
Wadsworth Center

New York State Department of Health

ERYTHROCYTE PROTOPORPHYRIN

Proficiency Test Report

Event #3, 2010

January 31, 2011

January 31, 2011

TOXICOLOGY - ERYTHROCYTE PROTOPORPHYRIN

Event #3, 2010

"2010 Educational Quality Assurance Program"

*We continue our suspension of the regulatory grading process
for erythrocyte protoporphyrin (EP) by extraction and hematofluorometry (HF) methods.*

Dear Laboratory Director:

Test materials were prepared from whole goat blood. Five animals were dosed with lead acetate prior to the test to generate elevated erythrocyte protoporphyrin (EP) levels. On November 2nd, 2010, 400-500 mL of blood were drawn from each animal into separate plastic blood bags containing 750 mg K₂EDTA. Each animal yielded a separate blood pool. Aliquots of whole blood were transferred into labeled additive-free evacuated glass tubes and shipped to extraction participants on November 3rd, 2010. The remaining blood was prepared for HF participants. To eliminate fluorescent artifacts, erythrocytes were separated from plasma, washed with normal saline and resuspended in a citrate-glycerol solution. Aliquots of the blood-product were transferred to labeled additive-free evacuated glass tubes and shipped to all HF participants on December 1st, 2010.

Extraction and Hematofluorometry Methods

Overall mean values were calculated using results from all participants (peer group) after outlier deletion for the reference extraction method, Aviv instruments (reported as µg/dL at a fixed hematocrit of 35%) and the Helena ProtoFluor-Z instruments (reported as µmol ZPP/mol heme). Upward and downward indicator arrows next to individual results should be used as part of a laboratory's on-going internal quality assessment scheme.

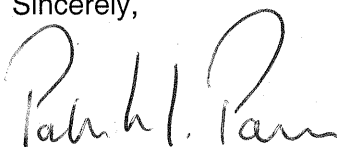
TOXIERPR 2011 Event #1

The next Educational Event for EP will be shipped March 2nd, 2011 for extraction methods and March 30th, 2011 for HF methods. Contact Wadsworth laboratory staff at (518) 473-0452 if the PT materials have not arrived within five days of the scheduled mail out date.

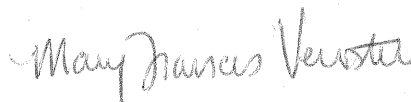
Should you have any questions, feel free to contact us at trel@wadsworth.org. Thank you once again for your patience as we attempt to resolve this difficult issue.

Thank you for your participation.

Sincerely,



Patrick J. Parsons, Ph.D.
Chief
Laboratory of Inorganic and Nuclear Chemistry



Mary Frances Verostek, Ph.D.
Assistant Section Head
PT Program for Blood Lead/EP/Trace Elements

**New York State Department of Health
Erythrocyte Protoporphyrin - Extraction Test Results, 2010 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES**

Lab Code	Method	Results ($\mu\text{g/dL}$ whole blood)					Normalized Mean	
		EP10-11	EP10-12	EP10-13	EP10-14	EP10-15		
Mean Values:		117	118	82	36	60		
108	EtOAc	120	120	85	37	61	1.02	
110	EtOAc	122	125	84	35	64	1.03	
168	EtOAc	118	123	84	36	60	1.02	
179	EtOAc	114	113	79	35	58	0.97	
206	EtOAc	113	108	77	35	58	0.95	
445	EtOAc	99	92 ↓	71	34	50 ↓	0.85	Info

Notes: ↑ reported value outside upper limit
↓ reported value outside lower limit

Normalized mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info only: results included for informational purposes only.

