV and RDW-SD are different expressions of the RDW and laboratories should exercise caution so as not to confuse them for purposes of clinical reporting as well as proficiency testing.

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Hematology and Clinical Microscopy Resource Committee

References:

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2. Kjeldsberg CR, Perkins SL, eds. *Practical Diagnosis of Hematologic Disorders*. 5th ed. Singapore: American Society for Clinical Pathology; 2010.
3. MediaLab, Inc. Website. http://www.medialabinc.net/spg579122/red_blood_cell_distribution_width_rdw_definition_a.aspx. Accessed June 3, 2013.

Neutrophils/Granulocytes – %

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	186	50.41	1.02	2.0
	Sysmex XE-2100C,XE2100DC	28	50.12	1.09	2.2
	Sysmex XE-2100 D/L (Bld Ctr)	21	50.15	1.16	2.3
	Sysmex XE-5000	348	50.41	1.06	2.1
	Sysmex XN-L Series	30	49.45	8.52	17.2
	Sysmex XN-Series	1701	46.02	0.94	2.0
	Sysmex XN-Series (RL App)	28	48.33	5.94	12.3
	Sysmex XS (Except RL App)	725	42.49	0.89	2.1
	Sysmex XS-1000iC (RL App)	47	42.52	0.86	2.0
	Sysmex XT-1800i/2000i	296	50.66	0.97	1.9
	Sysmex XT-4000i	161	50.82	1.05	2.1
FH9-12	Sysmex XE-2100,2100 D/L	185	45.70	1.15	2.5
	Sysmex XE-2100C,XE2100DC	28	45.78	1.19	2.6
	Sysmex XE-2100 D/L (Bld Ctr)	21	45.55	0.97	2.1
	Sysmex XE-5000	351	45.66	1.31	2.9
	Sysmex XN-L Series	30	45.05	8.37	18.6
	Sysmex XN-Series	1700	41.58	1.16	2.8
	Sysmex XN-Series (RL App)	25	41.96	2.57	6.1
	Sysmex XS (Except RL App)	720	38.99	1.09	2.8
	Sysmex XS-1000iC (RL App)	47	39.24	1.12	2.9
	Sysmex XT-1800i/2000i	300	46.04	1.38	3.0
	Sysmex XT-4000i	160	46.38	1.26	2.7
FH9-13	Sysmex XE-2100,2100 D/L	185	43.45	0.90	2.1
	Sysmex XE-2100C,XE2100DC	28	43.30	1.06	2.5
	Sysmex XE-2100 D/L (Bld Ctr)	20	43.34	0.97	2.2
	Sysmex XE-5000	349	43.23	0.90	2.1
	Sysmex XN-L Series	30	42.89	7.80	18.2
	Sysmex XN-Series	1701	39.43	0.92	2.3
	Sysmex XN-Series (RL App)	25	40.12	1.94	4.8
	Sysmex XS (Except RL App)	723	36.80	0.90	2.4
	Sysmex XS-1000iC (RL App)	47	36.90	0.90	2.5
	Sysmex XT-1800i/2000i	298	44.07	0.98	2.2
	Sysmex XT-4000i	160	44.21	0.99	2.2
FH9-14	Sysmex XE-2100,2100 D/L	184	46.06	1.03	2.2
	Sysmex XE-2100C,XE2100DC	28	46.05	1.11	2.4
	Sysmex XE-2100 D/L (Bld Ctr)	21	45.94	1.03	2.2
	Sysmex XE-5000	348	46.06	1.07	2.3
	Sysmex XN-L Series	30	45.47	8.57	18.8
	Sysmex XN-Series	1699	41.63	0.95	2.3
	Sysmex XN-Series (RL App)	25	42.00	2.44	5.8
	Sysmex XS (Except RL App)	724	38.56	0.96	2.5
	Sysmex XS-1000iC (RL App)	47	38.41	1.14	3.0
	Sysmex XT-1800i/2000i	298	45.65	1.06	2.3
	Sysmex XT-4000i	162	45.68	1.08	2.4
FH9-15	Sysmex XE-2100,2100 D/L	186	43.56	1.19	2.7
	Sysmex XE-2100C,XE2100DC	28	43.25	1.50	3.5
	Sysmex XE-2100 D/L (Bld Ctr)	21	43.68	1.17	2.7
	Sysmex XE-5000	348	43.50	1.17	2.7
	Sysmex XN-L Series	30	42.73	7.81	18.3
	Sysmex XN-Series	1699	39.50	1.13	2.9
	Sysmex XN-Series (RL App)	25	39.91	2.04	5.1
	Sysmex XS (Except RL App)	716	36.20	1.07	3.0
	Sysmex XS-1000iC (RL App)	47	36.40	1.00	2.7
	Sysmex XT-1800i/2000i	298	43.93	1.38	3.1
	Sysmex XT-4000i	160	44.02	1.32	3.0

Neutrophils/Granulocytes – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	177	8.921	0.268	3.0
	Sysmex XE-2100C,XE2100DC	28	8.837	0.379	4.3
	Sysmex XE-2100 D/L (Bld Ctr)	21	8.926	0.301	3.4
	Sysmex XE-5000	342	8.894	0.292	3.3
	Sysmex XN-L Series	31	9.123	1.799	19.7
	Sysmex XN-Series	1685	8.083	0.207	2.6
	Sysmex XN-Series (RL App)	28	8.511	1.011	11.9
	Sysmex XS (Except RL App)	730	7.870	0.254	3.2
	Sysmex XS-1000iC (RL App)	44	7.882	0.209	2.7
	Sysmex XT-1800i/2000i	286	9.077	0.307	3.4
	Sysmex XT-4000i	156	9.082	0.283	3.1
FH9-12	Sysmex XE-2100,2100 D/L	177	1.307	0.049	3.8
	Sysmex XE-2100C,XE2100DC	28	1.310	0.057	4.4
	Sysmex XE-2100 D/L (Bld Ctr)	21	1.309	0.063	4.8
	Sysmex XE-5000	343	1.306	0.061	4.7
	Sysmex XN-L Series	31	1.267	0.264	20.8
	Sysmex XN-Series	1693	1.137	0.043	3.8
	Sysmex XN-Series (RL App)	25	1.129	0.071	6.3
	Sysmex XS (Except RL App)	726	1.122	0.051	4.5
	Sysmex XS-1000iC (RL App)	44	1.132	0.042	3.7
	Sysmex XT-1800i/2000i	288	1.324	0.061	4.6
	Sysmex XT-4000i	157	1.332	0.060	4.5
FH9-13	Sysmex XE-2100,2100 D/L	178	3.355	0.108	3.2
	Sysmex XE-2100C,XE2100DC	28	3.286	0.114	3.5
	Sysmex XE-2100 D/L (Bld Ctr)	21	3.357	0.120	3.6
	Sysmex XE-5000	344	3.339	0.117	3.5
	Sysmex XN-L Series	31	3.393	0.618	18.2
	Sysmex XN-Series	1686	3.053	0.093	3.0
	Sysmex XN-Series (RL App)	25	3.061	0.149	4.9
	Sysmex XS (Except RL App)	726	2.995	0.112	3.7
	Sysmex XS-1000iC (RL App)	44	3.011	0.107	3.6
	Sysmex XT-1800i/2000i	287	3.436	0.121	3.5
	Sysmex XT-4000i	155	3.441	0.120	3.5
FH9-14	Sysmex XE-2100,2100 D/L	178	3.000	0.118	3.9
	Sysmex XE-2100C,XE2100DC	28	3.011	0.137	4.6
	Sysmex XE-2100 D/L (Bld Ctr)	20	2.946	0.057	1.9
	Sysmex XE-5000	343	2.995	0.122	4.1
	Sysmex XN-L Series	31	3.005	0.626	20.8
	Sysmex XN-Series	1684	2.653	0.080	3.0
	Sysmex XN-Series (RL App)	25	2.664	0.167	6.3
	Sysmex XS (Except RL App)	727	2.618	0.100	3.8
	Sysmex XS-1000iC (RL App)	43	2.613	0.077	2.9
	Sysmex XT-1800i/2000i	285	3.082	0.114	3.7
	Sysmex XT-4000i	156	3.085	0.103	3.4
FH9-15	Sysmex XE-2100,2100 D/L	178	1.259	0.051	4.1
	Sysmex XE-2100C,XE2100DC	28	1.243	0.062	5.0
	Sysmex XE-2100 D/L (Bld Ctr)	21	1.252	0.058	4.6
	Sysmex XE-5000	343	1.256	0.052	4.2
	Sysmex XN-L Series	31	1.324	0.231	17.4
	Sysmex XN-Series	1691	1.190	0.046	3.9
	Sysmex XN-Series (RL App)	25	1.199	0.062	5.2
	Sysmex XS (Except RL App)	722	1.164	0.054	4.6
	Sysmex XS-1000iC (RL App)	44	1.172	0.045	3.8
	Sysmex XT-1800i/2000i	287	1.277	0.062	4.9
	Sysmex XT-4000i	156	1.275	0.055	4.3

Lymphocytes – %

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	183	28.53	0.67	2.4
	Sysmex XE-2100C,XE2100DC	28	28.89	0.89	3.1
	Sysmex XE-2100 D/L (Bld Ctr)	20	28.50	0.63	2.2
	Sysmex XE-5000	346	28.59	0.66	2.3
	Sysmex XN-L Series	28	26.72	0.86	3.2
	Sysmex XN-Series	1729	24.57	1.05	4.3
	Sysmex XN-Series (RL App)	27	24.59	0.83	3.4
	Sysmex XS (Except RL App)	723	29.72	0.45	1.5
	Sysmex XS-1000iC (RL App)	48	29.74	0.41	1.4
	Sysmex XT-1800i/2000i	295	28.03	0.70	2.5
	Sysmex XT-4000i	160	27.89	0.77	2.8
FH9-12	Sysmex XE-2100,2100 D/L	184	34.14	1.39	4.1
	Sysmex XE-2100C,XE2100DC	28	34.38	1.34	3.9
	Sysmex XE-2100 D/L (Bld Ctr)	20	34.29	1.12	3.3
	Sysmex XE-5000	348	34.28	1.45	4.2
	Sysmex XN-L Series	29	31.38	2.30	7.3
	Sysmex XN-Series	1715	28.36	2.87	10.1
	Sysmex XN-Series (RL App)	26	27.62	2.19	7.9
	Sysmex XS (Except RL App)	720	35.52	1.34	3.8
	Sysmex XS-1000iC (RL App)	48	35.53	1.10	3.1
	Sysmex XT-1800i/2000i	300	33.34	2.37	7.1
	Sysmex XT-4000i	162	33.30	2.51	7.5
FH9-13	Sysmex XE-2100,2100 D/L	185	36.76	0.82	2.2
	Sysmex XE-2100C,XE2100DC	27	37.01	0.72	1.9
	Sysmex XE-2100 D/L (Bld Ctr)	20	36.89	0.72	2.0
	Sysmex XE-5000	349	37.02	0.79	2.1
	Sysmex XN-L Series	29	35.41	1.12	3.2
	Sysmex XN-Series	1702	33.61	1.01	3.0
	Sysmex XN-Series (RL App)	25	33.42	0.82	2.4
	Sysmex XS (Except RL App)	723	38.11	0.63	1.6
	Sysmex XS-1000iC (RL App)	48	38.24	0.66	1.7
	Sysmex XT-1800i/2000i	299	35.77	1.13	3.2
	Sysmex XT-4000i	161	35.61	1.01	2.8
FH9-14	Sysmex XE-2100,2100 D/L	182	34.43	0.90	2.6
	Sysmex XE-2100C,XE2100DC	28	34.67	0.92	2.7
	Sysmex XE-2100 D/L (Bld Ctr)	20	34.38	0.94	2.7
	Sysmex XE-5000	348	34.59	0.96	2.8
	Sysmex XN-L Series	30	31.04	1.85	5.9
	Sysmex XN-Series	1738	27.79	2.83	10.2
	Sysmex XN-Series (RL App)	26	26.32	0.92	3.5
	Sysmex XS (Except RL App)	722	36.29	0.95	2.6
	Sysmex XS-1000iC (RL App)	48	36.41	0.93	2.6
	Sysmex XT-1800i/2000i	299	34.73	1.43	4.1
	Sysmex XT-4000i	158	34.85	1.18	3.4
FH9-15	Sysmex XE-2100,2100 D/L	185	37.61	1.19	3.2
	Sysmex XE-2100C,XE2100DC	28	37.94	1.13	3.0
	Sysmex XE-2100 D/L (Bld Ctr)	20	37.17	1.05	2.8
	Sysmex XE-5000	347	37.61	1.14	3.0
	Sysmex XN-L Series	29	35.77	1.49	4.2
	Sysmex XN-Series	1724	33.52	1.25	3.7
	Sysmex XN-Series (RL App)	28	33.45	1.21	3.6
	Sysmex XS (Except RL App)	717	39.00	0.99	2.5
	Sysmex XS-1000iC (RL App)	48	39.03	0.85	2.2
	Sysmex XT-1800i/2000i	299	36.93	1.51	4.1
	Sysmex XT-4000i	159	36.76	1.56	4.2

