Peroxidase Content per Single Myeloid Cell and in Plasma — Its Clinical Significance in Pediatrics

By

Noriko Katsushima

From the Department of Pediatrics, Faculty of Medicine, Tohoku University, Sendai; Director: Prof. Ts. A r a k a w a

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Very little is known about the physiological function of animal peroxidases, and clinical significance of peroxidase in human blood remains to be solved.

The author had devised new colorimetric methods for estimation of peroxidase activity in plasma¹⁾ and per single myeloid cell.²⁾ By using these methods the peroxidase activity was estimated in plasma and per single myeloid cell of the peripheral blood from normal and sick children in order to try to investigate the clinical significance of blood peroxidase.

One of the most noteworthy findings of the present investigation was that an abnormally high value for peroxidase per single myeloid cell was found in all the 4 children with neoplasm.

METHOD AND MATERIALS

The methods for the estimation of peroxidase in plasma and per single myeloid cell were the same as described in our preceding papers.^{1,2)}

The normal subjects consisted of 32 children and 11 adults. As for pathologic conditions 101 cases with various kinds of disorders were subjected to this investigation.

RESULTS AND DISCUSSION

Normal value for plasma peroxidase (cf. Tables I & II)

As was shown in Tables I & II mean values $\pm$ standard deviation for plasma peroxidase from the normal subjects were found to be 0.031 ± 0.016 γ /ml at the age of 0-1 year, 0.058 ± 0.037 γ /ml at the age of 2-5 years, 0.045 ± 0.019 γ /ml at the age of 6-12 years, and 0.039 ± 0.011 γ /ml in adults. As was seen from

TABLE I. Peroxidase Content in Plasma and per Single Myeloid Cell from Normal Subjects

Range of age	Age (years and months)	Sex	Total white cell count per mm ³ of the peripheral blood	Total count of myeloid cells per mm ³ of the peripheral blood	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ/ml)
0-1 year	0-6	♀	8,600	2,480	6.85	0.036
	0-7	♀	8,850	3,450	6.48	
	0-9	♂	13,400	5,900	7.66	
	0-8	♂	10,150	4,880	5.17	0.024
	0-7	♂	11,700	4,740	6.73	
	0-9	♀	10,200	4,100	6.13	
	1-5	♂	6,150	3,030	5.55	0.017
	1-9	♂	9,750	5,220	7.00	0.041
2-5 years	Average $\pm$ standard deviation				6.45 $\pm$ 0.81	0.031 $\pm$ 0.019
	3	♂	9,850	6,850	10.31	0.082
	3	♂	8,100	4,370	5.50	0.141
	3	♂	6,850	4,590	5.23	0.042
	4	♀	7,100	3,550	10.00	0.071
	4	♂	9,500	5,350	9.65	0.112
	4	♂	10,500	4,830	4.18	0.063
	5	♂	10,200	5,040	8.05	0.056
	5	♂	8,500	5,650	8.95	0.024
	5	♂	7,800	4,870	9.50	0.045
	5	♀	9,500	6,270	5.95	0.041
	5	♂	8,100	4,790	8.60	0.063
	5	♂	8,700	4,870	7.00	0.026
	5	♂	6,050	2,990	6.27	0.041
	5	♀	9,100	5,840	9.94	0.036
	5	♂	9,550	5,750	9.66	0.030
		Average $\pm$ standard deviation			7.81 $\pm$ 2.05	0.058 $\pm$ 0.037

Fig. 1 it was likely that high values for the plasma peroxidase were found more frequently at the age of 2-5 years than in the other age groups (cf. Fig. 1).

Normal value for peroxidase per single myeloid cell (cf. Tables I & II)

As was seen from Tables I & II mean values $\pm$ standard deviation for peroxidase per single myeloid cell from the normal subjects were $(6.45 \pm 0.81\gamma) \times 10^{-8}$ at the age of 0-1 year, $(7.81 \pm 2.05\gamma) \times 10^{-8}$ at the age of 2-5 years, $(7.31 \pm 0.91\gamma) \times 10^{-8}$ at the age of 6-12 years, and $(5.53 \pm 1.23\gamma) \times 10^{-8}$ in adults. As was seen from Fig. 2, there was such a tendency that the peroxidase content per single myeloid cell was higher in children, especially in those of the age of 2-5 years, than in adults (cf. Fig. 2).

