Blood Picture in Bacillary Dysentery in Children; Hematological Difference of Its Two Clinical Forms.*

55th Hematological Paper.

By

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Introduction.

In our country bacillary dysentery in children can manifest itself in a toxic form called "Ekiri",† besides the banal colitis dysenterica.

It was our aim to study the hematological difference between two clinical forms of dysentery, foudroyant and colitic forms. In the present paper we do not touch upon the nuclear picture of neutrophiles, which will be published in the near future (Cf. 57th Hematological Paper).

The results of our routine blood work in daily practice in our Laboratory was the basis of the present paper.

Method of Experiment.

1. Materials: Infants and children who were admitted to our Pediatric Department of the Tohoku Imperial University Hospital on account of bacillary dysentery.

* Read at the 28th Meeting of the Sendai Branch of the Japanese Pediatric Society, September 27, 1940.

† "Ekiri" is more a clinical syndrom than a clinical entity; it is often a form of dysenteric infection: at least this is the opinion of not a few authors.

2. Method of blood examination: Blood was taken from an ear lobe. White cell count was made by the use of Türk's solution. Red cells were counted by the use of Hayem's solution. Hemoglobin was given in Sahli's value. For the purpose of staining blood smears the Tohoku Pediatric Method¹⁾ (50th Report of the Peroxidase Reaction), a modification of Sato and Sekiya's²⁾ copper peroxidase reaction, was applied. Red cell sedimentation was examined with Yoshida's³⁾ micro apparatus (3rd Hematological Paper).

1) A. Sato, T. Suzuki and Ry. Shibata, Tohoku J. Exp. Med., 1934, 24, 195.

2) A. Sato and S. Sekiya, Ibid., 1926, 7, 111.

3) M. Yoshida, Ibid., 1936, 29, 400.

TABLE
Cases of Bacillary

Case No.	Name, Sex and Age (y=years m=months)	Red cell count (per cm., ten thousands) (Hemo- globin, Sahli's value)	White cell count (per cm.)	Varieties of white blood cells						Arneth's nuclear shift of neutrophils					
				Basophiles % (absolute count)	Eosinophiles % (absolute count)	Neutrophiles % (absolute count)	Monocytes % (absolute count)	Lymphocytes % (absolute count)	Plasma cells %						
										I			II	III	IV V
										M	W	T			
Cases in Children															
1	T.K. ♀ 6y 8m	491 (105)	15800	0 (0)	0 (0)	82.4 (13000)	4.0 (630)	12.4 (1940)	1.2	0	5.0	63.5	26.0	5.5	0 0
		582 (105)	10500	0 (0)	0 (0)	76.0 (7980)	3.1 (315)	21.0 (2205)	0	1.3	1.7	60.0	33.7	3.3	0 0
		587 (110)	19000	0 (0)	1.0 (190)	80.0 (15200)	4.0 (760)	12.0 (2280)	3.0	+	1.0	23	44	28	1 1
		552 (—)	14300	0 (0)	1.5 (214)	65.0 (9295)	7.0 (1001)	26.5 (3790)	0	0	0	24	50	22	3 1
		509 (90)	11200	1.5 (168)	8.5 (952)	42.0 (4704)	8.5 (952)	39.0 (4368)	0.5	0	1	13	31	42	12 1
2	Y.F. ♂ 3y 6m	592 (100)	7900	0 (0)	0 (0)	47.3 (3637)	8.0 (632)	44.7 (3531)	0	0	14	78.8	7.0	0.2	0 0
3	A.C. ♂ 2y 6m	515 (—)	13100	0 (0)	0 (0)	80 (10500)	7.4 (590)	12.6 (1650)	0	0	0	69	19	9	3 0
4	T.I. ♀ 2y 10m	530 (95)	7350	0 (0)	0 (0)	72 (5300)	3.4 (250)	24.6 (1800)	0	9.2	20	52	18	0.8	0 0
		540 (100)	7000	0.7 (49)	0.3 (21)	50.3 (3521)	10 (700)	38.7 (2609)	0	0	0	65.3	28.0	6.6	0.1 0
5	M.S. ♂ 1y 9m	430 (—)	6000	0 (0)	0 (0)	47.2 (2700)	18.4 (1100)	34.4 (2050)	0	3.3	9.1	51.7	31.0	4.1	0.8 0
		670 (—)	35700	0 (0)	0.6 (210)	84.8 (30000)	1.3 (464)	13.0 (4641)	0	4.0	3.2	63.6	28.4	0.8	0 0
6	S.S. ♂ 4y 8m	521 (75)	15550	0 (0)	0 (0)	52.1 (8101)	3.9 (610)	38.6 (5900)	5.4	0	1.3	80.0	16.0	2.7	0 0