Lymphocytes – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	177	5.055	0.155	3.1
	Sysmex XE-2100C,XE2100DC	28	5.081	0.153	3.0
	Sysmex XE-2100 D/L (Bld Ctr)	20	5.075	0.205	4.0
	Sysmex XE-5000	342	5.050	0.177	3.5
	Sysmex XN-L Series	28	4.872	0.150	3.1
	Sysmex XN-Series	1699	4.312	0.187	4.3
	Sysmex XN-Series (RL App)	27	4.288	0.142	3.3
	Sysmex XS (Except RL App)	724	5.507	0.148	2.7
	Sysmex XS-1000iC (RL App)	44	5.527	0.091	1.6
	Sysmex XT-1800i/2000i	284	5.018	0.183	3.6
	Sysmex XT-4000i	154	4.990	0.187	3.8
FH9-12	Sysmex XE-2100,2100 D/L	178	0.977	0.052	5.3
	Sysmex XE-2100C,XE2100DC	28	0.987	0.054	5.5
	Sysmex XE-2100 D/L (Bld Ctr)	20	0.983	0.046	4.7
	Sysmex XE-5000	341	0.981	0.052	5.3
	Sysmex XN-L Series	30	0.877	0.060	6.9
	Sysmex XN-Series	1698	0.775	0.082	10.5
	Sysmex XN-Series (RL App)	26	0.744	0.056	7.5
	Sysmex XS (Except RL App)	721	1.023	0.049	4.8
	Sysmex XS-1000iC (RL App)	44	1.022	0.046	4.5
	Sysmex XT-1800i/2000i	287	0.956	0.074	7.7
	Sysmex XT-4000i	155	0.958	0.075	7.8
FH9-13	Sysmex XE-2100,2100 D/L	177	2.834	0.093	3.3
	Sysmex XE-2100C,XE2100DC	27	2.823	0.094	3.3
	Sysmex XE-2100 D/L (Bld Ctr)	20	2.856	0.106	3.7
	Sysmex XE-5000	346	2.857	0.103	3.6
	Sysmex XN-L Series	30	2.808	0.113	4.0
	Sysmex XN-Series	1681	2.602	0.091	3.5
	Sysmex XN-Series (RL App)	25	2.585	0.068	2.6
	Sysmex XS (Except RL App)	722	3.101	0.094	3.0
	Sysmex XS-1000iC (RL App)	44	3.122	0.083	2.7
	Sysmex XT-1800i/2000i	288	2.782	0.116	4.2
	Sysmex XT-4000i	155	2.766	0.107	3.9
FH9-14	Sysmex XE-2100,2100 D/L	175	2.238	0.094	4.2
	Sysmex XE-2100C,XE2100DC	27	2.243	0.070	3.1
	Sysmex XE-2100 D/L (Bld Ctr)	20	2.218	0.120	5.4
	Sysmex XE-5000	341	2.250	0.094	4.2
	Sysmex XN-L Series	31	2.063	0.124	6.0
	Sysmex XN-Series	1712	1.770	0.180	10.2
	Sysmex XN-Series (RL App)	26	1.666	0.058	3.5
	Sysmex XS (Except RL App)	722	2.462	0.089	3.6
	Sysmex XS-1000iC (RL App)	44	2.483	0.091	3.7
	Sysmex XT-1800i/2000i	287	2.345	0.111	4.7
	Sysmex XT-4000i	154	2.352	0.098	4.1
FH9-15	Sysmex XE-2100,2100 D/L	178	1.086	0.044	4.1
	Sysmex XE-2100C,XE2100DC	28	1.092	0.038	3.4
	Sysmex XE-2100 D/L (Bld Ctr)	20	1.067	0.040	3.7
	Sysmex XE-5000	344	1.085	0.048	4.4
	Sysmex XN-L Series	30	1.118	0.058	5.2
	Sysmex XN-Series	1703	1.009	0.044	4.3
	Sysmex XN-Series (RL App)	28	1.004	0.046	4.6
	Sysmex XS (Except RL App)	716	1.253	0.048	3.9
	Sysmex XS-1000iC (RL App)	44	1.256	0.042	3.4
	Sysmex XT-1800i/2000i	286	1.070	0.052	4.8
	Sysmex XT-4000i	154	1.064	0.055	5.2

Monocytes – %

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	184	10.429	0.675	6.5
	Sysmex XE-2100C,XE2100DC	28	10.450	0.571	5.5
	Sysmex XE-2100 D/L (Bld Ctr)	18	10.439	0.514	4.9
	Sysmex XE-5000	348	10.309	0.626	6.1
	Sysmex XN-L Series	30	10.823	2.624	24.2
	Sysmex XN-Series	1697	13.693	0.979	7.1
	Sysmex XN-Series (RL App)	28	12.900	2.489	19.3
	Sysmex XS (Except RL App)	722	11.078	0.393	3.5
	Sysmex XS-1000iC (RL App)	47	11.079	0.470	4.2
	Sysmex XT-1800i/2000i	296	10.692	0.770	7.2
	Sysmex XT-4000i	158	10.796	0.808	7.5
FH9-12	Sysmex XE-2100,2100 D/L	186	10.295	1.005	9.8
	Sysmex XE-2100C,XE2100DC	28	9.979	0.911	9.1
	Sysmex XE-2100 D/L (Bld Ctr)	18	10.339	0.869	8.4
	Sysmex XE-5000	350	10.195	1.037	10.2
	Sysmex XN-L Series	28	11.682	1.290	11.0
	Sysmex XN-Series	1736	15.169	2.849	18.8
	Sysmex XN-Series (RL App)	28	15.436	2.405	15.6
	Sysmex XS (Except RL App)	723	10.274	1.117	10.9
	Sysmex XS-1000iC (RL App)	47	10.155	0.993	9.8
	Sysmex XT-1800i/2000i	303	10.925	2.145	19.6
	Sysmex XT-4000i	163	10.711	2.425	22.6
FH9-13	Sysmex XE-2100,2100 D/L	186	10.526	0.576	5.5
	Sysmex XE-2100C,XE2100DC	28	10.650	0.538	5.1
	Sysmex XE-2100 D/L (Bld Ctr)	18	10.378	0.548	5.3
	Sysmex XE-5000	349	10.497	0.539	5.1
	Sysmex XN-L Series	30	10.443	2.252	21.6
	Sysmex XN-Series	1704	12.616	0.829	6.6
	Sysmex XN-Series (RL App)	25	13.004	0.553	4.2
	Sysmex XS (Except RL App)	727	10.946	0.480	4.4
	Sysmex XS-1000iC (RL App)	48	10.904	0.397	3.6
	Sysmex XT-1800i/2000i	301	11.037	0.973	8.8
	Sysmex XT-4000i	157	11.075	0.845	7.6
FH9-14	Sysmex XE-2100,2100 D/L	183	9.554	0.821	8.6
	Sysmex XE-2100C,XE2100DC	28	9.339	0.617	6.6
	Sysmex XE-2100 D/L (Bld Ctr)	18	9.717	0.651	6.7
	Sysmex XE-5000	347	9.435	0.755	8.0
	Sysmex XN-L Series	28	11.643	1.605	13.8
	Sysmex XN-Series	1734	15.666	2.829	18.1
	Sysmex XN-Series (RL App)	28	16.186	2.982	18.4
	Sysmex XS (Except RL App)	725	9.941	0.783	7.9
	Sysmex XS-1000iC (RL App)	48	9.906	0.764	7.7
	Sysmex XT-1800i/2000i	297	9.869	1.231	12.5
	Sysmex XT-4000i	157	9.704	1.093	11.3
FH9-15	Sysmex XE-2100,2100 D/L	183	9.551	0.821	8.6
	Sysmex XE-2100C,XE2100DC	28	9.729	0.677	7.0
	Sysmex XE-2100 D/L (Bld Ctr)	18	9.867	0.701	7.1
	Sysmex XE-5000	347	9.590	0.814	8.5
	Sysmex XN-L Series	30	10.397	2.862	27.5
	Sysmex XN-Series	1699	12.686	0.985	7.8
	Sysmex XN-Series (RL App)	27	12.207	1.343	11.0
	Sysmex XS (Except RL App)	721	10.302	0.743	7.2
	Sysmex XS-1000iC (RL App)	49	10.149	0.748	7.4
	Sysmex XT-1800i/2000i	300	9.858	1.167	11.8
	Sysmex XT-4000i	162	10.012	1.304	13.0

Monocytes – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	177	1.844	0.130	7.1
	Sysmex XE-2100C,XE2100DC	28	1.838	0.108	5.9
	Sysmex XE-2100 D/L (Bld Ctr)	18	1.861	0.116	6.2
	Sysmex XE-5000	341	1.820	0.122	6.7
	Sysmex XN-L Series	29	1.989	0.343	17.2
	Sysmex XN-Series	1677	2.407	0.176	7.3
	Sysmex XN-Series (RL App)	28	2.256	0.439	19.5
	Sysmex XS (Except RL App)	721	2.054	0.091	4.4
	Sysmex XS-1000iC (RL App)	44	2.051	0.105	5.1
	Sysmex XT-1800i/2000i	283	1.916	0.148	7.7
	Sysmex XT-4000i	152	1.928	0.149	7.7
FH9-12	Sysmex XE-2100,2100 D/L	178	0.294	0.030	10.1
	Sysmex XE-2100C,XE2100DC	28	0.284	0.027	9.4
	Sysmex XE-2100 D/L (Bld Ctr)	18	0.298	0.024	8.1
	Sysmex XE-5000	341	0.292	0.033	11.1
	Sysmex XN-L Series	29	0.329	0.039	11.9
	Sysmex XN-Series	1718	0.414	0.080	19.2
	Sysmex XN-Series (RL App)	28	0.416	0.064	15.5
	Sysmex XS (Except RL App)	725	0.296	0.035	11.9
	Sysmex XS-1000iC (RL App)	44	0.290	0.026	8.9
	Sysmex XT-1800i/2000i	289	0.314	0.063	20.2
	Sysmex XT-4000i	157	0.308	0.069	22.3
FH9-13	Sysmex XE-2100,2100 D/L	179	0.813	0.051	6.3
	Sysmex XE-2100C,XE2100DC	27	0.814	0.046	5.7
	Sysmex XE-2100 D/L (Bld Ctr)	18	0.804	0.038	4.7
	Sysmex XE-5000	342	0.811	0.048	5.9
	Sysmex XN-L Series	31	0.834	0.180	21.6
	Sysmex XN-Series	1685	0.976	0.068	6.9
	Sysmex XN-Series (RL App)	25	1.007	0.052	5.1
	Sysmex XS (Except RL App)	729	0.892	0.049	5.5
	Sysmex XS-1000iC (RL App)	45	0.890	0.033	3.8
	Sysmex XT-1800i/2000i	288	0.860	0.079	9.2
	Sysmex XT-4000i	153	0.864	0.075	8.7
FH9-14	Sysmex XE-2100,2100 D/L	176	0.620	0.057	9.2
	Sysmex XE-2100C,XE2100DC	27	0.608	0.046	7.6
	Sysmex XE-2100 D/L (Bld Ctr)	17	0.634	0.030	4.8
	Sysmex XE-5000	340	0.614	0.052	8.5
	Sysmex XN-L Series	29	0.769	0.104	13.6
	Sysmex XN-Series	1716	0.998	0.183	18.3
	Sysmex XN-Series (RL App)	28	1.025	0.193	18.8
	Sysmex XS (Except RL App)	724	0.674	0.061	9.0
	Sysmex XS-1000iC (RL App)	45	0.676	0.055	8.1
	Sysmex XT-1800i/2000i	283	0.666	0.083	12.5
	Sysmex XT-4000i	152	0.656	0.081	12.4
FH9-15	Sysmex XE-2100,2100 D/L	176	0.276	0.026	9.6
	Sysmex XE-2100C,XE2100DC	28	0.284	0.022	7.8
	Sysmex XE-2100 D/L (Bld Ctr)	18	0.283	0.020	6.9
	Sysmex XE-5000	340	0.277	0.023	8.3
	Sysmex XN-L Series	31	0.328	0.087	26.6
	Sysmex XN-Series	1697	0.381	0.032	8.5
	Sysmex XN-Series (RL App)	26	0.373	0.037	10.0
	Sysmex XS (Except RL App)	718	0.331	0.028	8.3
	Sysmex XS-1000iC (RL App)	45	0.326	0.030	9.1
	Sysmex XT-1800i/2000i	287	0.286	0.037	12.8
	Sysmex XT-4000i	153	0.290	0.041	14.0