New York State Department of Health
Erythrocyte Protoporphyrin - Extraction Test Results, 2010 Event #3
STATISTICAL SUMMARY

Lab Code	Method	Results ($\mu\text{g/dL}$ whole blood)				
		EP10-11	EP10-12	EP10-13	EP10-14	EP10-15
108	EtOAc	120	120	85	37	61
110	EtOAc	122	125	84	35	64
168	EtOAc	118	123	84	36	60
179	EtOAc	114	113	79	35	58
206	EtOAc	113	108	77	35	58
Number of Sample Measurements:		5	5	5	5	5
Mean values:		117	118	82	36	60
Standard Deviation:		3.8	7.1	3.6	0.9	2.5
RSD (%):		3.3	6.0	4.4	2.5	4.1
Acceptable Range:						
Upper Limit:		135	136	94	42	69
Lower Limit:		99	100	70	30	51

notes: Results reported as less than the detection limits are treated as zero for statistical and grading purposes.

New York State Department of Health
Erythrocyte Protoporphyrin - Extraction Test Results, 2010 Event #3

STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/dL}$ whole blood)				
	EP10-11	EP10-12	EP10-13	EP10-14	EP10-15
EtOAc					
Number of Sample Measurements:	6	6	6	6	6
Mean:	114.3	113.5	80.0	35.3	58.5
Standard Deviation:	8.3	12.3	5.4	1.0	4.7
RSD (%):	7.2	10.8	6.8	2.9	8.1
All Laboratories					
Number of Sample Measurements:	6	6	6	6	6
Mean:	114.3	113.5	80.0	35.3	58.5
Standard Deviation:	8.3	12.3	5.4	1.0	4.7
RSD (%):	7.2	10.8	6.8	2.9	8.1

notes: ? Insufficient data for calculation.

New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer Test Results, 2010 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{g/dL}$ whole blood)					Normalized Mean	
		HF10-11	HF10-12	HF10-13	HF10-14	HF10-15		
Mean Values:		101	130	59	96	50		
104	Aviv Hematofluorometry	90	92 ↓	95 ↑	41 ↓	90 ↑	1.09	Info
107	Aviv Hematofluorometry	101	125	62	96	53	1.01	
110	Aviv Hematofluorometry	95	122	58	91	49	0.96	
114	Aviv Hematofluorometry	91	119	50	86	44	0.89	
123	Aviv Hematofluorometry	97	126	58	92	46	0.96	
126	Aviv Hematofluorometry	>80	>80	66	>80	56	1.12	
147	Aviv Hematofluorometry	103	134	58	99	49	1.01	
155	Aviv Hematofluorometry	96	125	58	95	50	0.98	
156	Aviv Hematofluorometry	94	120	54	90	46	0.93	
158	Aviv Hematofluorometry	128 ↑	165 ↑	77 ↑	124 ↑	66 ↑	1.29	
160	Aviv Hematofluorometry	92	122	55	88	45	0.92	
164	Aviv Hematofluorometry	103	135	61	99	51	1.03	
199	Aviv Hematofluorometry	111	143	62	106	52	1.08	
221	Aviv Hematofluorometry	108	134	56	94	46	0.99	
272	Aviv Hematofluorometry	100	131	59	94	48	0.99	
293	Aviv Hematofluorometry	99	135	52	93	35 ↓	0.91	Info
305	Aviv Hematofluorometry	107	137	58	100	55	1.05	
383	Aviv Hematofluorometry	95	127	55	91	48	0.95	
386	Aviv Hematofluorometry	101	130	59	92	46	0.98	
398	Aviv Hematofluorometry	106	134	60	98	52	1.03	
406	Aviv Hematofluorometry	111	>120	65	103	58	1.11	
407	Aviv Hematofluorometry	108	136	63	101	56	1.07	
447	Aviv Hematofluorometry	113	145	65	106	52	1.10	
451	Aviv Hematofluorometry	95	124	57	95	48	0.96	
454	Aviv Hematofluorometry	106	139	62	102	51	1.05	
459	Aviv Hematofluorometry	99	127	59	94	51	0.99	

Notes: ↑ reported value outside upper limit Normalized mean: The average of each reported result divided by the corresponding target value. It measures bias.
↓ reported value outside lower limit Info only: results included for informational purposes only.