3. Judging of the blood picture: Sato-Suzuki's⁴⁾ standard table of normal blood picture for every age (Cf. 8th Hematological Paper) was used for judging blood picture of the patients.

4. We divided for convenience's sake the course of disease into 3 stages as follows:—

- I. The first stage: acute stage with toxic signs.
- II. The second stage: protracted stage with diarrhoea, but without toxic sign.
- III. The third stage: convalescent stage without diarrhoea.

4) T. Suzuki, Tohoku J. Exp. Med., 1937, 30, 378.

1.

Dysentery.

Nuclear picture of neutrophiles %				Sedimentation of red cells (Yoshida's micro method)		Day of illness (Date)	Form of illness (F=foudroyant form C=colitic form)	Clinical symptoms							Remarks and fate	
,	C	O	;	Rate (60' mm)	Type			Diarrhoea	Stool white blood*	Vomiting	Nausea	Fever	Cyanosis	Somnolence		Convulsion
54	36	19	0.5	9	I	1	F	++	+	+	+	##	+	+	-	Recovered
20	55	25	1.0	15	I	6		##	-	-	-	++	±	-	-	
4	44	52	6.0	6	—	9		##	-	-	-	-	-	-	-	
4	56	40	1.0	8	IV	25		+	-	-	-	-	-	-	-	
9	47	44	1	16	III	47		-	-	-	-	-	-	-	-	
37	45	18	0	12	II	5	C	##	+	-	+	+	+	++	-	"
19	65	16	0	3	—	1	F	++	-	-	-	##	+	++	+	"
30	35	35	0	18	II	3	F	++	-	-	+	##	-	++	-	"
33	38	29	0	5.5	III	17		++	+	-	-	-	-	-	-	
43	42	15	0	22	I	4	C	++	-	-	-	##	-	-	-	Died on the next day
11	45	44	0	5	II	11		##	-	+	-	-	±	+	-	
18	35	47	0	8	—	12	C	##	-	-	-	+	-	-	-	Recovered