Eosinophils – %

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	185	10.68	0.85	8.0
	Sysmex XE-2100C,XE2100DC	28	10.62	0.86	8.1
	Sysmex XE-2100 D/L (Bld Ctr)	19	10.86	0.94	8.7
	Sysmex XE-5000	352	10.70	0.85	8.0
	Sysmex XN-L Series	30	8.50	4.62	54.3
	Sysmex XN-Series	1703	10.88	0.86	7.9
	Sysmex XN-Series (RL App)	28	9.70	3.41	35.1
	Sysmex XS (Except RL App)	726	10.12	0.79	7.8
	Sysmex XS-1000iC (RL App)	48	10.16	0.82	8.1
	Sysmex XT-1800i/2000i	301	10.60	0.79	7.4
	Sysmex XT-4000i	162	10.55	0.82	7.8
FH9-12	Sysmex XE-2100,2100 D/L	186	9.89	0.79	8.0
	Sysmex XE-2100C,XE2100DC	28	9.89	0.76	7.7
	Sysmex XE-2100 D/L (Bld Ctr)	19	9.87	0.89	9.0
	Sysmex XE-5000	353	9.87	0.82	8.3
	Sysmex XN-L Series	30	7.77	4.40	56.6
	Sysmex XN-Series	1704	9.99	0.76	7.6
	Sysmex XN-Series (RL App)	25	9.99	0.82	8.2
	Sysmex XS (Except RL App)	721	9.29	0.77	8.3
	Sysmex XS-1000iC (RL App)	48	9.12	0.75	8.3
	Sysmex XT-1800i/2000i	302	9.68	0.75	7.8
	Sysmex XT-4000i	162	9.66	0.73	7.5
FH9-13	Sysmex XE-2100,2100 D/L	186	9.25	0.77	8.4
	Sysmex XE-2100C,XE2100DC	28	9.21	0.78	8.5
	Sysmex XE-2100 D/L (Bld Ctr)	19	9.33	0.91	9.7
	Sysmex XE-5000	353	9.25	0.75	8.1
	Sysmex XN-L Series	30	7.21	4.11	57.0
	Sysmex XN-Series	1702	9.52	0.73	7.6
	Sysmex XN-Series (RL App)	28	8.13	2.93	36.0
	Sysmex XS (Except RL App)	724	8.65	0.73	8.5
	Sysmex XS-1000iC (RL App)	48	8.56	0.73	8.6
	Sysmex XT-1800i/2000i	302	9.14	0.73	8.0
	Sysmex XT-4000i	162	9.10	0.73	8.0
FH9-14	Sysmex XE-2100,2100 D/L	186	9.95	0.76	7.6
	Sysmex XE-2100C,XE2100DC	28	9.94	0.75	7.5
	Sysmex XE-2100 D/L (Bld Ctr)	19	9.71	0.70	7.2
	Sysmex XE-5000	353	9.91	0.80	8.0
	Sysmex XN-L Series	30	7.87	4.31	54.7
	Sysmex XN-Series	1705	9.98	0.75	7.5
	Sysmex XN-Series (RL App)	25	9.84	0.79	8.0
	Sysmex XS (Except RL App)	724	9.36	0.75	8.1
	Sysmex XS-1000iC (RL App)	48	9.42	0.80	8.5
	Sysmex XT-1800i/2000i	301	9.71	0.75	7.7
	Sysmex XT-4000i	162	9.78	0.72	7.3
FH9-15	Sysmex XE-2100,2100 D/L	186	9.33	0.75	8.1
	Sysmex XE-2100C,XE2100DC	28	9.12	0.78	8.6
	Sysmex XE-2100 D/L (Bld Ctr)	19	9.37	0.94	10.1
	Sysmex XE-5000	350	9.33	0.81	8.7
	Sysmex XN-L Series	30	7.17	4.10	57.2
	Sysmex XN-Series	1702	9.47	0.79	8.3
	Sysmex XN-Series (RL App)	28	8.51	3.10	36.5
	Sysmex XS (Except RL App)	717	8.77	0.73	8.4
	Sysmex XS-1000iC (RL App)	48	8.61	0.80	9.3
	Sysmex XT-1800i/2000i	302	9.28	0.84	9.1
	Sysmex XT-4000i	161	9.29	0.82	8.8

Eosinophils – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	179	1.893	0.159	8.4
	Sysmex XE-2100C,XE2100DC	28	1.873	0.153	8.2
	Sysmex XE-2100 D/L (Bld Ctr)	19	1.933	0.188	9.7
	Sysmex XE-5000	348	1.888	0.156	8.2
	Sysmex XN-L Series	30	1.532	0.833	54.4
	Sysmex XN-Series	1682	1.912	0.155	8.1
	Sysmex XN-Series (RL App)	28	1.699	0.597	35.2
	Sysmex XS (Except RL App)	721	1.873	0.155	8.3
	Sysmex XS-1000iC (RL App)	45	1.898	0.163	8.6
	Sysmex XT-1800i/2000i	287	1.900	0.152	8.0
	Sysmex XT-4000i	155	1.886	0.161	8.5
FH9-12	Sysmex XE-2100,2100 D/L	177	0.283	0.024	8.4
	Sysmex XE-2100C,XE2100DC	28	0.287	0.025	8.5
	Sysmex XE-2100 D/L (Bld Ctr)	18	0.286	0.031	10.9
	Sysmex XE-5000	348	0.282	0.026	9.1
	Sysmex XN-L Series	30	0.217	0.123	56.7
	Sysmex XN-Series	1678	0.274	0.023	8.3
	Sysmex XN-Series (RL App)	28	0.244	0.082	33.7
	Sysmex XS (Except RL App)	719	0.268	0.025	9.4
	Sysmex XS-1000iC (RL App)	45	0.262	0.026	10.0
	Sysmex XT-1800i/2000i	287	0.279	0.024	8.4
	Sysmex XT-4000i	154	0.278	0.023	8.2
FH9-13	Sysmex XE-2100,2100 D/L	178	0.715	0.060	8.4
	Sysmex XE-2100C,XE2100DC	28	0.698	0.053	7.6
	Sysmex XE-2100 D/L (Bld Ctr)	19	0.724	0.071	9.8
	Sysmex XE-5000	351	0.715	0.062	8.6
	Sysmex XN-L Series	30	0.569	0.325	57.2
	Sysmex XN-Series	1683	0.737	0.059	8.0
	Sysmex XN-Series (RL App)	28	0.629	0.226	36.0
	Sysmex XS (Except RL App)	721	0.704	0.062	8.8
	Sysmex XS-1000iC (RL App)	45	0.698	0.059	8.5
	Sysmex XT-1800i/2000i	288	0.709	0.058	8.2
	Sysmex XT-4000i	153	0.705	0.056	8.0
FH9-14	Sysmex XE-2100,2100 D/L	179	0.647	0.057	8.7
	Sysmex XE-2100C,XE2100DC	28	0.652	0.058	8.9
	Sysmex XE-2100 D/L (Bld Ctr)	19	0.626	0.056	8.9
	Sysmex XE-5000	350	0.644	0.054	8.4
	Sysmex XN-L Series	30	0.515	0.282	54.7
	Sysmex XN-Series	1683	0.636	0.050	7.9
	Sysmex XN-Series (RL App)	25	0.625	0.057	9.1
	Sysmex XS (Except RL App)	721	0.634	0.054	8.5
	Sysmex XS-1000iC (RL App)	45	0.640	0.060	9.3
	Sysmex XT-1800i/2000i	287	0.655	0.054	8.2
	Sysmex XT-4000i	155	0.658	0.051	7.8
FH9-15	Sysmex XE-2100,2100 D/L	179	0.271	0.024	8.9
	Sysmex XE-2100C,XE2100DC	28	0.265	0.025	9.6
	Sysmex XE-2100 D/L (Bld Ctr)	19	0.268	0.032	12.0
	Sysmex XE-5000	348	0.270	0.026	9.5
	Sysmex XN-L Series	30	0.220	0.126	57.2
	Sysmex XN-Series	1680	0.286	0.025	8.6
	Sysmex XN-Series (RL App)	28	0.254	0.093	36.5
	Sysmex XS (Except RL App)	716	0.281	0.025	8.9
	Sysmex XS-1000iC (RL App)	45	0.276	0.027	9.9
	Sysmex XT-1800i/2000i	286	0.270	0.026	9.8
	Sysmex XT-4000i	154	0.269	0.027	10.2

Basophils – %

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	183	69.43	0.74	1.1
	Sysmex XE-2100C,XE2100DC	28	69.47	0.88	1.3
	Sysmex XE-2100 D/L (Bld Ctr)	19	69.46	0.83	1.2
	Sysmex XE-5000	345	69.48	0.76	1.1
	Sysmex XN-L Series	30	4.74	2.21	46.7
	Sysmex XN-Series	1699	4.82	0.12	2.6
	Sysmex XN-Series (RL App)	28	4.36	1.33	30.5
	Sysmex XS (Except RL App)	725	6.61	0.53	8.0
	Sysmex XS-1000iC (RL App)	47	6.46	0.49	7.5
	Sysmex XT-1800i/2000i	299	70.98	0.72	1.0
	Sysmex XT-4000i	161	71.06	0.60	0.8
FH9-12	Sysmex XE-2100,2100 D/L	185	64.30	1.46	2.3
	Sysmex XE-2100C,XE2100DC	28	64.41	1.57	2.4
	Sysmex XE-2100 D/L (Bld Ctr)	19	64.70	1.47	2.3
	Sysmex XE-5000	348	64.55	1.47	2.3
	Sysmex XN-L Series	30	4.42	2.07	46.8
	Sysmex XN-Series	1702	4.79	0.19	4.0
	Sysmex XN-Series (RL App)	25	4.83	0.15	3.1
	Sysmex XS (Except RL App)	719	5.92	0.52	8.8
	Sysmex XS-1000iC (RL App)	47	5.93	0.56	9.5
	Sysmex XT-1800i/2000i	300	63.76	1.39	2.2
	Sysmex XT-4000i	160	63.66	1.36	2.1
FH9-13	Sysmex XE-2100,2100 D/L	185	63.05	0.86	1.4
	Sysmex XE-2100C,XE2100DC	28	63.05	0.76	1.2
	Sysmex XE-2100 D/L (Bld Ctr)	19	62.74	1.05	1.7
	Sysmex XE-5000	348	62.99	0.81	1.3
	Sysmex XN-L Series	30	3.92	2.22	56.5
	Sysmex XN-Series	1699	4.83	0.12	2.5
	Sysmex XN-Series (RL App)	28	4.31	1.52	35.4
	Sysmex XS (Except RL App)	723	5.49	0.43	7.8
	Sysmex XS-1000iC (RL App)	47	5.46	0.44	8.1
	Sysmex XT-1800i/2000i	301	62.30	0.83	1.3
	Sysmex XT-4000i	160	62.38	0.69	1.1
FH9-14	Sysmex XE-2100,2100 D/L	185	64.42	1.10	1.7
	Sysmex XE-2100C,XE2100DC	28	64.24	1.00	1.5
	Sysmex XE-2100 D/L (Bld Ctr)	19	64.42	0.87	1.4
	Sysmex XE-5000	346	64.51	1.06	1.6
	Sysmex XN-L Series	30	4.40	2.10	47.6
	Sysmex XN-Series	1704	4.81	0.13	2.8
	Sysmex XN-Series (RL App)	25	4.85	0.14	2.8
	Sysmex XS (Except RL App)	722	5.85	0.49	8.4
	Sysmex XS-1000iC (RL App)	47	5.88	0.53	9.1
	Sysmex XT-1800i/2000i	300	63.14	1.02	1.6
	Sysmex XT-4000i	161	63.28	0.98	1.5
FH9-15	Sysmex XE-2100,2100 D/L	185	62.67	1.32	2.1
	Sysmex XE-2100C,XE2100DC	28	63.12	1.47	2.3
	Sysmex XE-2100 D/L (Bld Ctr)	19	62.49	1.28	2.0
	Sysmex XE-5000	348	62.78	1.41	2.2
	Sysmex XN-L Series	30	3.89	2.19	56.4
	Sysmex XN-Series	1701	4.82	0.17	3.5
	Sysmex XN-Series (RL App)	28	4.37	1.55	35.5
	Sysmex XS (Except RL App)	717	5.71	0.50	8.8
	Sysmex XS-1000iC (RL App)	48	5.73	0.55	9.6
	Sysmex XT-1800i/2000i	299	64.20	1.19	1.9
	Sysmex XT-4000i	160	64.31	1.22	1.9