New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer Test Results, 2010 Event #3
STATISTICAL SUMMARY

Lab Code	Method	Results ($\mu\text{g/dL}$ whole blood)				
		HF10-11	HF10-12	HF10-13	HF10-14	HF10-15
107	Aviv Hematofluorometry	101	125	62	96	53
110	Aviv Hematofluorometry	95	122	58	91	49
114	Aviv Hematofluorometry	91	119	50	86	44
123	Aviv Hematofluorometry	97	126	58	92	46
126	Aviv Hematofluorometry	>80	>80	66	>80	56
147	Aviv Hematofluorometry	103	134	58	99	49
155	Aviv Hematofluorometry	96	125	58	95	50
156	Aviv Hematofluorometry	94	120	54	90	46
160	Aviv Hematofluorometry	92	122	55	88	45
164	Aviv Hematofluorometry	103	135	61	99	51
199	Aviv Hematofluorometry	111	143	62	106	52
221	Aviv Hematofluorometry	108	134	56	94	46
272	Aviv Hematofluorometry	100	131	59	94	48
305	Aviv Hematofluorometry	107	137	58	100	55
383	Aviv Hematofluorometry	95	127	55	91	48
386	Aviv Hematofluorometry	101	130	59	92	46
398	Aviv Hematofluorometry	106	134	60	98	52
406	Aviv Hematofluorometry	111	>120	65	103	58
407	Aviv Hematofluorometry	108	136	63	101	56
447	Aviv Hematofluorometry	113	145	65	106	52
451	Aviv Hematofluorometry	95	124	57	95	48
454	Aviv Hematofluorometry	106	139	62	102	51
459	Aviv Hematofluorometry	99	127	59	94	51
Number of Sample Measurements:		22	21	23	22	23
Mean values:		101	130	59	96	50
Standard Deviation:		6.6	7.4	3.8	5.5	3.8
RSD (%):		6.5	5.7	6.5	5.8	7.7
Acceptable Range:						
Upper Limit:		116	150	68	110	58
Lower Limit:		86	111	50	82	43

notes: Results reported as less than the detection limits are treated as zero for statistical and grading purposes.

**New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer Test Results, 2010 Event #3**

STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/dL}$ whole blood)				
	HF10-11	HF10-12	HF10-13	HF10-14	HF10-15
Aviv Hematofluorometry					
Number of Sample Measurements:	25	24	26	25	25
Mean:	103.3	130.4	60.4	94.3	49.8
Standard Deviation:	10.5	12.8	9.2	13.8	6.0
RSD (%):	10.2	9.8	15.2	14.7	12.1
All Laboratories					
Number of Sample Measurements:	25	24	26	25	25
Mean:	103.3	130.4	60.4	94.3	49.8
Standard Deviation:	10.5	12.8	9.2	13.8	6.0
RSD (%):	10.2	9.8	15.2	14.7	12.1

notes: ? Insufficient data for calculation.

New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer (ZPP) Test Results, 2010 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{mol ZPP/mol heme}$)					Normalized Mean	
		HF10-11	HF10-12	HF10-13	HF10-14	HF10-15		
Mean Values:		114	161	73	119	54		
110	Helena ZPP	110	154	71	112	51	0.96	
112	Helena ZPP	111	157	73	122	54	0.99	
131	Helena ZPP	120	156	70	118	56	1.00	
197	Helena ZPP	139 \uparrow	183	88 \uparrow	145 \uparrow	73 \uparrow	1.23	
201	Helena ZPP	118	166	76	127	59	1.05	
204	Helena ZPP	111	158	73	119	57	1.00	
206	Helena ZPP	118	156	74	115	50	0.98	
208	Helena ZPP	122	179	78	124	54	1.06	
290	Helena ZPP	115	158	73	119	53	0.99	
333	Helena ZPP	61 \downarrow	86 \downarrow	39 \downarrow	64 \downarrow	29 \downarrow	0.54	
401	Helena ZPP	108	163	71	119	53	0.98	
405	Helena ZPP	111	159	75	118	53	0.99	
460	Helena ZPP	138 \uparrow	193 \uparrow	91 \uparrow	138 \uparrow	59	1.18	Info

Notes: \uparrow reported value outside upper limit
 \downarrow reported value outside lower limit

Normalized mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info only: results included for informational purposes only.