TABLE

Case No.	Name, Sex and Age (y=years m=months)	Red cell count (per cm., ten thousands) (Hemo- globin, Sahli's value)	White cell count (per mm.)	Varieties of white blood cells						Arneth's nuclear shift of neutrophiles									
				Basophiles % (absolute count)	Eosinophiles % (absolute count)	Neutrophiles % (absolute count)	Monocytes % (absolute count)	Lymphocytes % (absolute count)	Plasma cells %										
										I			II	III	IV	V			
										M	W	T							
7	T.C. ♂ 3y 10m	504 (70)	10650	0 (0)	0.8 (85)	50.5 (5300)	7.7 (820)	41.0 (4300)	0	0	0.8	81.0	17.0	1.2	0	0			
		281 (60)	19700	0 (0)	9.0 (600)	66.0 (13000)	4.4 (290)	20.6 (4000)	0	0	3.5	37.0	40.0	18.5	1.0	0			
		390 (65)	18250	0 (0)	1.8 (330)	24.6 (4500)	3.6 (650)	70.0 (12800)	0	3.5	13.0	29.0	31.0	28.0	3.5	0			
8	K.A. ♂ 3y 11m	633 (85)	3850	0 (0)	0 (0)	45.0 (1730)	23.6 (899)	31.4 (1200)	0	0	13.6	70.0	14.0	2.4	0	0			
		511 (98)	8500	0 (0)	0 (0)	70.3 (6000)	7.5 (630)	22.5 (1900)	0	0	1.7	57.0	31.0	10.3	0	0			
		440 (85)	6750	0 (0)	0 (0)	82.0 (5500)	0.5 (40)	17.5 (1100)	0	0	2.7	55.0	32.0	9.0	1.3	0			
9	J.I. ♂ 11y 6m	518 (85)	18050	0 (0)	0 (0)	92.0 (16600)	3.1 (560)	4.9 (890)	0	0	2.4	41.5	36.5	17.5	2.9	0			
10	F.I. ♀ 3y 9m	463 (90)	9950	0 (0)	0 (0)	43.0 (4300)	10.0 (995)	47.0 (4700)	0	0	7	57	35	0.5	0.5	0			
11	T.A. ♀ 4y 1m	474 (70)	12250	0 (0)	0 (0)	62.0 (7500)	10.4 (1250)	27.6 (3360)	0	0	0	36	53	10	1	0			
12	M.I. ♂ 4y	535 (—)	5500	0 (0)	0 (0)	72 (3960)	8 (440)	20 (1100)	0	0	7	76	17	0	0	0			
13	T.S. ♂ 2y 11m	480 (90)	7800	0 (0)	0 (0)	59 (4602)	12 (936)	28 (2184)	1	0	8	54	36	2	0	0			
14	K.H. ♂ 2y 11m	498 (95)	7750	0 (0)	0 (0)	59 (4572)	7 (542)	34 (2635)	0	0	3	59	34	4	0	0			
15	T.A. ♂ 5y 9m	380 (70)	7800	0.3 (23)	3.3 (250)	85.6 (4500)	9.3 (720)	24.3 (1900)	3.6	3.3	6.6	48.3	35.8	4.6	0.6	0.3			
16	M.M. ♂ 1y 9m	520 (70)	10000	0.4 (40)	0.9 (90)	39.6 (3960)	3.7 (370)	55.2 (5520)	0.2	0	0	30.7	50.6	16.0	2.1	0.6			
17	N.K. ♂ 5y 4m	388 (70)	6400	0.4 (26)	0.4 (26)	49.2 (3148)	17.6 (1126)	32.4 (2074)	0	0	0	57.4	36.0	6.0	0.5	0			
		504 (85)	11000	0.4 (44)	2.4 (264)	51.6 (5676)	12.0 (1320)	32.0 (3520)	0	0	0	40.5	48.5	10.0	1.0	0			
18	S.F. ♂ 4y 1m	646 (80)	8050	0 (0)	0 (0)	60 (480)	14 (1120)	26 (2100)	0	0	0	64.5	29.0	7.8	2.2	0			
19	M.I. ♂ 6y 1m	479 (—)	10100	0 (0)	0 (0)	70.8 (7150)	15.5 (1565)	13.7 (1383)	0	1.5	2.5	80.5	13.5	1.5	0.5	0			
20	S.K. ♂ 6y 11m	— (—)	8000	0 (0)	0 (0)	38 (6640)	10 (800)	7 (560)	0	0	19	75	5	1	0	0			
		135 (36)	16000	0 (0)	0.5 (80)	81 (12960)	4.5 (720)	13.5 (2160)	0.5	3	1	45	35	12	3	1			