Basophils – x 10^9/L

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	179	12.306	0.313	2.5
	Sysmex XE-2100C,XE2100DC	28	12.231	0.342	2.8
	Sysmex XE-2100 D/L (Bld Ctr)	19	12.356	0.343	2.8
	Sysmex XE-5000	335	12.275	0.315	2.6
	Sysmex XN-L Series	30	0.864	0.398	46.1
	Sysmex XN-Series	1679	0.847	0.026	3.0
	Sysmex XN-Series (RL App)	28	0.761	0.234	30.7
	Sysmex XS (Except RL App)	722	1.225	0.103	8.4
	Sysmex XS-1000iC (RL App)	44	1.195	0.096	8.1
	Sysmex XT-1800i/2000i	286	12.704	0.357	2.8
	Sysmex XT-4000i	153	12.689	0.340	2.7
FH9-12	Sysmex XE-2100,2100 D/L	179	1.839	0.074	4.0
	Sysmex XE-2100C,XE2100DC	28	1.840	0.083	4.5
	Sysmex XE-2100 D/L (Bld Ctr)	19	1.861	0.082	4.4
	Sysmex XE-5000	339	1.848	0.074	4.0
	Sysmex XN-L Series	30	0.127	0.060	47.7
	Sysmex XN-Series	1683	0.130	0.008	6.2
	Sysmex XN-Series (RL App)	28	0.116	0.034	29.2
	Sysmex XS (Except RL App)	717	0.172	0.017	10.0
	Sysmex XS-1000iC (RL App)	43	0.173	0.019	10.8
	Sysmex XT-1800i/2000i	283	1.832	0.067	3.7
	Sysmex XT-4000i	154	1.829	0.068	3.7
FH9-13	Sysmex XE-2100,2100 D/L	178	4.863	0.128	2.6
	Sysmex XE-2100C,XE2100DC	27	4.812	0.128	2.7
	Sysmex XE-2100 D/L (Bld Ctr)	19	4.866	0.149	3.1
	Sysmex XE-5000	341	4.864	0.147	3.0
	Sysmex XN-L Series	30	0.310	0.175	56.5
	Sysmex XN-Series	1677	0.374	0.013	3.4
	Sysmex XN-Series (RL App)	28	0.336	0.119	35.5
	Sysmex XS (Except RL App)	732	0.439	0.068	15.5
	Sysmex XS-1000iC (RL App)	44	0.448	0.039	8.7
	Sysmex XT-1800i/2000i	286	4.851	0.148	3.1
	Sysmex XT-4000i	152	4.851	0.128	2.6
FH9-14	Sysmex XE-2100,2100 D/L	176	4.180	0.145	3.5
	Sysmex XE-2100C,XE2100DC	27	4.175	0.130	3.1
	Sysmex XE-2100 D/L (Bld Ctr)	19	4.149	0.144	3.5
	Sysmex XE-5000	339	4.194	0.143	3.4
	Sysmex XN-L Series	30	0.290	0.139	47.8
	Sysmex XN-Series	1683	0.306	0.011	3.6
	Sysmex XN-Series (RL App)	25	0.307	0.009	2.9
	Sysmex XS (Except RL App)	718	0.397	0.035	8.8
	Sysmex XS-1000iC (RL App)	44	0.401	0.042	10.4
	Sysmex XT-1800i/2000i	287	4.261	0.138	3.2
	Sysmex XT-4000i	154	4.266	0.119	2.8
FH9-15	Sysmex XE-2100,2100 D/L	177	1.811	0.058	3.2
	Sysmex XE-2100C,XE2100DC	27	1.802	0.051	2.9
	Sysmex XE-2100 D/L (Bld Ctr)	19	1.790	0.073	4.1
	Sysmex XE-5000	340	1.812	0.067	3.7
	Sysmex XN-L Series	30	0.125	0.071	57.0
	Sysmex XN-Series	1631	0.145	0.006	4.1
	Sysmex XN-Series (RL App)	28	0.135	0.050	36.9
	Sysmex XS (Except RL App)	715	0.184	0.017	9.2
	Sysmex XS-1000iC (RL App)	44	0.188	0.017	9.0
	Sysmex XT-1800i/2000i	287	1.863	0.072	3.9
	Sysmex XT-4000i	154	1.867	0.069	3.7

Immature Granulocytes (IG) – % (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	132	11.94	0.51	4.3
	Sysmex XE-2100C,XE2100DC	23	11.87	0.49	4.1
	Sysmex XE-5000	324	11.96	0.44	3.7
	Sysmex XN-L Series	26	9.39	4.26	45.4
	Sysmex XN-Series	1607	11.56	0.31	2.7
	Sysmex XN-Series (RL App)	19	10.41	2.86	27.4
	Sysmex XT-1800i/2000i	129	13.49	0.49	3.6
	Sysmex XT-4000i	143	13.46	0.46	3.4
FH9-12	Instrument				
	Sysmex XE-2100,2100 D/L	132	10.80	0.49	4.6
	Sysmex XE-2100C,XE2100DC	23	10.82	0.50	4.6
	Sysmex XE-5000	324	10.77	0.50	4.7
	Sysmex XN-L Series	26	8.37	4.35	51.9
	Sysmex XN-Series	1604	10.60	0.37	3.5
	Sysmex XN-Series (RL App)	19	9.11	3.37	37.0
	Sysmex XT-1800i/2000i	130	12.49	0.59	4.7
	Sysmex XT-4000i	144	12.49	0.56	4.5
FH9-13	Instrument				
	Sysmex XE-2100,2100 D/L	133	10.38	0.37	3.6
	Sysmex XE-2100C,XE2100DC	23	10.32	0.45	4.3
	Sysmex XE-5000	326	10.33	0.39	3.8
	Sysmex XN-L Series	26	8.58	2.82	32.8
	Sysmex XN-Series	1607	10.07	0.28	2.8
	Sysmex XN-Series (RL App)	17	9.92	0.84	8.4
	Sysmex XT-1800i/2000i	129	11.70	0.42	3.6
	Sysmex XT-4000i	142	11.68	0.41	3.5
FH9-14	Instrument				
	Sysmex XE-2100,2100 D/L	132	10.81	0.46	4.3
	Sysmex XE-2100C,XE2100DC	23	10.93	0.52	4.7
	Sysmex XE-5000	324	10.81	0.48	4.4
	Sysmex XN-L Series	26	8.52	4.32	50.7
	Sysmex XN-Series	1606	10.62	0.32	3.0
	Sysmex XN-Series (RL App)	19	9.26	3.22	34.8
	Sysmex XT-1800i/2000i	129	12.59	0.59	4.6
	Sysmex XT-4000i	144	12.53	0.56	4.5
FH9-15	Instrument				
	Sysmex XE-2100,2100 D/L	132	10.37	0.45	4.3
	Sysmex XE-2100C,XE2100DC	23	10.24	0.51	5.0
	Sysmex XE-5000	323	10.36	0.44	4.3
	Sysmex XN-L Series	26	8.92	2.68	30.1
	Sysmex XN-Series	1612	10.12	0.35	3.5
	Sysmex XN-Series (RL App)	19	9.22	2.18	23.6
	Sysmex XT-1800i/2000i	129	11.91	0.53	4.4
	Sysmex XT-4000i	141	11.91	0.43	3.6

Immature Granulocytes (IG) – x 10^9/L (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	131	2.111	0.103	4.9
	Sysmex XE-2100C,XE2100DC	23	2.085	0.123	5.9
	Sysmex XE-5000	319	2.112	0.093	4.4
	Sysmex XN-L Series	27	1.730	0.759	43.9
	Sysmex XN-Series	1591	2.031	0.063	3.1
	Sysmex XN-Series (RL App)	19	1.814	0.503	27.7
	Sysmex XT-1800i/2000i	129	2.514	0.107	4.3
	Sysmex XT-4000i	140	2.518	0.111	4.4
FH9-12	Sysmex XE-2100,2100 D/L	130	0.309	0.016	5.3
	Sysmex XE-2100C,XE2100DC	23	0.310	0.016	5.0
	Sysmex XE-5000	319	0.308	0.018	5.8
	Sysmex XN-L Series	27	0.236	0.119	50.5
	Sysmex XN-Series	1585	0.290	0.012	4.2
	Sysmex XN-Series (RL App)	19	0.244	0.090	36.9
	Sysmex XT-1800i/2000i	128	0.359	0.018	5.0
	Sysmex XT-4000i	141	0.360	0.021	5.8
FH9-13	Sysmex XE-2100,2100 D/L	132	0.800	0.035	4.4
	Sysmex XE-2100C,XE2100DC	23	0.788	0.029	3.7
	Sysmex XE-5000	322	0.798	0.036	4.6
	Sysmex XN-L Series	27	0.686	0.220	32.1
	Sysmex XN-Series	1589	0.779	0.026	3.4
	Sysmex XN-Series (RL App)	18	0.747	0.090	12.0
	Sysmex XT-1800i/2000i	130	0.914	0.037	4.1
	Sysmex XT-4000i	137	0.910	0.041	4.5
FH9-14	Sysmex XE-2100,2100 D/L	131	0.703	0.039	5.5
	Sysmex XE-2100C,XE2100DC	23	0.719	0.042	5.9
	Sysmex XE-5000	321	0.704	0.038	5.4
	Sysmex XN-L Series	27	0.564	0.278	49.3
	Sysmex XN-Series	1584	0.676	0.024	3.6
	Sysmex XN-Series (RL App)	19	0.585	0.203	34.7
	Sysmex XT-1800i/2000i	130	0.847	0.047	5.5
	Sysmex XT-4000i	139	0.845	0.042	5.0
FH9-15	Sysmex XE-2100,2100 D/L	131	0.299	0.016	5.3
	Sysmex XE-2100C,XE2100DC	23	0.295	0.014	4.8
	Sysmex XE-5000	318	0.299	0.016	5.3
	Sysmex XN-L Series	27	0.281	0.084	30.0
	Sysmex XN-Series	1589	0.305	0.012	4.1
	Sysmex XN-Series (RL App)	19	0.275	0.067	24.3
	Sysmex XT-1800i/2000i	130	0.360	0.020	5.6
	Sysmex XT-4000i	138	0.359	0.017	4.7

nRBC – % (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.*
FH9-11	Sysmex XE-2100,2100 D/L				
	echeck Control	49	100.00	0.00	0.0
	echeck XE Control	85	6.52	0.31	4.8
	Sysmex XE-2100C,XE2100DC				
	echeck Control	12	100.00	0.00	0.0
	Sysmex XE-5000				
	echeck XE Control	331	6.49	0.30	4.7
	Sysmex XN-Series				
	XN Check Control	19	5.58	1.23	22.0
	Sysmex XN-Series (RL App)				
	echeck XE Control	10	6.17	0.25	4.0
	XN Check Control	1561	6.07	0.21	3.5
FH9-12	Instrument				
	Sysmex XE-2100,2100 D/L				
	echeck Control	49	100.00	0.00	0.0
	echeck XE Control	86	5.37	0.62	11.5
	Sysmex XE-2100C,XE2100DC				
	echeck Control	12	100.00	0.00	0.0
	Sysmex XE-5000				
	echeck XE Control	332	5.45	0.63	11.5
	Sysmex XN-Series				
	XN Check Control	19	4.95	0.61	12.3
	Sysmex XN-Series (RL App)				
	echeck XE Control	10	5.01	0.47	9.3
	XN Check Control	1582	5.01	0.52	10.3
FH9-13	Instrument				
	Sysmex XE-2100,2100 D/L				
	echeck Control	49	100.00	0.00	0.0
	echeck XE Control	85	0.00	0.00	0.0
	Sysmex XE-2100C,XE2100DC				
	echeck Control	12	100.00	0.00	0.0
	Sysmex XE-5000				
	echeck XE Control	330	0.00	0.00	0.0
	Sysmex XN-Series				
	XN Check Control	19	0.11	0.11	99.5
	Sysmex XN-Series (RL App)				
	echeck XE Control	10	0.13	0.09	73.0
	XN Check Control	1595	0.12	0.10	78.0
FH9-14	Instrument				
	Sysmex XE-2100,2100 D/L				
	echeck Control	49	100.00	0.00	0.0
	echeck XE Control	85	5.30	0.50	9.5
	Sysmex XE-2100C,XE2100DC				
	echeck Control	12	100.00	0.00	0.0
	Sysmex XE-5000				
	echeck XE Control	334	5.32	0.48	9.1
	Sysmex XN-Series				
	XN Check Control	19	4.98	0.86	17.3
	Sysmex XN-Series (RL App)				
	echeck XE Control	10	5.24	0.33	6.2
	XN Check Control	1556	5.16	0.37	7.2

* When low results are reported on an analyte, a high coefficient of variation (CV) may result.

nRBC – % (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.*
FH9-15	Sysmex XE-2100,2100 D/L				
	echeck Control	49	100.00	0.00	0.0
	echeck XE Control	85	0.00	0.00	0.0
	Sysmex XE-2100C,XE2100DC				
	echeck Control	12	100.00	0.00	0.0
	Sysmex XE-5000				
	echeck XE Control	331	0.00	0.00	0.0
	Sysmex XN-Series				
	XN Check Control	19	0.17	0.15	87.6
	Sysmex XN-Series (RL App)				
	echeck XE Control	10	0.22	0.23	*
	XN Check Control	1553	0.12	0.15	*

nRBC – Absolute x 10^3/uL (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.*
FH9-11	Sysmex XE-2100,2100 D/L				
	echeck Control	62	17.519	0.623	3.6
	echeck XE Control	83	1.081	0.053	4.9
	Sysmex XE-2100C,XE2100DC				
	echeck Control	14	17.864	0.626	3.5
	Sysmex XE-5000				
	echeck XE Control	319	1.077	0.055	5.1
	Sysmex XN-Series				
	XN Check Control	19	0.971	0.219	22.5
	Sysmex XN-Series (RL App)				
	echeck XE Control	14	1.077	0.043	3.9
	XN Check Control	1495	1.067	0.038	3.6
FH9-12	Sysmex XE-2100,2100 D/L				
	echeck Control	62	2.690	0.099	3.7
	echeck XE Control	84	0.146	0.017	11.9
	Sysmex XE-2100C,XE2100DC				
	echeck Control	14	2.739	0.111	4.1
	Sysmex XE-5000				
	echeck XE Control	320	0.147	0.018	11.9
	Sysmex XN-Series				
	XN Check Control	19	0.132	0.018	13.9
	Sysmex XN-Series (RL App)				
	echeck XE Control	14	0.135	0.014	10.4
	XN Check Control	1524	0.136	0.015	10.9
FH9-13	Sysmex XE-2100,2100 D/L				
	echeck Control	61	7.690	0.250	3.2
	echeck XE Control	83	0.000	0.000	0.0
	Sysmex XE-2100C,XE2100DC				
	echeck Control	14	7.756	0.232	3.0
	Sysmex XE-5000				
	echeck XE Control	320	0.000	0.000	0.0
	Sysmex XN-Series				
	XN Check Control	19	0.009	0.007	82.4
	Sysmex XN-Series (RL App)				
	echeck XE Control	14	0.010	0.006	55.5
	XN Check Control	1515	0.010	0.006	58.9