TABLE II. Peroxidase Content in Plasma and per Single Myeloid Cell from Normal Subjects

Range of age	Age (years)	Sex	Total white cell count in mm ³ of the peripheral blood	Total count of myeloid cells in mm ³ of the peripheral blood	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ/ml)
6-12 years	6	♀	9,250	5,280	7.87	0.041
	6	♂	9,240	6,000	5.41	0.019
	7	♀	7,250	4,640	7.86	0.054
	8	♀	10,200	4,540	7.74	0.032
	7	♀	8,650	5,200	8.30	0.019
	9	♀	7,200	4,250	6.50	0.067
	10	♀	9,950	5,470	7.80	0.057
	12	♀	5,900	4,070	6.75	0.038
	12	♂	7,950	5,300	7.60	0.073
20-40 years			Average $\pm$ standard deviation		7.31 $\pm$ 0.91	0.045 $\pm$ 0.019
	26	♂	6,000	3,420	4.35	0.039
	42	♂	6,150	4,150	8.07	0.023
	37	♂	7,200	4,650	4.20	0.026
	34	♂	7,800	5,420	5.06	0.054
	26	♂	7,800	5,340	5.62	0.026
	26	♂	6,600	3,860	5.00	0.042
	20	♂	5,050	2,600	4.01	0.056
	20	♂	8,200	5,000	5.50	0.051
	23	♀	6,000	4,200	5.62	0.035
	28	♀	7,200	5,100	5.24	0.035
	27	♀	7,800	5,300	6.06	0.039
			Average $\pm$ standard deviation		5.53 $\pm$ 1.23	0.039 $\pm$ 0.011

Relation between peroxidase content in plasma and that per single myeloid cell in the normal subjects

No significant correlation was found between the peroxidase content in plasma and that per single myeloid cell, as was shown in Fig. 3 (cf. Fig. 3).

Peroxidase content in plasma and per single cell from the subjects with various kinds of disorders

The peroxidase content both in plasma and per single myeloid cell was estimated simultaneously upon 101 cases with various kind of disorders. In most cases the determination of peroxidase was carried out before any effective medical treatment was given. Total and differential counts of leukocytes in peripheral blood were simultaneously determined on these subjects, in order to know whether or not the peroxidase content per single cell or in plasma was related with the blood picture.

Fig. 1. Peroxidase content in plasma from normal subjects.

The results were given in Tables III-XII according to the kind of disorders.

In this paper a term of "abnormal value for peroxidase activity" was used from view-point of clinical evaluation of the peroxidase activity in plasma and per single myeloid cell. It was used provisionally in the following way;— when peroxidase content per single myeloid cell was below $4 \times 10^{-8} \gamma$ or above $12 \times 10^{-8} \gamma$, it was defined as "abnormal"; and when peroxidase content in plasma was below $0.02 \gamma/\text{ml}$ or above $0.1 \gamma/\text{ml}$, it was "abnormal" likewise.

Leukemia (cf. Table III)

As was seen in Nos. 1 and 6 in Table III, myeloblasts which were peroxidase negative to the Tohoku Pediatric stain⁶⁾ did not show any of peroxidase activity by means of my own chemical method. This might be an expected result because benzidine, as a chromogen, was used in common in both the histochemical and my chemical methods. In this respect Loeb and Doniger's⁷⁾ experiment upon

Fig. 2. Peroxidase content per single myeloid cell from the normal subjects.

chloroma of rats should be mentioned, in which peroxidase activity of the chloroma tissues was not detected by histochemical method, but could be detected by a certain chemical method.

As was seen in No. 7 in Table III, peroxidase positive myeloblasts showed a low peroxidase activity per single myeloblast.

In the cases with peroxidase negative myeloblastic leukemia (Nos. 2-5), peroxidase per single myeloid cell showed a normal value, this normal result will be considered as to be due to that in this case the peroxidase was derived from the nonleukemic myeloid cells.

Nos. 9 and 10 were the cases with acute myeloid leukemia in which both the peroxidase positive and negative myeloblasts, promyelocytes, myelocytes and metamyelocytes were found. In these cases normal values for peroxidase activity per single myeloid cell were found.

As regards plasma peroxidase levels, the extremely high values were found in the cases with peroxidase positive myeloblastic leukemia (Nos. 7 & 8). Such high values had not been found in any of the cases examined up to the present time. Kwasniwski and Henning,⁸⁾ and Bunte and Demling³⁾ reported an increase in serum peroxidase in myeloid leukemia and they were of the opinion that it was

Fig. 3. Relation between peroxidase content in plasma and that per single myeloid cell in the cases of normal subjects.