New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer (ZPP) Test Results, 2010 Event #3
STATISTICAL SUMMARY

Lab Code	Method	Results ($\mu\text{mol ZPP/mol heme}$)				
		HF10-11	HF10-12	HF10-13	HF10-14	HF10-15
110	Helena ZPP	110	154	71	112	51
112	Helena ZPP	111	157	73	122	54
131	Helena ZPP	120	156	70	118	56
201	Helena ZPP	118	166	76	127	59
204	Helena ZPP	111	158	73	119	57
206	Helena ZPP	118	156	74	115	50
208	Helena ZPP	122	179	78	124	54
290	Helena ZPP	115	158	73	119	53
401	Helena ZPP	108	163	71	119	53
405	Helena ZPP	111	159	75	118	53
Number of Sample Measurements:		10	10	10	10	10
Mean values:		114	161	73	119	54
Standard Deviation:		4.8	7.4	2.5	4.3	2.7
RSD (%):		4.2	4.6	3.3	3.6	5.0
Acceptable Range:						
Upper Limit:		131	185	84	137	62
Lower Limit:		97	137	62	101	46

notes: Results reported as less than the detection limits are treated as zero for statistical and grading purposes.

**New York State Department of Health
Erythrocyte Protoporphyrin - Hematofluorometer (ZPP) Test Results, 2010 Event #3**

STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{mol ZPP/mol heme}$)				
	HF10-11	HF10-12	HF10-13	HF10-14	HF10-15
Helena ZPP					
Number of Sample Measurements:	13	13	13	13	13
Mean:	114.0	159.1	73.2	118.5	53.9
Standard Deviation:	18.8	25.1	12.1	18.8	9.5
RSD (%):	16.5	15.8	16.5	15.8	17.6
All Laboratories					
Number of Sample Measurements:	13	13	13	13	13
Mean:	114.0	159.1	73.2	118.5	53.9
Standard Deviation:	18.8	25.1	12.1	18.8	9.5
RSD (%):	16.5	15.8	16.5	15.8	17.6

notes: ? Insufficient data for calculation.

New York State Department of Health
Erythrocyte Protoporphyrin - Extraction Test Results, 2010 Event #3

METHOD NOTES

ATOMIC SPECTROMETRY METHODS

- A-1 ETAAS-Z (Electrothermal atomic absorption spectrometry with Zeeman background correction)
- A-2 ETAAS other (i.e., D₂, S-H background correction)
- A-3 FAAS (Flame atomic absorption spectrometry)
- A-4 CV-AAS (Cold vapor atomic absorption spectrometry)
- A-5 HG-AAS (Hydride generation atomic absorption spectrometry)
- A-6 AFS (Atomic fluorescence spectrometry)
- A-7 Other

INDUCTIVELY COUPLED PLASMA

- P-1 ICP-MS (Inductively coupled plasma - mass spectrometry)
- P-2 DRC/CC-ICP-MS (ICP-MS used in the Dynamic Reaction Cell or Collision Cell mode)
- P-3 ICP-AES/OES (ICP atomic/optical emission spectrometry)
- P-4 HR-ICP-MS (High resolution ICP-MS)
- P-5 ETV-ICP-MS (Electrothermal vaporization ICP-MS)
- P-6 ID-ICP-MS (Isotope dilution ICP-MS)
- P-7 Other

ELECTROCHEMICAL METHODS

- E-1 ASV (Anodic stripping voltammetry without digestion)
- E-2 ASV-LeadCare® (Anodic stripping voltammetry using the ESA LeadCare® system)
- E-3 Fluoride specific electrode
- E-4 Other

MOLECULAR FLUORIMETRY

- F-1 EtOAc (Ethyl acetate-acetic acid extraction method for determination of erythrocyte protoporphyrin)
- F-2 Aviv hematofluorometry (for determination of EP at hematocrit 35)
- F-3 Helena ZPP (for determination of zinc protoporphyrin in $\mu\text{mol ZPP/mol heme}$)
- F-4 Other

OTHER METHODS

If your method is not listed in the above list, please describe it briefly.