* When low results are reported on an analyte, a high coefficient of variation (CV) may result.

nRBC – Absolute x 10^3/uL (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.*
FH9-14	Sysmex XE-2100,2100 D/L				
	echeck Control	62	6.456	0.272	4.2
	echeck XE Control	82	0.325	0.035	10.8
	Sysmex XE-2100C,XE2100DC				
	echeck Control	14	6.531	0.220	3.4
	Sysmex XE-5000				
	echeck XE Control	320	0.328	0.030	9.1
	Sysmex XN-Series				
	XN Check Control	19	0.313	0.054	17.4
	Sysmex XN-Series (RL App)				
	echeck XE Control	14	0.336	0.019	5.8
	XN Check Control	1497	0.328	0.025	7.7
FH9-15	Sysmex XE-2100,2100 D/L				
	echeck Control	61	3.026	0.128	4.2
	echeck XE Control	83	0.000	0.000	0.0
	Sysmex XE-2100C,XE2100DC				
	echeck Control	14	3.108	0.105	3.4
	Sysmex XE-5000				
	echeck XE Control	321	0.000	0.000	0.0
	Sysmex XN-Series				
	XN Check Control	19	0.005	0.005	97.5
	Sysmex XN-Series (RL App)				
	echeck XE Control	14	0.004	0.006	*
	XN Check Control	1526	0.004	0.006	*

* When low results are reported on an analyte, a high coefficient of variation (CV) may result.

Immature Platelet Fraction – % (Ungraded)

	Instrument	NO. LABS	MEAN	S.D.	C.V.
FH9-11	Sysmex XE-2100,2100 D/L	32	21.09	1.40	6.6
	SYSMEX XE-2100C,XE-2100DC	10	21.79	0.99	4.6
	Sysmex XE-5000	271	21.60	0.90	4.2
	Sysmex XN-Series	1221	20.00	0.69	3.4
	Sysmex XN-Series (RL App)	15	20.12	0.78	3.9
FH9-12	Sysmex XE-2100,2100 D/L	33	21.75	0.99	4.6
	SYSMEX XE-2100C,XE-2100DC	10	21.23	0.72	3.4
	Sysmex XE-5000	271	21.42	0.93	4.3
	Sysmex XN-Series	1226	20.05	0.59	2.9
	Sysmex XN-Series (RL App)	15	19.84	0.51	2.6
FH9-13	Sysmex XE-2100,2100 D/L	31	21.93	0.90	4.1
	SYSMEX XE-2100C,XE-2100DC	10	21.85	0.92	4.2
	Sysmex XE-5000	272	21.73	0.97	4.5
	Sysmex XN-Series	1222	20.01	0.73	3.6
	Sysmex XN-Series (RL App)	15	20.12	0.64	3.2
FH9-14	Sysmex XE-2100,2100 D/L	32	21.24	1.07	5.0
	SYSMEX XE-2100C,XE-2100DC	10	21.57	0.76	3.5
	Sysmex XE-5000	271	21.46	0.97	4.5
	Sysmex XN-Series	1225	20.00	0.66	3.3
	Sysmex XN-Series (RL App)	15	20.22	0.62	3.1
FH9-15	Sysmex XE-2100,2100 D/L	31	21.31	0.79	3.7
	SYSMEX XE-2100C,XE-2100DC	10	21.25	0.64	3.0
	Sysmex XE-5000	270	21.35	0.86	4.0
	Sysmex XN-Series	1221	19.98	0.54	2.7
	Sysmex XN-Series (RL App)	15	20.30	0.40	2.0

Blood Cell Identification – Graded

Case History

This peripheral blood smear is from an 11-year-old girl presenting to the emergency room with wheezing. She is diagnosed with asthma and an elevated Immunoglobulin E. Laboratory data include: WBC = 12.5 x 10E9/L; RBC = 4.13 x 10E12/L; HGB = 12.4 g/dL; HCT = 37.2%; and PLT = 211 x 10E9/L. Identify the arrowed object(s) on each image.

(PERIPHERAL BLOOD, WRIGHT-GIEMSA)

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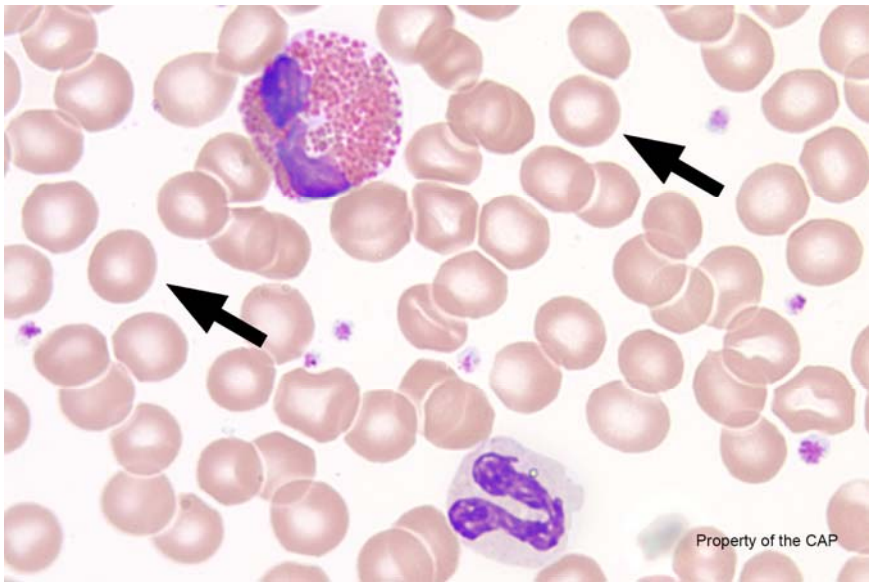
BCP-21

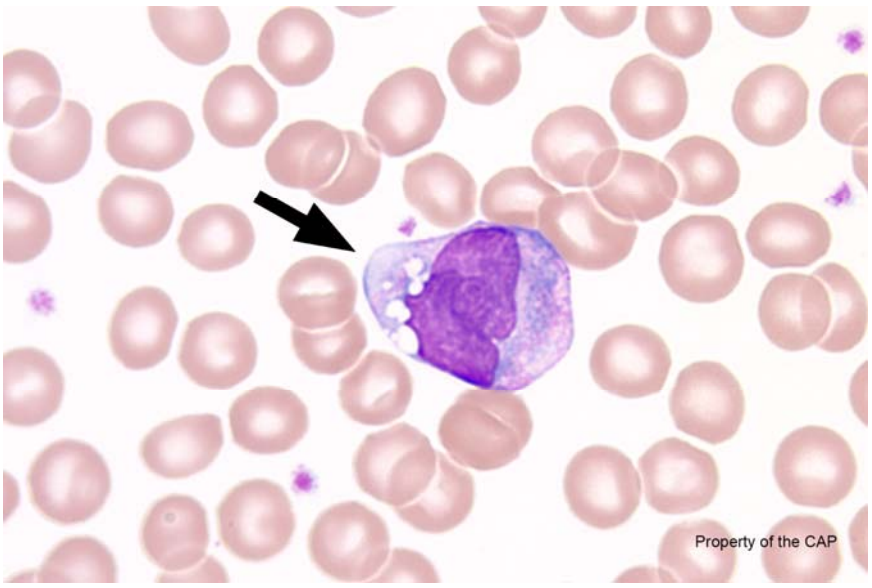


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Erythrocyte, normal	92	100.0	5668	98.0	Good

The arrowed cells are normal erythrocytes, as correctly identified by 100.0% of the referees and 98.0% of the participants. Normal erythrocytes lack a nucleus and are characterized by a circular outer contour and round, central zone of pallor due to their biconcave disc cell shape. The zone of central pallor occupies approximately one third of the cell diameter, which is a key feature to distinguish normal erythrocytes from abnormal, hypochromatic erythrocytes or spherocytes. Erythrocytes appear bright red to pink after staining with Wright-Giemsa due to the presence of abundant cytoplasmic hemoglobin, a protein-heme complex that carries oxygen throughout the body. Normal erythrocytes show minimal variation in size. The cell diameter ranges between 6.8 - 7.8 µm. The cytoplasm of normal erythrocytes is free of inclusions.

Blood Cell Identification – Graded

BCP-22



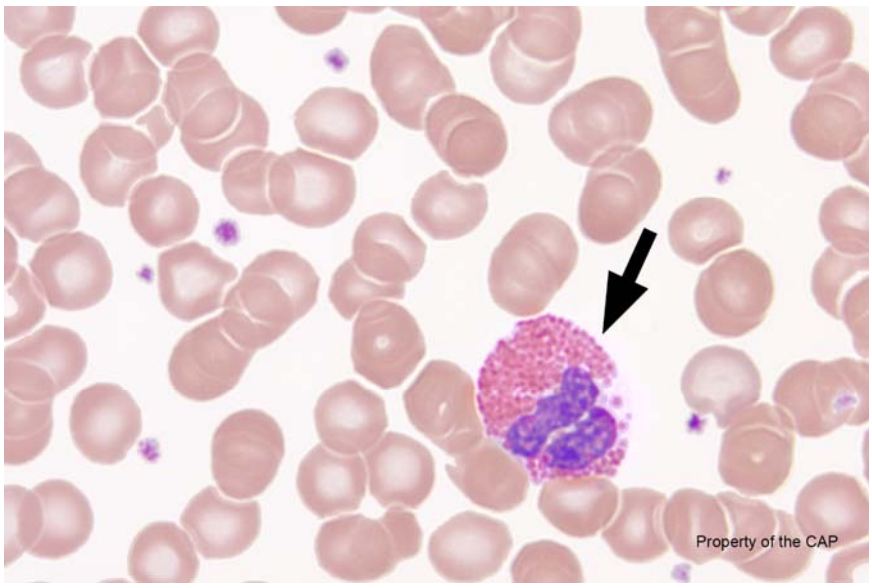
Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Monocyte	90	97.8	5363	92.8	Good
Monocyte, immature (promonocyte, monoblast)	1	1.1	308	5.3	Unacceptable
Lymphocyte, reactive (to include plasmacytoid and immunoblastic forms)	1	1.1	49	0.9	Unacceptable
Immature or abnormal cell, would refer for identification	-	-	24	0.4	Unacceptable
Neutrophil, toxic (to include toxic granulation and/or Döhle bodies, and/or toxic vacuolization)	-	-	12	0.2	Unacceptable
Neutrophil with hypersegmented nucleus	-	-	7	0.1	Unacceptable
Neutrophil, myelocyte	-	-	5	0.1	Unacceptable
Lymphocyte, large granular	-	-	4	0.1	Unacceptable

The arrowed cell is a monocyte, as correctly identified by 97.8% of the referees and 92.8% of the participants. This monocyte exhibits the characteristic indented and folded nucleus. The nucleus lacks nucleoli, which helps to distinguish mature monocytes from immature forms. The cytoplasm is grey-blue with a “ground-glass” quality and numerous vacuoles, qualities that help to differentiate monocytes from large, reactive lymphocytes. Although the cytoplasm of monocytes can show sparse azurophilic granules, the abundant cytoplasmic granules of neutrophils, eosinophils and basophils is lacking. The cell contour is generally round but may show cytoplasmic extensions. Monocytes range in cell diameter between 12 and 20 µm.

The arrowed cell was incorrectly identified as an immature monocyte by 5.3% of participants. Although the folded and convoluted nature of the nucleus gives the chromatin an irregular appearance, a definitive nucleolus is not present. The nuclear chromatin also lacks the fine, lacy appearance seen in immature monocytes. Therefore, the appearance is most consistent with a monocyte."