- represents values from children under 12 years of age.
- × represents those from adults.

due to a release of peroxidase from disintegrated leukocytes. A short life span of leukemic cells was reported by Weisberger and Levine.⁴⁾

Neoplasm (cf. Table IV)

The peroxidase levels of plasma were found to be within the normal range in 14 cases with neoplasm (Nos. 11-24 in Table IV).

An abnormally high value for peroxidase per single myeloid cell was found in 7 cases out of the 13 cases examined, into which all the four cases of children (Nos. 11-14) and three cases (Nos. 19, 21, 23) of adults were included. In No. 17 abnormally low value of peroxidase activity per single myeloid cell was found. A complication with severe hypochromic anemia might be a contributing factor for low values of the peroxidase activity in this case (see below).

In 1958, Loeb and Doniger⁵⁾ investigated, by using a guajacol method, the peroxidase activity in bone marrow from the mice bearing neoplasm, and they found a progressive increase in bone marrow peroxidase activity in mice bearing the Ehrlich ascites carcinoma or Sarcoma 180. They stated that an increase in

TABLE III. Peroxidase Content in Plasma and per

No. of cases	Name	Sex and age	Clinical diagnosis	Total count of white cells/mm ³	Leukemic cells	
					%	absolute number/mm ³
1	H.C.	♂, 2y.	Peroxidase-negative myeloblastic leukemia	24,800	99	24,000
2	T.T.	♂, 3y.	"	192,000	97	186,240
3	S.T.	♂, 3y.	"	79,000	97	76,730
4	S.O.	♂, 10y.	"	16,300	64	10,440
5	K.S.	♂, 10y.	"	56,900	84.5	48,100
6	K.T.	♀, 10y.	"	2,800	100	2,800
7	T.S.	♀, 5y.	Peroxidase positive myeloblastic leukemia	22,000	98	19,200
				24,000	52.5	12,600
				25,350	35	9,000
				42,000	20	8,400
				30,900	52.5	16,200
8	H.K.	♂, 13y.	"	39,400	95	37,400
9	M.K.	♂, 3y.	Acute myeloid leukemia	18,200	43	7,810
10	A.S.	♀, 13y.	"	8,700	40	3,480

TABLE IV. Peroxidase Content in Plasma and per

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
11	K.N. ♀	3	Neuroblastoma	4,800	0	4.5
12	A.K. ♂	3	Craniopharyngioma	11,400	0.5	3
13	T.U. ♂	15	Craniopharyngioma	8,800	0	2
14	F.M. ♂	7	Brain tumor	5,600	0	0.5
15	M.K. ♂	58	Carcinoma of pancreas	16,700	0	2.5
16	O.T. ♀	59	Stomach cancer	6,750	0	3.5
17	M.A. ♀	35	Stomach cancer	11,750	0	0.5
18	U.S. ♂	57	Stomach cancer	5,300	0	4
19	M.K. ♀	53	Esophageal cancer	7,900	0	8.5
20	N.O. ♂	63	Carcinoma of lung	3,800	0	2.5
21	M.M. ♀	42	Metastatic cancer of cervical nodes	11,950	0	9
22	S.S. ♀	41	Breast cancer	7,600	0	0.5
23	T.O. ♂	63	Reticulosarcoma	4,350	0	5.5
24	K.T. ♀	67	Reticulosarcoma	5,500	0	3.5

Single Myeloid Cell in the Cases of Leukemia

Absolute number of peroxidase positive cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ/ml)	Remarks
0	0	0.043	No medical treatment
5,760	7.46	0.110	"
2,270	11.00	0.013	"
5,860	6.57	0.022	"
4,550	5.41	0.037	"
0	0	0.054	"
19,200	1.88	0.260	No medical treatment
16,800		0.347	} Treatment with steroid and 6-MP
11,300		0.165	
15,200		0.189	
21,600		0.268	
37,400		0.740	No medical treatment
7,600	6.73	0.086	No medical treatment
2,950	9.05	0.019	Treatment with steroid