TABLE

Case No.	Name, Sex and Age (y = years m = months)	Red cell count (per cm., ten thousands) (Hemo- globin, Sahli's value)	White cell count (per cmm.)	Varieties of white blood cells						Ar neth's nuclear shift of neutrophiles									
				Basophiles % (absolute count)	Eosinophiles % (absolute count)	Neutrophiles % (absolute count)	Monocytes % (absolute count)	Lymphocytes % (absolute count)	Plasma cells %	I			II	III	IV	V			
										M	W	T							
21	A.M. ♂ 8y 4m	495 (80)	5800	0.4 (23)	0 (0)	58.4 (3387)	18.0 (1044)	22.0 (1276)	1.2	0.5	1.0	72.5	24.0	2.0	0	0			
		448 (75)	4300	1.2 (52)	1.6 (69)	38.0 (1034)	4.4 (189)	52.8 (2270)	2.0	1	0	22	53	19	5	0			
22	M.S. ♂ 1y 7m	615 (76)	16600	0 (0)	0.7 (116)	72.0 (11952)	8.0 (1328)	18.0 (2988)	1.4	0	1.0	36.8	59.0	2.5	0.7	0			
23	F.S. ♀ 4y 1m	605 (—)	15300	0 (0)	0 (0)	63.2 (9669)	16.4 (2509)	17.0 (2601)	3.4	2.0	0.5	89.0	8.0	0.5	0	0			
		526 (—)	17900	0 (0)	0 (0)	81.0 (14499)	9.0 (1611)	9.0 (1611)	1.0	0	1	67	28	4	0	6			
24	T.O. ♂ 4y 8m	521 (—)	7700	0 (0)	0 (0)	75.8 (5836)	7.5 (577)	16.7 (1285)	0	1.5	2.0	72.5	23.0	1.0	0	0			
		529 (—)	13000	0 (0)	2.6 (338)	64.9 (8437)	6.5 (845)	26 (3380)	0	0	0	15	43	32	10	0			
25	T.K. ♂ 3y 7m	500 (85)	13000	0.4 (52)	2.4 (312)	61.2 (6956)	11.2 (1456)	24 (3120)	0.8	0	0	28	32	28.5	9.5	2.0			
		500 (100)	7000	1.0 (70)	6.5 (455)	35 (2450)	5.0 (350)	49 (3430)	3.5	0.5	0.5	36	42	17.5	3.5	0			
26	T.N. ♀ 1y 6m	528 (105)	6800	0.5 (34)	2.0 (136)	32.5 (2210)	2.5 (170)	62.5 (4250)	0	0	0	27.8	54.5	16.2	1.5	0			
27	M.O. ♀ 6y 7m	517 (—)	7600	0 (0)	0 (0)	52.2 (4423)	8.1 (615)	83.7 (2561)	0	0	0	78	21	1	0	0			
		420 (—)	8750	0.6 (52)	3.6 (315)	39.8 (3482)	6.8 (595)	49.2 (4305)	0	0	0	11.5	53.5	30.5	4.5	0			
28	M.Y. ♂ 3y 8m	512 (82)	8150	0 (+)	1.2 (98)	65.0 (5300)	6.7 (546)	27.1 (2210)	0	1.5	1.5	69.6	23.5	3.9	0	0			
		484 (71)	17100	0 (0)	3.5 (599)	36.6 (6259)	5.4 (923)	54.5 (9320)	0	0	0	57.2	33.6	6.3	2.9	0			
		461 (—)	1400	0 (0)	1.0 (104)	50.0 (5200)	3.5 (364)	45.5 (4732)	0	0	0	40	42.5	16.5	1.0	0			
29	K.M. ♂ 1y 8m	548 (84)	17300	0 (+)	1.0 (173)	66.0 (11418)	10.0 (1730)	21.0 (3633)	2	0	0	70	27	2	1	0			
		540 (75)	8050	0 (0)	3 (242)	50 (4025)	5 (403)	40 (3220)	2	0	0	35	42	19	4	0			
30	T.N. ♂ 5y 7m	470 (—)	8400	0 (+)	2.0 (170)	53 (4450)	9.0 (760)	36 (3020)	0	0	0	26	48	25	1	0			
31	Y.T. ♀ 3y 5m	516 (—)	22000	0 (0)	0 (0)	59.8 (18160)	11.2 (2460)	29.0 (6380)	0	1	3	39	52	4	1	0			
		— (—)	30600	0.5 (150)	1.5 (460)	52.0 (15910)	9.0 (3760)	37.0 (11320)	0	0	1	36	48	12	1	0			
		432 (—)	18000	0 (0)	0 (0)	63.4 (11410)	5.6 (1010)	31.0 (5580)	0	0	0	18	52	23	7	0			
		512 (—)	6500	1.3 (80)	2.7 (180)	34.2 (2220)	7.8 (510)	54.0 (3510)	0	0	0	11	50	32	6	1			