Blood Cell Identification – Graded

BCP-23

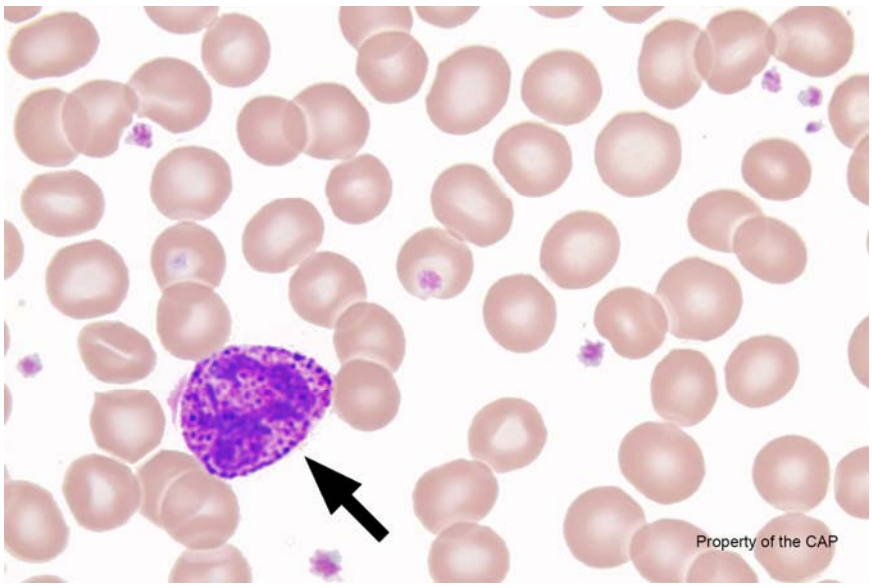


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Eosinophil, any stage	92	100.0	5780	99.9	Good

The arrowed cell is an eosinophil, as correctly identified by 100.0% of the referees and 99.9% of the participants. Eosinophils are characterized by coarse, spherical orange-red cytoplasmic granules of uniform size, which can be contrasted to the fine azurophilic cytoplasmic granules found in neutrophils. The nucleus is classically composed of two segments separated by a thin chromatin filament as demonstrated by the arrowed cell; however, one, three, or rarely more lobes may be seen. The condensed, clumped quality of the chromatin helps to distinguish mature eosinophils from immature forms.

Blood Cell Identification – Graded

BCP-24

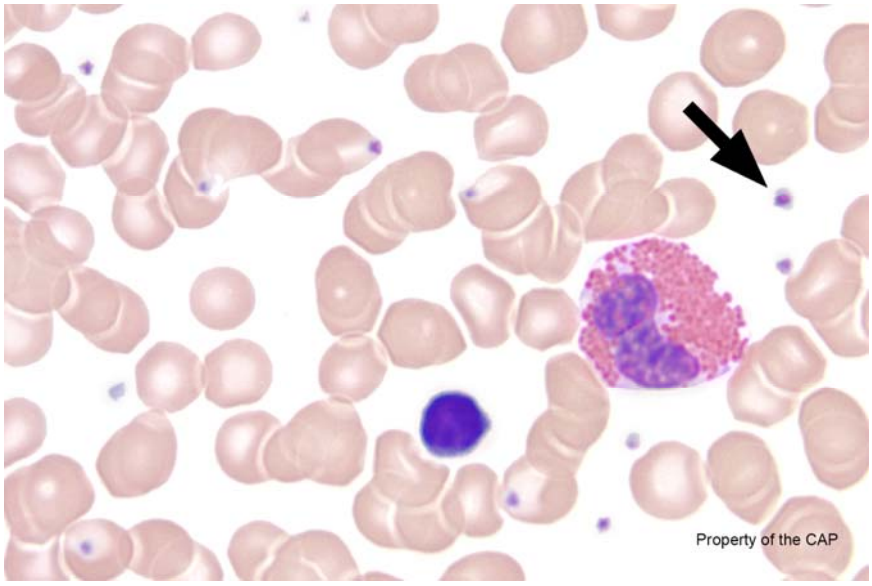


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Basophil, any stage	91	98.9	5658	97.9	Good
Neutrophil, toxic (to include toxic granulation and/or Döhle bodies, and/or toxic vacuolization)	-	-	109	1.9	Unacceptable
Eosinophil, any stage	-	-	4	0.1	Unacceptable
Basophilic stippling (coarse)	-	-	3	0.1	Unacceptable
Mast cell	-	-	3	0.1	Unacceptable
Cryoglobulin	1	1.1	-	-	Unacceptable

The arrowed cell is a basophil, as correctly identified by 98.9% of the referees and 97.9% of the participants. Basophils are similar in size to other granulocytes such as neutrophils and eosinophils but are distinguished by their characteristic course, dark-purple granules that vary in size. The granules overlay and often obscure the basophil nucleus. Basophils are the least common circulating granulocytes but play an important role in the allergic immune response. The presence of an increased number of basophils is abnormal and can be a clue to underlying disease, such as a myeloproliferative disorder.

Blood Cell Identification – Graded

BCP-25



Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Platelet, normal	92	100.0	5766	99.7	Good

The arrowed object is a normal platelet, as correctly identified by 100.0% of the referees and 99.7% of the participants. Platelets are fragments of megakaryocyte cytoplasm. Most range in size between 1.5 and 2.5 µm in diameter and are distinct from giant platelets, which are larger than erythrocytes (7 µm in diameter). This platelet shows the characteristic features of small size as well as pale gray-blue cytoplasm that contains red and purple granules. These granules are made up of proteins and molecules that have an important role in coagulation. Following activation, granules are released and, therefore, may not be present in all platelets. This phenomenon is seen in one neighboring platelet in the photomicrograph.

Case Presentation:

This peripheral blood smear is from an 11-year-old girl presenting to the emergency room with wheezing. She is diagnosed with asthma and an elevated Immunoglobulin E. Laboratory data include: WBC = 12.5 x 10E9/L; RBC = 4.13 x 10E12/L; HGB = 12.4 g/dL; HCT = 37.2%; and PLT = 211 x 10E9/L.

(PERIPHERAL BLOOD, WRIGHT-GIEMSA)

Case Discussion: Reactive Eosinophilia

Absolute eosinophilia is defined as a peripheral blood eosinophil count greater than 0.6 x 10E9/L and is present in less than 1% of most outpatient populations. Eosinophilia can cause tissue damage and organ dysfunction, particularly when levels are above 1.0 x 10E9/L for a prolonged period. Tissue damage is due to release of toxic mediators from the eosinophil's cytoplasmic granules. A common example is cardiac damage, resulting in congestive heart failure and arrhythmias. Eosinophilia may result from hundreds of conditions, including malignant disorders; therefore, investigation to uncover the correct underlying cause is important to ensure appropriate treatment. If levels are above 100 x 10E9/L, admission to hospital for urgent investigation should be undertaken.

The causes of eosinophilia can be divided into neoplastic, reactive, and idiopathic causes. Neoplastic causes are comprised of hematopoietic malignancies that include a clonal proliferation of eosinophils. Notably, several of these entities are defined by the World Health Organization (WHO) by specific genetic abnormalities, such as myeloid and lymphoid neoplasms with *PDGFRA* rearrangement. Reactive causes are diverse. Common etiologies include parasitic infections, allergic disorders, drug reactions, certain vasculitides, and several bullous skin diseases. Reactive eosinophilia can also occur in response to cytokines released by neoplastic cells associated with a variety of tumors including carcinoma, sarcomas, mastocytosis, Hodgkin's lymphoma, and non-Hodgkin's lymphoma.

A rigorous clinical and laboratory investigation is critical for appropriate management of patients with eosinophilia. A patient history and physical examination are important to determine the presence of risk factors and signs to guide subsequent laboratory testing. A peripheral smear has limited utility to distinguish between reactive and neoplastic causes of eosinophilia. Dysplastic features, including hypogranularity, hypersegmentation (6 or more lobes), and vacuolated cytoplasm, can also be seen in reactive conditions. However, frequent or marked abnormalities coupled with dysplasia in other cells lines favors a neoplastic process. Examination of the feathered edge of the peripheral blood smear can reveal parasitic forms. Additional lab testing may be indicated. For example, elevated IgE levels, as seen in this patient, support an allergic cause for eosinophilia in the right clinical context. If a clear reactive cause is not identified and/or risk factors for neoplasia are present, further investigation including a bone marrow biopsy, cytogenetics, and other molecular testing should be performed. Overall, eosinophilia is an effect of a variety of processes and requires a thorough investigation and clinical correlation.

Amy Thommasen, MD
Hematology and Clinical Microscopy Resource Committee

References:

1. Kjeldsberg CR, Perkins SL, eds. *Practical Diagnosis of Hematologic Disorders*. 5th ed. Singapore: American Society for Clinical Pathology; 2010.
2. Jaffe ES, Arber DA, Campo E, Harris NL, Quintanilla-Martinez L, eds. *Hematopathology.* 2nd ed. Philadelphia: Elsevier; 2017.
3. Gotlib J. World Health Organization-defined eosinophilic disorders: 2014 update on diagnosis, risk stratification, and management. *Am J Hematol*. 2014;89:326-337.

Blood Cell Identification – Ungraded

Case History

This peripheral blood smear is from a 78-year-old man presenting with leukocytosis and recent progression of skin tumors. Laboratory data include: WBC = 35.6 × 10E9/L; RBC = 4.44 × 10E12/L; HGB = 13.3 g/dL; HCT = 40.0%; MCV = 91 fL; and PLT = 423 × 10E9/L. Identify the arrowed object(s) on each image.

(PERIPHERAL BLOOD, WRIGHT-GIEMSA)

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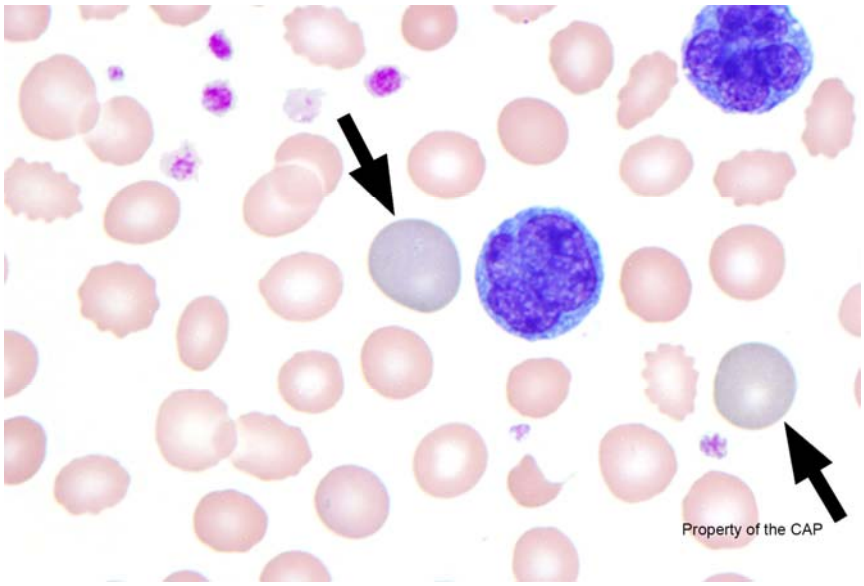
BCP-26

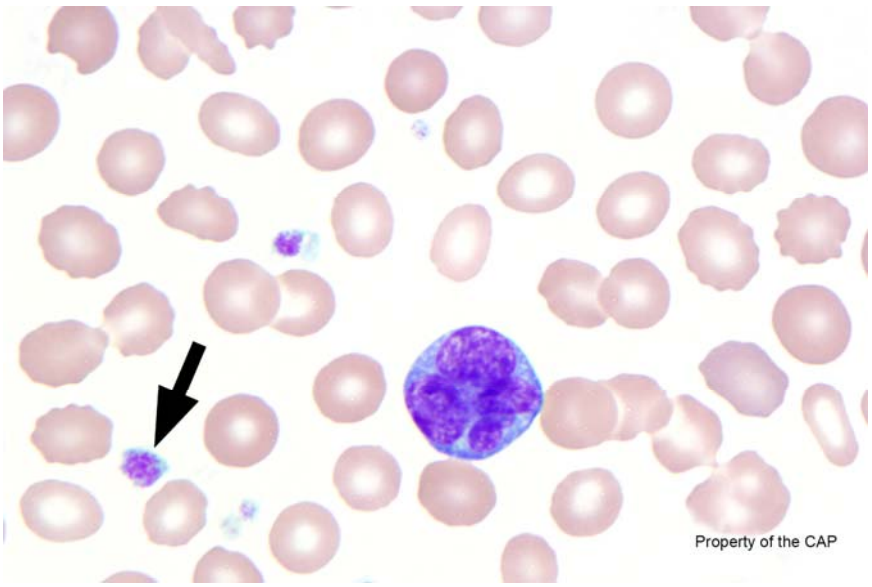


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Polychromatophilic (non-nucleated) red blood cell	91	100.0	5686	99.5	Educational

The arrowed cells are polychromatophilic (non-nucleated) red blood cells, as correctly identified by 100.0% of the referees and 99.5% of the participants. A polychromatophilic red blood cell is a non-nucleated, round or ovoid red blood cell that represents the final stage of maturation after exiting the bone marrow. It is larger than a mature erythrocyte and lacks central pallor. It primarily contains hemoglobin with a small amount of RNA, and thereby stains homogeneously pink-gray or pale purple with Romanowsky or Wright-Giemsa stain. These cells can be stained as reticulocytes and enumerated by using supravital stains, such as new methylene blue.