Single Myeloid Cell from Cases with Neoplasm

count of leukocytes (%)				% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
cell		L	Virocyte plasma cell				
M	N						
5.5	44	46	0	36	2,600	14.00	0.071
2.5	42.5	51.5	0	7	5,530	14.10	0.029
4	58.5	35.5	1	21	5,670	12.32	0.059
4	41	54.5	0	6	2,520	16.00	0.055
2.5	85	10	0	11	15,030	8.45	0.062
2	57	37.5	0	12	4,220	9.45	0.024
3.5	89	7	0	13	10,880	3.99	0.043
7	58	31	0	8	3,660	8.00	0.030
5	79	5	0	17	7,270	14.08	0.040
10.5	82	5	0	7	3,400	6.71	0.027
4.5	82	4.5	0	16	11,410	13.81	0.025
7	78	14.5	0	15	6,500	6.54	0.025
7.5	71	16	0	27	3,650	13.80	0.024
4	74	18.5	0	20	4,480	6.74	0.045

TABLE V. Peroxidase Content in Plasma and per Single Myeloid Cell from a Child with Chronic Agranulocytosis

No. of cases	No. of examination	Total count of white cells/mm ³	Differential count of leukocytes (%)					Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell (10 ⁻⁸ γ)	Peroxidase content in plasma (γ/ml)	Remarks
			B	E	M	N	L				
25	1	8,100	0	0	18.5	6.5	75	2,030	5.90	0.047	} Treated with steroid
	2	3,600	1	1	17	6	75	900	3.80		
	3	1,200	0	0	40	1	59	490	0.90	0.057	
	4	7,200	0	0	34	3	63	2,670	1.39	0.052	
	5	3,400	0	0.5	7	11	81.5	640	2.87	0.043	
	6	5,750	0	0	36	3	61	2,350	2.83	0.083	
	7	8,600	0	0	20	9	71	2,490	1.79	0.047	
	8	8,200	1	8.5	19	2.5	66	2,900	18.60	0.067	
	9	6,950	0.5	0	13	3.5	83	1,140	5.87	0.053	
	10	14,300	0	0	15.5	3.5	81	1,750	3.31		
	11	7,200	0	13	42.5	5.5	39	4,100	1.85		
	12	3,550	0	6	36	7	51	1,770	3.70		

TABLE VI. Peroxidase Content in Plasma and per Single

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
26	M.S. ♀	5	Galactosemia	8,400	1.5	0.5
27	S.T. ♂	1	Glycogen storage disease	10,500	0	1
28	K.O. ♂	10	"	4,900	0	2.5
29	E.S. ♂	2	Idiopathic hyperlipemia	4,500	0	0
30	H.K. ♂	11	Gargoylism	6,400	0	0
				8,100	0	2.5
				8,800	0	1
31	M.M. ♂	10	Osteochondrodystrophy	6,600	0	8.5
32	S.S. ♂	9	Albinism	8,950	0	2.5
33	KU.A. ♂	4	Dystrophia musculorum progressiva	13,050	0	0.5
				10,600	0	4.5
34	KA.A. ♂	9	"	7,050	0	1
				11,400	0	3
				10,250	0	3
35	K.I. ♂	14		13,300	0	0
				7,600	1	2.5
36	Y.K. ♂	8	"	5,700	0.5	2.5
37	M.K. ♀	0-10	Idiopathic hypercalcemia	14,300	0.5	0
38	T.M. ♂	2	de Toni-Debré-Fanconi's syndrome	11,400	1	0.5
				11,200	0.5	0
				9,200	0	1.5
39	T.M. ♂	5	Renal rickets due to congenital hydronephrosis	7,900	0.5	2
				12,950	0	3

peroxidase activity in bone marrow of tumor bearing mice might be taken as an adaptive response, as in the case of reduced catalase in the liver of tumor bearing animals.

Chronic agranulocytosis (cf. Table V)

Basing upon our hematological observation of more than one year No. 25 was found to be a case with chronic agranulocytosis in which the majority of myeloid cells in the peripheral blood was consisted of monocytes. Peroxidase activity per single myeloid cell (monocyte) was abnormally low, but plasma peroxidase level remained within the normal range.

Metabolic disorders (cf. Table VI)

The plasma peroxidase levels were found to be within the normal limits in all the cases with metabolic disorders. The abnormally high values for peroxidase per single myeloid cell were found in glycogen storage disease (Nos. 27, 28), albinism (No. 32), Fanconi's syndrome (No. 38), and dystrophia musculorum progressiva (Nos. 33, 35), while the abnormally low values for peroxidase per single myeloid cell were found in gargoylism (No. 30), osteochondrodystrophy

Myeloid Cell from the Cases with Metabolic Disorders

count of leukocytes (%)				% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
cells		L	Virocyte plasma cell				
M	N						
2	47	49	0	9	3,290	5.96	0.021
8.5	53	37.5	0	0	6,630	12.50	0.042
2	47	48.5	0	28	2,250	11.90	0.030
8.5	54	37.5	0	47	2,570	6.18	0.046
3	54.5	42.5	0	7	3,680	3.00	0.032
3.5	31.5	62.5	0	6	3,050	2.84	0.052
2	42.5	54.5	0	4	3,310	5.65	0.033
4	60	27.5	0	9	4,780	3.90	0.039
4.5	63	30	0	2	6,770	16.40	0.021
4	36.5	59	0	4	5,100	12.00	
4	24	67.5	0	2	3,450	11.45	
5.5	41	52.5	0	6	3,250	4.06	
4.5	49.5	43	0	9	6,580	3.05	0.039
3	39	55	0	20	4,620	5.52	0.027
5	70.5	24.5	0	21	10,050	11.42	0.049
6.5	57.5	32.5	0	15	5,130	18.65	
5.5	40.5	50	0	7	5,130	7.26	0.055
3	27.5	69	0	15	4,360	10.00	0.032
7	33	58.5	0	5	5,240	4.56	0.026
5	52	42.5	0	8	5,440	11.57	0.033
2	46	50.5	0	10	4,550	12.12	0.053
8	56.5	33	0	19	5,300	7.10	0.041
2.5	72.5	22	0	10	10,100	6.61	0.084

TABLE VII. Peroxidase Content in Plasma and per

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
40	A.F. ♂	0-2	Osteomyelitis	24,300	0	1
41	H.H. ♂	3	Sepsis	21,000	0	0
42	N.S. ♂	4	Actue bronchitis	11,000	0	0
43	J.K. ♂	4	Purulent meningitis	9,400	0	0.5
44	Y.O. ♀	5	Thoracic empyema	12,700	0.5	3
45	J.K. ♂	6	Ecthyma	6,950	0	3.5
46	E.H. ♀	7	Thoracic empyema	17,700	0	0
				15,100	0	1
				15,100	0	1.5
47	M.O. ♀	10	Tuberculous meningitis	12,900	0	1
48	H.K. ♂	1	Adenoconjunctivitis	13,800	0	2
49	M.C. ♂	0-8	Infectious lymphocytosis	21,100	0.5	2
50	Y.O. ♀	6	Viral pleuritis	18,500	0	3
51	Y.T. ♀	6	Primary atypical pneumonia	9,200	0	1.5
52	H.O. ♂	9	Rheumatic fever	10,000	0	0
53	H.Y. ♂	11	Rheumatic fever	8,000	0.5	4
54	T.O. ♂	13	Rheumatic fever	10,000	0	1
				7,100	0	0
55	H.S. ♀	11	Rheumatoid arthritis	15,340	0	1.5

TABLE VIII. Peroxidase Content in Plasma and per Single

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
56	T.A. ♂	1	Myoclonic seizure	10,200	0	0.5
57	R.K. ♀	1	Myoclonic seizure	6,200	0	0.5
58	R.S. ♀	2	Myoclonic seizure	3,700	0	1
				5,000	0	0
59	M.S. ♂	2	Grand mal and petit mal	13,500	0	1
60	M.A. ♀	3	Grand mal	11,600	0	0
61	Y.M. ♀	5	Abdominal epilepsy	20,600	0	0.5
62	M.T. ♂	8	Abdominal epilepsy	8,450	0	1
63	T.K. ♂	9	Grand mal	14,200	0.5	0
64	A.K. ♂	5	Actue hemiplegia	8,850	1	0
65	M.F. ♀	7	Actue hemiplegia	7,200	0.5	0
66	Y.S. ♂	9	Actue hemiplegia	9,950	0	2
67	T.K. ♂	0-10	Idiopathic cerebral calcification	9,500	0.5	2
				6,600	0.5	1.5
68	S.S. ♀	0-10	Encephalitis	5,850	1	1.5
				7,100	0	2
69	K.A. ♀	7	Post-meningitic state (tuberculous)	7,000	0	0.5
				6,650	0.5	0.5
70	R.K. ♀	6	Congenital choreoathetosis	7,400	1.5	0
				7,000	0	0
				6,000	0	1
71	K.A. ♂	10	Dystonia musculorum deformans	14,400	0	0
				9,900	1	3
72	T.K. ♂	7	Tic convulsive	6,100	0.5	0
				6,600	0.5	2.5