Blood Cell Identification – Ungraded

BCP-27



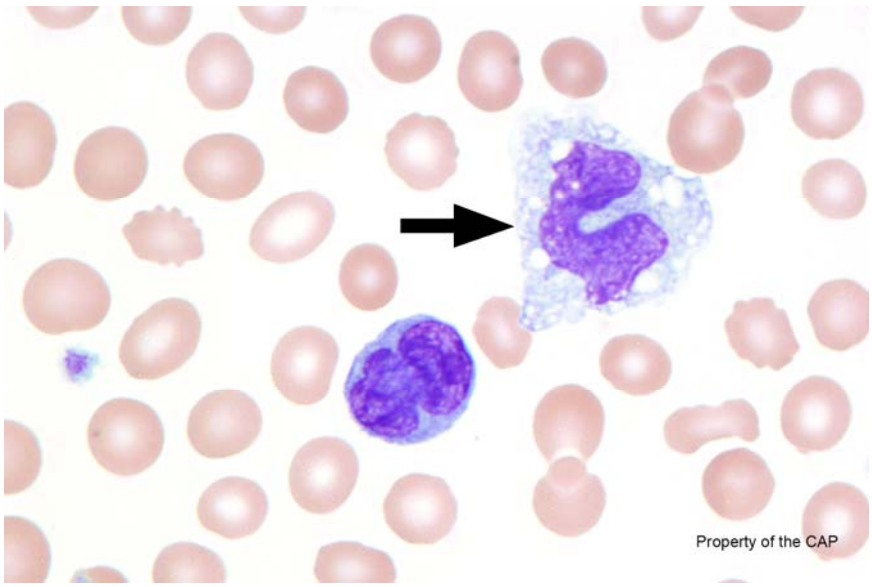
Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Platelet, normal	77	84.6	4226	75.1	Educational
Platelet, giant (macrothrombocyte)	14	14.4	1337	23.8	Educational
Platelet, hypogranular	-	-	43	0.8	Educational
Megakaryocyte (normal, abnormal, or nuclear fragment)	-	-	14	0.3	Educational

The arrowed object is a normal platelet, as correctly identified by 84.6% of the referees and 75.1% of the participants. Platelets, also known as thrombocytes, are small, blue-gray fragments of megakaryocytic cytoplasm. Most are 1.5 - 3 µm in diameter. A few small platelets, less than 1.5 µm in diameter, and a few large platelets, 4 - 7 µm in diameter, can also be seen in normal blood films. Fine, purple-red granules are dispersed throughout the cytoplasm or are sometimes aggregated at the center. These granules are platelet alpha granules. Platelet delta granules (or dense granules) are not visible on light microscopy. Platelets may be variable in shape, but most normal platelets are round or very slightly elliptical. Some have short cytoplasmic projections or ruffled margins.

The arrowed cell is incorrectly identified by 14.4% of the referees and 23.8% of the participants as a giant platelet. Giant platelets are larger than 7 µm, usually measuring 10 - 20 µm in diameter. For proficiency testing purposes, the term giant platelet is used when the platelet is larger than the size of the average red blood cell in the field, assuming a normal MCV. The arrowed platelet is clearly smaller in size than any of the red blood cells shown in the field.

Blood Cell Identification – Ungraded

BCP-28

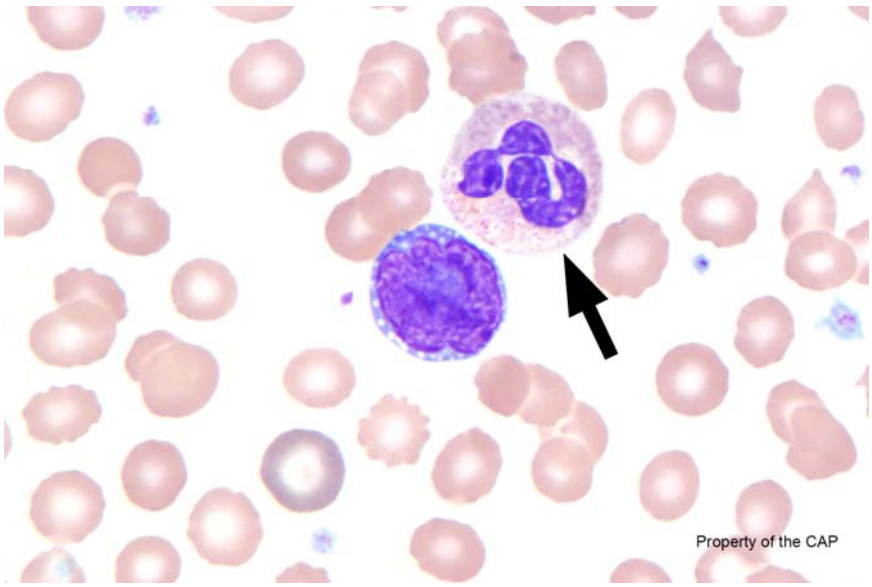


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Monocyte	89	97.8	5509	98.0	Educational
Monocyte, immature (promonocyte, monoblast)	1	1.1	45	0.8	Educational
Neutrophil, toxic (to include toxic granulation and/or Döhle bodies, and/or toxic vacuolization)	-	-	20	0.4	Educational
Lymphocyte, reactive (to include plasmacytoid and immunoblastic forms)	1	1.1	16	0.3	Educational
Neutrophil, giant band or giant metamyelocyte	-	-	9	0.2	Educational
Immature or abnormal cell, would refer for identification	-	-	8	0.1	Educational
Neutrophil, segmented or band	-	-	5	0.1	Educational
Platelet, giant (macrothrombocyte)	-	-	3	0.1	Educational
Platelet, normal	-	-	3	0.1	Educational

The arrowed cell is a monocyte, as correctly identified by 97.8% of the referees and 98.0% of the participants. Monocytes are slightly larger than neutrophils, ranging from 12 - 20 µm in diameter. Most monocytes are round with smooth edges, but some may have pseudopod-like cytoplasmic extensions. The cytoplasm is abundant, with a gray or gray-blue ground-glass appearance, and may contain vacuoles or fine, evenly distributed azurophilic granules. The N:C ratio ranges from 4:1 to 2:1. The nucleus is usually indented, often resembling a three-pointed hat, but it can also be folded or band-like. The chromatin is condensed, but is usually less dense than that of a neutrophil or lymphocyte. Nucleoli are generally absent, but occasional monocytes may contain a small, inconspicuous nucleolus.

Blood Cell Identification – Ungraded

BCP-29

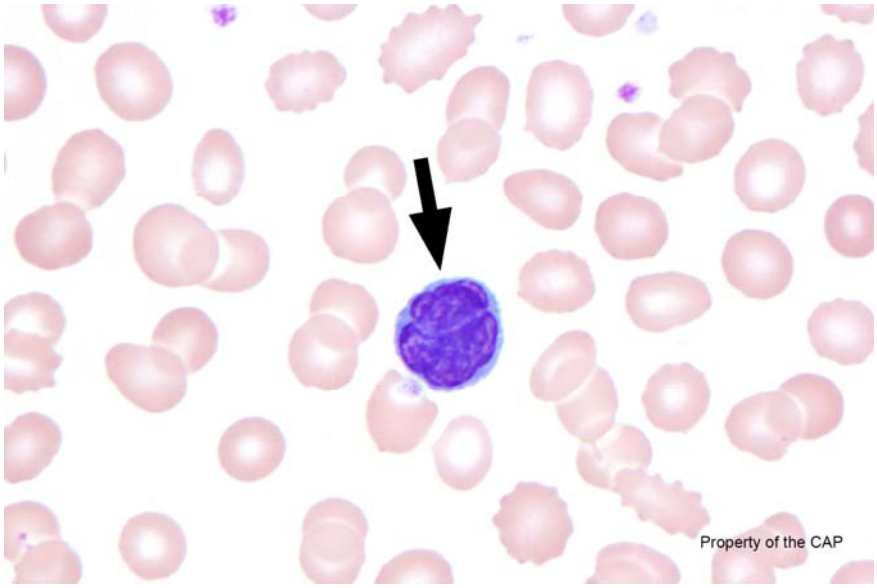


Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Neutrophil, segmented or band	89	97.8	5379	95.6	Educational
Neutrophil, toxic (to include toxic granulation and/or Döhle bodies, and/or toxic vacuolization)	2	2.2	177	3.1	Educational
Neutrophil with dysplastic nucleus and/or hypogranular cytoplasm	-		31	0.6	Educational
Neutrophil with hypersegmented nucleus	-	-	22	0.4	Educational
Neutrophil, polyploid	-	-	5	0.1	Educational

The arrowed cell is a segmented neutrophil, as correctly identified by 97.8% of the referees and 95.6% of the participants. The segmented neutrophil is the predominant blood leukocyte. It has a similar size to a band neutrophil (ie, 10 - 15 µm in diameter), as well as comparable shape (round to oval), and cytoplasmic appearance (pale pink cytoplasm with specific granules). The N:C ratio is 1:3, and the nuclear chromatin is highly condensed. The nucleus is segmented or lobated (with a normal range of three to five lobes). The lobes are connected by a thin filament that contains no internal chromatin, giving it the appearance of a solid, dark, thread-like line. The presence of these thread-like filaments is the basis for distinguishing the segmented neutrophil from the band neutrophil. The cytoplasm contains specific granules and pale cytoplasm. If the granules are very numerous, dark, and prominent, designation as “toxic granulation” may be appropriate. In this case, the appearance is normal.

Blood Cell Identification – Ungraded

BCP-30



Identification	Referees No.	Referees %	Participants No.	Participants %	Evaluation
Malignant lymphoid cell (other than blast)	57	62.6	3157	56.2	Educational
Lymphocyte	24	26.4	1639	29.1	Educational
Lymphocyte, reactive (to include plasmacytoid and immunoblastic forms)	7	7.7	443	7.9	Educational
Immature or abnormal cell, would refer for identification	2	2.2	204	3.6	Educational
Monocyte, immature (promonocyte, monoblast)	1	1.1	42	0.8	Educational
Blast cell	-	-	26	0.5	Educational
Lymphocyte, large granular	-	-	23	0.4	Educational
Monocyte	-	-	21	0.4	Educational
Nucleated red blood cell, normal or abnormal morphology	-	-	14	0.3	Educational
Metastatic tumor cell or tumor cell clump	-	-	12	0.2	Educational
Plasma cell (to include morphologically mature, abnormal, containing inclusion, eg, Dutcher body, Russell body, etc)	-	-	10	0.2	Educational
Megakaryocyte (normal, abnormal, or nuclear fragment)	-	-	7	0.1	Educational
Neutrophil with dysplastic nucleus and/or hypogranular cytoplasm	-	-	3	0.1	Educational
Neutrophil, metamyelocyte	-	-	3	0.1	Educational
Platelet satellitism	-	-	3	0.1	Educational

The arrowed cell is a malignant lymphoid cell (Sézary cell), as correctly identified by 62.6% of the referees and 56.2% of the participants. Sézary cells are classically found in patients with leukemic manifestations of mycosis fungoides, a form of primary cutaneous T-cell lymphoma. These cells are usually round to oval, but they can be irregular. They range in size from 8 - 20 µm, and their N:C ratio varies from 7:1 to 3:1. Smaller Sézary cells, as seen in this peripheral blood smear, are slightly bigger than normal lymphocytes and have folded, grooved, or convoluted nuclear membranes, which may give them a cerebriform appearance. The chromatin is dark and hyperchromatic without visible nucleoli. Larger Sézary cells can be more than twice the size of normal lymphocytes. The nucleus is also convoluted and cerebriform appearing with hyperchromatic chromatin. Often, the nuclear membrane is so folded that the nucleus may appear lobulated or even similar to a cluster of berries. Some cells may exhibit a small nucleolus, although this is not a prominent feature. Both large and small Sézary cells have scant, pale blue to gray agranular cytoplasm, and they may contain one or several small vacuoles that lie adjacent to the nucleus. While the appearance of Sézary cells is distinctive, other T-cell lymphomas and some cases of B-cell lymphoma can mimic Sézary cells. Small populations of Sézary-like cells have been reported in normal, healthy individuals, comprising up to 6% of lymphocytes.

The arrowed cell is incorrectly identified by 26.4% of the referees and 29.1% of the participants as a lymphocyte and incorrectly identified by 7.7% of the referees and 7.9% of the participants as a reactive lymphocyte. The atypical features (discussed above) exclude a lymphocyte. The key distinguishing feature of reactive lymphocytes is their wide range of cellular sizes and shapes, as well as nuclear sizes, shapes, and chromatin patterns. These cells are reacting to an immune stimulus and are frequently increased in viral illnesses. The classic example is infectious mononucleosis (acute Epstein-Barr virus infection). Reactive or atypical lymphocytes can also be found in a variety of other viral infections (including cytomegalovirus, adenovirus, or acute HIV infection) protozoal infections (such as toxoplasmosis), some drug reactions, connective tissue diseases, and after major stress to the body's immune system. A variety of reactive lymphocyte forms have been described and they are often seen concurrently in the same blood film. These round to ovoid to irregular cells range from 10 - 25 µm in size with an N:C ratio that varies from 3:1 to 1:2. The most common type of reactive lymphocyte resembles a large lymphocyte and corresponds to a Downey type II cell. These cells have round to oval nuclei, moderately condensed chromatin (giving it a smeared appearance), and absent or indistinct nucleoli. They contain abundant pale gray-blue cytoplasm. Granules, if present, are usually small and few in number. Frequently, these reactive lymphocytes have an amoeboid cytoplasm that partially surrounds adjacent red cells and has a darker-staining, furled margin. Basophilia radiating out from the nucleus may also be present. Immunoblasts and immunoblastic-like reactive lymphocytes are large cells (15 - 20 µm) with round to oval nuclei. They have finely to moderately dispersed chromatin with abundant parachromatin and one or more prominent nucleoli. These may resemble lymphoma cells or blasts. Their cytoplasm is moderately abundant and stains deeply basophilic. The N:C ratio is high (3:1 to 2:1). These reactive lymphocytes correspond to Downey type III cells. Another type of reactive lymphocyte is referred to as a Downey I cell. These cells are rare. These cells possess scant to moderate amounts of basophilic cytoplasm. The nuclei often appear indented, folded, or lobulated. The chromatin is condensed. A few small vacuoles may be present. Granules may also be apparent. Plasmacytoid lymphocytes resemble plasma cells and are intermediate in size (10 to 20 µm) and round to oblong in shape. They have round nuclei that are centrally placed or slightly eccentric. The chromatin is slightly to moderately coarse and forms small dense masses or a meshwork of strands resembling that of plasma cells. Nucleoli are generally not visible, but some cells may have one or two small irregular nucleoli. The cytoplasm is moderately abundant, homogeneous, and light blue to deep slate-blue, and it may show a perinuclear clear zone, or hof. Of the common reactive lymphocyte variants, only Downey I cells may resemble Sezary cells, and the distinction between those two may be difficult when examining individual cells, rather than the entire spectrum of lymphocyte morphology from the peripheral blood smear slide. However, since Downey type I lymphocytes are rare, and Sezary cells typically show a distinct population, a comprehensive slide review is helpful in the differential diagnosis.