Single Myeloid Cell from the Cases with Infections

count of leukocytes (%)		L	Virocyte plasma cell	% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
M	N						
3	66	30	0	6	17,000	11.10	0.049
1	85.5	13.5	0	17	18,130	9.45	
3	81	16	0	6	9,240	7.46	0.061
4	61	34.5	0	12	6,160	8.30	0.049
5	56.5	35	0	25	8,250	8.28	0.040
6.5	46	44	0	30	3,920	14.00	0.027
5	65	30	0	30	12,390	8.69	0.056
1.5	45.5	52	0	4	7,200	3.90	0.023
4	36.5	58	0	27	6,200	4.70	0.033
7	82.5	9.5	0	34	11,650	10.00	0.056
3	22	71.5	1.5	10	3,750	8.45	
5.5	27	64	1	8	7,600	9.05	0.058
3.5	67.5	26	0	10	13,690	4.72	0.055
2.5	35.5	60.5	0	18	3,650	5.69	0.032
1.5	73	25.5	0	11	7,650	7.25	0.093
4	49.5	42	0	10	4,640	7.07	0.049
3.5	65	30.5	0	8	6,950	15.95	0.057
6.5	37	54.5	2	11	3,230	16.80	0.015
2	85.5	11	0	24	15,340	3.92	0.014

Myeloid Cell from the Cases with Nervous Disorders

count of leukocytes (%)		L	Virocyte plasma cell	% of band from	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
M	N						
5	27	67.5	0	7	3,301	7.17	0.095
3.5	30.5	65.5	1	10	2,610	6.25	0.062
3	63	31.5	1.5	20	2,540	7.75	0.072
2.5	48.5	48	0	15	2,600	7.35	0.057
4.5	46.5	47.5	0	10	7,080	8.22	
3.5	65	31.5	0	9	7,970	6.22	0.066
5.5	61	33	0	8	13,800	4.06	0.084
4	66.5	28.5	0	10	6,040	8.49	0.072
3.5	75	21	0	13	11,210	10.08	
1.5	66.5	31	0	4	6,110	9.64	0.061
4.5	43	52	0	2	3,460	6.07	
3	50	45	0	11	5,470	6.98	0.039
8	48	41.5	0	14	5,560	5.65	0.035
9	32.5	56.5	0.5	16	2,850	7.59	0.047
6.5	35	55.5	0	13	2,870	7.24	0.108
6.5	60	31.5	0	19	4,870	10.02	
2	24	0	0	10	1,850	9.38	0.074
7.5	63.5	0.5	0.5	2	4,850	6.28	0.022
6	62.5	30	0	5	5,190	11.80	0.026
7.5	49.5	43	0	44	4,000	11.10	0.061
1	31	67	0	9	1,980	5.21	0.036
2.5	76.5	21	0	6	11,360	4.22	0.040
5.5	45.5	45	0	0	5,500	4.18	0.026
7	59	33.5	0	5	3,190	6.06	0.037
5	58	34	0	6	4,350	7.43	0.042

TABLE IX. Peroxidase Content in plasma and per

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
73	Y.S. ♀	1	Aplastic anemia	7,000	0	1
				5,700	0	1.5
				10,250	0	0
74	Y.H. ♂	3	Aplastic anemia	2,300	0	3
75	H.S. ♀	10	Aplastic anemia	3,200	0	0.5
76	S.K. ♀	10	Acquired hemolytic anemia	4,400	0	0.
77	I.U. ♂	12	Hypochromic anemia	8,200	0.5	1.5
				8,300	0	0.5
78	H.O. ♂	7	Hemophilia	6,700	0	3

TABLE X. Peroxidase Content in Plasma and per

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
79	R.N. ♀	7	Acute nephritis	7,250	0	0.5
80	S.O. ♀	12	Acute nephritis	10,200	0	0
81	M.E. ♀	6	Chronic nephritis	12,600	0	0.5
				9,200	0	2.5
82	Y.I. ♀	12	Chronic nephritis	6,750	0	2

TABLE XI. Peroxidase Content in Plasma and per

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
83	S.H. ♂	9	Acute hepatitis	11,000	0	0
84	C.N. ♀	5	Chronic hepatitis	4,050	0	5.5
85	G.K. ♂	4	Cirrhosis of the liver	9,400	0	0.5
86	T.S. ♂	7	Lupoid hepatitis	5,850	0	0.5
				8,400	0	0
87	R.C. ♀	10	Plasma cell hepatitis	5,300	0	0
88	M.K. ♂	12	Cirrhosis of the liver			

(No. 31) and dystrophia musculorum progressiva (No. 34). Among these four cases of progressive muscular dystrophy, degeneration of the affected muscles was the most severe in No. 34 as compared with that in the other 3 cases (Nos. 33, 35, 36).

Infections (cf. Table VII)

The abnormally low values for plasma peroxidase were found in rheumatic

Single Myeloid Cell from the Cases with Anemia

count of leukocytes (%)				% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
cells		L	Virocyte plasma cell				
M	N						
2	27	70	0	30	3,100	6.58	0.027
2.5	55.5	40.5	0	9	3,310	13.50	0.044
4.5	31.5	64	0	4	3,690	3.36	
1.5	29.5	55	0	16	800	7.35	0.056
3	57.5	38	0	6	1,970	5.29	0.026
8	60.5	31.5	0	14	3,020	2.02	0.043
6.5	53.5	38	0	17	5,900	2.62	0.027
13	48	38	0	21	3,990	3.66	0.027
7.5	48.5	40.5	0	4	3,990	8.36	0.026

Single Myeloid Cell from the Cases with Nephritis

count of leukocytes (%)				% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
cells		L	Virocyte plasma cell				
M	N						
4.6	59	36	0	12	4,640	7.75	0.062
6.5	75.5	18	0	5	8,370	5.50	0.026
3	80.5	15.5	0	12	10,300	4.39	0.030
7	59.5	31	0	15	6,350	10.04	0.037
5.5	61.5	31	0	4	4,070	10.03	0.031

Single Myeloid Cell from the Cases with Liver Diseases

count of leukocytes (%)				% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
cells		L	Virocyte plasma cell				
M	N						
5.5	42.5	52	0	8	5,280	4.41	0.028
6	33	54.5	1	19	1,800	13.60	0.049
4	61	34.5	0	12	6,160	8.30	0.046
6	65.5	28	0	33	4,245	12.19	0.042
2	71	26.5	0.5	43	6,150	12.95	
4	54.5	41.5	0	20	3,100	5.47	0.055
						1.31	0.035

fever (No. 54) and rheumatoid arthritis (No. 55). As regards the peroxidase content per single myeloid cell, the abnormally high values were found in ecthyma (No. 45), and rheumatic fever (No. 54), and the abnormally low values in thoracic empyema (No. 46) and rheumatoid arthritis (No. 55).

Diseases of the nervous system (cf. Table VIII)

TABLE XII. Peroxidase Content in Plasma and per Single

No. of cases	Name and sex	Age (years)	Clinical diagnosis	Total count of white cells/mm ³	Differential	
					Myeloid	
					B	E
89	H.M. ♀	6	Bronchial asthma	6,000	0.5	6
90	J.S. ♂	7	Bronchial asthma	8,350	0	1
91	C.O. ♂	10	Cyclic vomiting	14,500	1.5	1
				9,200	0	0.5
92	Y.T. ♂	5	Enuresis	5,600	0	0.5
93	T.I. ♂	1	Cretinism	18,600	0	1
				12,000	0.5	3.5
94	S.S. ♂	11	Hypothyroidism	8,350	0.5	2
95	F.S. ♀	13	Hypoparathyroidism	3,600	0	1
96	H.S. ♀	0-5	Dextrocardia	20,500	0.5	0.5
97	T.K. ♀	0-11	Pseudohermaphroditism	7,600	0	1
98	M.K. ♀	1	Pseudohermaphroditism	14,800	0	7
99	H.K. ♂	3	Incontinentia pigmenti	9,750	1	1.5
100	T.M. ♂	4	Hydroa vacciniforme	7,350	0	2
				8,150	0.5	1.5
101	K.W. ♂	1	Mongolism	12,900	0	1.5

No abnormal values for peroxidase in plasma and per single myeloid cell were found in the cases with nervous disorders, except a case of encephalitis (No. 68), in which a high plasma peroxidase level was found.

Anemia (cf. Table IX)

The peroxidase levels in plasma were found to be within the normal range in all the cases examined. As regards the peroxidase content per single myeloid cell, the abnormally high values were found in aplastic anemia (No. 73), while the abnormally low values in acquired hemolytic anemia (No. 76) and hypochromic anemia (No. 77).

Nephritis (cf. Table X)

No abnormal values for peroxidase in plasma and per single myeloid cell were found in the cases with chronic or acute nephritis.