Case Presentation:

This peripheral blood smear is from a 78-year-old man presenting with leukocytosis and recent progression of skin tumors. Laboratory data include: WBC = 35.6 × 10E9/L; RBC = 4.44 × 10E12/L; HGB = 13.3 g/dL; HCT = 40.0%; MCV = 91 fL; and PLT = 423 × 10E9/L.

(PERIPHERAL BLOOD, WRIGHT-GIEMSA)

Case Discussion: Sézary syndrome

Mycosis fungoides (MF) is a primary cutaneous lymphoma characterized by epidermotropic neoplastic T-cells with characteristic morphologic features (cerebriform nuclei). Sézary syndrome (SS) is defined by the presence of neoplastic T-cells ("Sézary cells") in the peripheral blood of patients with erythroderma and generalized lymphadenopathy. Similar to SS, patients with advanced stage MF demonstrate circulating neoplastic cells (Sézary cells) in the peripheral blood and, in the absence of any clinical history, peripheral blood smears from both conditions show similar morphologic findings.

From an epidemiologic standpoint, MF is the most common type of cutaneous T-cell lymphoma (approximately 50%), and occurs mostly in adult to elderly patients, with a male:female ratio of 2:1. In contrast, SS is a rare disease (5% of cutaneous T-cell lymphomas) and it also has a predilection for affecting older male adults, characteristically over the age of 60.

Clinically, MF has an indolent, protracted clinical course (years or decades) characterized by skin lesions evolving through different stages (patches, plaques and, eventually, tumors). Only patients with advanced stages of MF show extracutaneous dissemination, including lymph nodes, liver, spleen and blood. Patients with SS have a more dramatic clinical picture with generalized disease, including general skin rash and leukemic presentation. The characteristic morphology of the neoplastic cells (Sézary cells) is that of small to medium-sized lymphocytes, with irregularly convoluted ("cerebriform") nuclei, powdery chromatin, and small amount of cytoplasm.

The diagnosis of MF/SS is based on clinical findings, morphology, immunophenotyping (by flow cytometry or immunohistochemistry) and genetic/molecular analysis. In recent years, it has been recognized that the degree of peripheral blood involvement by lymphoma cells is an important prognostic indicator in patients with MF/SS. Even though there is consensus on the importance of assessing circulating neoplastic T-cells, there is no universally accepted method to characterize and quantify the number of Sézary cells in peripheral blood. Morphologic identification of abnormal lymphocytes with cerebriform nuclei was previously the standard approach for disease detection and quantification. However, this method is compromised by several drawbacks, including high interobserver variability and difficulty in reliably identifying small Sézary cells. Flow cytometric immunophenotyping has proven to be more reliable than morphology in the detection of circulating Sézary cells, as these cells often have an aberrant immunophenotype, including typically expression of CD2, CD3, CD4, and CD5, and absence of CD8, CD7, and CD26. Figure 1 shows an example of peripheral blood flow cytometry from a patient with SS:

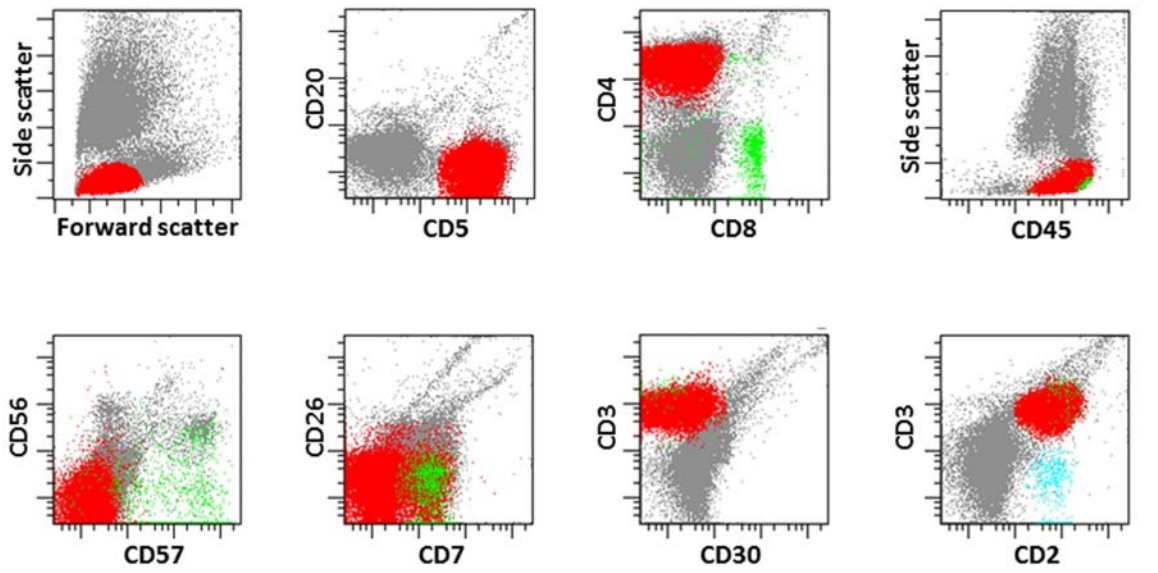


Figure 1: Peripheral blood flow cytometry from a patient with Sézary Syndrome. Immunophenotypic analysis demonstrates a predominant population of aberrant T-cells (in red) that are CD2(+), CD3(+), CD4(+), CD5(+), CD7(partial +), CD8(-), CD26(-), CD30(-), CD56(-), CD57(-). For comparison, normal T-cells (green) and NK cells (cyan) are shown.

Horatiu Olteanu, MD, PhD
Hematology and Clinical Microscopy Resource Committee

References:

1. Ralfkiaer E, Cerroni L, Sander CA, Smoller BR, Willemze R. Mycosis fungoides. In: Swerdlow SH, Campo E, Harris NL, et al (eds.). *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues*. 4th ed. Lyon: IARC Press; 2008:190-148.
2. Ralfkiaer E, Willemze R, Whittaker SJ. Sézary syndrome. In: Swerdlow SH, Campo E, Harris NL, et al (eds.). *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues*. 4th ed. Lyon: IARC Press; 2008:190-148.

Actions Laboratories Should Take when a PT Result is Not Graded

The College uses Exception Reason Codes that signify the proficiency testing (PT) for an analyte has not been graded. The Exception Reason Code is located on the evaluation report in brackets to the right of the result. Your laboratory must identify all of the analytes with an Exception Reason Code and investigate the acceptability of performance with the same rigor as if it were an unacceptable performance. The actions accredited laboratories should take include but are not limited to:

Code	***Exception Reason Code Description***	***Action Required***
11	Unable to analyze.	Document why the specimens were not analyzed (eg, instrument not functioning or reagents not available). Perform and document alternative assessment (ie, split samples) for the period that commercial PT was not tested to the same level and extent that would have been tested.
20	No appropriate target/response; cannot be graded.	Document that the laboratory performed a self-evaluation using the data presented in the Participant Summary and compared its results to a similar method, all method, or all participant statistics if provided. If comparison is not available, perform and document alternative assessment (ie, split samples) for the period that commercial PT was not tested to the same level and extent that would have been tested.
21	Specimen problem.	Document that the laboratory has reviewed the proper statistics supplied in the Participant Summary. Perform and document alternative assessment for the period that commercial PT was not tested to the same level and extent that would have been tested. Credit is not awarded in these cases.
22	Result is outside the method/ instrument reportable range.	Document the comparison of results to the proper statistics supplied in the Participant Summary. Verify detection limits.
24	Incorrect response due to failure to provide a valid response code.	Document the laboratory's self-evaluation against the proper statistics and evaluation criteria supplied in the Participant Summary. Perform and document the corrective action of any unacceptable results. Document corrective action to prevent future failures.
25	Inappropriate use of antimicrobial.	Document the investigation of the result as if they were unacceptable and review the proper reference documents to gain knowledge of the reason your response is not appropriate.
26	Educational challenge.	Response to the CAP is not required. Laboratory should document its review.
27,31	Lack of participant or referee consensus.	Document that the laboratory performed a self-evaluation and compared its results to the intended response when provided in the Participant Summary. If comparison is not available, perform and document alternative assessment (ie, split samples) for the period that commercial PT reached non-consensus to the same level and extent that would have been tested.
28	Response qualified with a greater than or less than sign; unable to quantitate.	Document that the laboratory performed a self-evaluation and compared its results to the proper statistics supplied in the Participant Summary. Verify detection limits.
30	Scientific Committee decision.	Document that the laboratory has reviewed the proper statistics supplied in the Participant Summary.
33	Specimen determined to be unsatisfactory after contacting the CAP.	Document that the laboratory has contacted the CAP and no replacements specimens were available. Perform and document alternative assessment (ie, split samples) for the period that commercial PT was not tested to the same level and extent that would have been tested.
40	Results for this kit were not received.	Document why results were not received, corrective action to prevent recurrence and the laboratory's self-evaluation of the results by comparing results to the proper statistics and evaluation criteria supplied in the Participant Summary. If PT specimens were not analyzed, perform and document alternative assessment (ie, split samples) for the period that commercial PT was not tested to the same level and extent that would have been tested.
41	Results for this kit were received past the evaluation cut-off date.	
42	No credit assigned due to absence of response.	The Participant Summary indicates which tests are graded (see evaluation criteria) and which tests are Not Evaluated/Educational. Updates to grading will also be noted. If a test is educational, the laboratory is not penalized for leaving a result(s) blank. The code 42 that appears on the evaluation is **not** a penalty. However, if a test is graded (regulated and non-regulated analytes) and your laboratory performs that test, results cannot be left blank. The laboratory is required to submit results for **all** challenges within that test or use an appropriate exception code or indicate test not performed/not applicable/not indicated. Exceptions may be noted in the Kit Instructions and/or the Result Form. Document corrective actions to prevent future failures.
44	This drug is not included in our test menu. Use of this code counts as a correct response.	Verify that the drug is not tested on patient samples and document to ensure proper future reporting.
45	Antimicrobial agent is likely ineffective for this organism or site of infection.	Document that the laboratory performed a self-evaluation of written protocols and practices for routine reporting of antimicrobial susceptibility reports to patient medical records. Document that routine reporting of this result to clinicians for patient care is compliant with specific recommendations of relevant Medical Staff and Committees (eg, infectious Diseases, Pharmacy and Therapeutics, Infection Control). Response to the CAP is not required.
77	Improper use of the exception code for this mailing.	Document the identification of the correct code to use for future mailings.
91	There was an insufficient number of contributing challenges to establish a composite grade.	Document the investigation of the result as if it were an unacceptable result. Perform and document the corrective action if required.
35, 43, 88, 92	Various codes.	No action required.

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Attestation of Participation for Self-Reported Training*

We the participants below have completed the review of the CAP FH9-C 2017 (Product Mailing, Year) Participant Summary/Final Critique report, and can self report the recommended 0.5 (Education Hours) hours towards fulfilling education and certification of maintenance requirements.

Participant	Date	Participant	Date

Director (or Designee) Signature - I have verified that the individuals listed above have successfully participated in this activity.

Date

Retain this page for record-keeping and auditing purposes.
Individuals can also track their participation of educational activities through the CAP Learning Management System (LMS).

1. Log in to www.cap.org, using your User ID and Password. If you don't have an online account, you will need to create one.
2. Click **Learning**, select **Learning Transcript**
3. Click '**Add My Own Activity**'
4. Enter the required information, and click **Save** when complete

For assistance, call our Customer Contact Center at 800-323-4040 or 847-832-7000 option 1.

**CAP Self-Reported Training activities do not offer CE credit, but can be used towards fulfilling requirements for certification of maintenance by agencies such as the American Society of Clinical Pathology (ASCP). Please verify with your certifying agency to determine your education requirements.*

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