Liver diseases (cf. Table XI)

The plasma peroxidase levels were found to be within the normal limits in all the 6 cases with liver diseases, while abnormally high values for peroxidase per single myeloid cell were found in chronic hepatitis (No. 84) and lupoid hepatitis (No. 86).

Miscellaneous diseases (cf. Table XII)

The abnormally low values for plasma peroxidase were found in pseudo-

Myeloid Cell from the Cases with Miscellaneous Disorders

count of leukocyte (%)		L	Virocyte plasma cell	% of band form	Absolute number of myeloid cells/mm ³	Peroxidase content per single myeloid cell ($\gamma \times 10^{-8}$)	Peroxidase content in plasma (γ /ml)
M	N						
4.5	47	42	0	16	3,480	7.25	0.052
1.5	45	52.5	0	16	3,960	9.20	
5	60	32.5	0	5	9,800	4.18	0.036
1.5	75	23	0	9	7,080	5.08	0.038
6.5	42.5	50	0.5	7	2,720	13.00	
5.5	74	19.5	0	42	14,970	8.17	0.043
6.5	32	57	0	17	5,150	10.01	0.065
2.5	47	46.5	1.5	11	4,470	7.15	0.063
4.5	69.5	25	0	13	2,250	10.08	0.027
4.5	82	12.5	0	26	17,930	7.75	0.024
5	59	35	0	11	3,940	8.25	0.017
2	31.5	59.5	0	9	5,990	8.47	0.074
4.5	33	60	0	10	3,900	6.40	
6	40	52	0	5	3,450	11.59	0.054
2	37	59	0	4	3,350	11.89	0.065
9	34.5	54.5	0.5	17	5,870	9.65	0.042

hermaphroditism (No. 98), while an abnormally high value for peroxidase per single myeloid cell was found in enuresis (No. 92).

In any group examined no distinct relationship was found between the peroxidase content per single cell or in plasma and total or differential count of leukocytes in peripheral blood.

SUMMARY

A simultaneous estimation of peroxidase in plasma and per single myeloid cell was carried out by my own colorimetric method upon 42 normal subjects and 101 cases with various disorders. Even though the cases examined were small in number, a certain speculation could be drawn as was shown in Table XIII. The abnormally high values for peroxidase per single myeloid cell were found in the cases with neoplasm, mild form of progressive muscular dystrophy and lupoid hepatitis. Less probably it might be said that in the cases with chronic hepatitis, glycogen storage disease, albinism, ecthyma, sepsis and rheumatic fever an abnormally high level of peroxidase per single myeloid cell would be found.

The extremely high values for plasma peroxidase were found in the cases with the peroxidase positive myeloblastic leukemia. A considerable high value for plasma peroxidase was found in one case with encephalitis of unknown etiology.

The abnormally low levels for peroxidase per single myeloid cell were found in the cases with chronic agranulocytosis, and gargoylism, and less probably in the cases with hypochromic anemia, acquired hemolytic anemia, osteochondrodystrophy and rheumatoid arthritis.

TABLE XIII. Summarized Table of Abnormal Peroxidase Values in Plasma or per Single Myeloid Cell, Basing upon the Results from 101 Cases Examined

Mode of abnormality in peroxidase value Occurrence in abnormality of peroxidase value	Abnormally low peroxidase value		Abnormally high peroxidase value	
	Per single myeloid cell	In plasma	Per single myeloid cell	In plasma
Probable	Chronic agranulocytosis Gargoylism		Neoplasm Dystrophia musculorum progressiva (mild form) Lupoid hepatitis	Peroxidase-positive myeloblastic leukemia
Less probable	Hypochromic anemia Acquired hemolytic anemia Osetochondrodystrophy Rheumatoid arthritis		Albinism Ecthyma Sepsis Glycogen disease Chronic hepatitis Rheumatic fever	Encephalitis

CONCLUSIONS

A simultaneous estimation of the peroxidase activity in plasma and per single myeloid cell of peripheral blood was made upon 144 subjects with or without disease.

The method for the determination of peroxidase activity was my own colorimetric method which required only 3.5 ml of blood. The results to be worthy of note were as follows:

1) For the peroxidase activity per single myeloid cell, an abnormally high value was found in the cases with neoplasm.

2) For the peroxidase activity in plasma, an abnormally high value was found in the cases with peroxidase-positive myeloblastic leukemia.

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