TABLE

Case No.	Name, Sex and Age (y=years m=months)	Red cell count (per cem., ten thousands) (Hemo- globin, Sahli's value)	White cell count (per cmm.)	Varieties of white blood cells						Arneeth's nuclear shift of neutrophiles						
				Basophiles % (absolute count)	Eosinophiles % (absolute count)	Neutrophiles % (absolute count)	Monocytes % (absolute count)	Lymphocytes % (absolute count)	Plasma cells %							
										I			II	III	IV	V
										M	W	T				
32	T.K. ♀ 2y 11m	— (—)	3300	0 (0)	0 (0)	56 (1848)	21 (693)	22 (726)	1	3	27	52	16	2	0	0
		564 (55)	9650	0 (0)	0 (+)	65 (8070)	13 (1260)	22 (2120)	+	0	0	31	48	17	4	0
33	M.U. ♀ 2y 11m	— (—)	22400	0 (0)	0 (0)	78.3 (17539)	8.5 (1904)	13.2 (2956)	0	0	4	83	13	0	0	0
34	K.M. ♀ 1y 9m	— (—)	16000	0.5 (80)	0 (0)	53.5 (8560)	7.0 (1120)	39.0 (6240)	0	0	0	21	47	26	5	1
35	M.O. ♀ 2y 10m	— (—)	24000	0 (0)	0 (0)	76.5 (18360)	17.0 (1105)	6.5 (1560)	0	6.5	6	71	16	0.5	0	0
Cases in Adults																
36	K.U. ♂ 23y	502 (105)	18600	0 (0)	0.4 (75)	89.0 (16500)	1.3 (240)	9.3 (1730)	0	0	0	31	46	21.5	1.5	0
		640 (—)	8900	2 (180)	0 (0)	48 (4400)	4 (360)	46 (4100)	0	0	0	10	56	26	8	0
37	K.W. ♀ 20y	381 (72)	5300	0 (0)	0 (0)	74.5 (3940)	4.5 (240)	21 (1120)	0	0	0	42	44	12	2	0
38	Y.I. ♀ 38y	384 (78)	7850	0 (0)	0 (0)	79 (6200)	2 (150)	19 (1500)	0	0	0	37	44	16	3	0

Results with Comment.

1. Total count of leucocytes.

As our result shows, the change of the leucocyte count according to the forms of illness, whether colitic or foudroyant, was not characteristic (Cf. Table 2).

As stated above, the change of the total leucocyte count did not depend on different forms of disease, nor was the count different according to different stages of disease; sometimes it increased, sometimes it decreased, and at other times it often remained unchanged, mainly because the change was only the manifestation of the combination of different counts of neutrophiles and lymphocytes. Compare our own results with those of other investigators in Table 3.

1. (Continued).

Nuclear picture of neutrophiles %				Sedimentation of red cells (Yoshida's micro method)		Day of illness (Date)	Form of illness (F=foudroyant form) (C=colitic form)	Clinical symptoms							Remarks and fate
								Diarrhoea	Stool white blood	Vomiting	Nausea	Fever	Cyanosis	Somnolence	
,	C	O	;	Rate (60' mm)	Type										
20	40	40	0	19	III	5	C	##	+	-	-	+	-	-	
33	25	42	0	-	-	24		##	-	-	-	+	-	-	Recovered
20	79	1	0	23	II	2	F	++	-	##	+	##	+	##	"
0	60	40	0	21	II	3	F	+	+	+	+	++	-	-	Died after 11 days
5	48	47	0	21	I	7	F	##	+	-	-	+	+	-	Died after 4 weeks
4	40	56	1	2	-	1	C	++	+	+	+	++	-	-	3 hours after the beginning of illness
20	40	40	2.5	3	-	19		-	-	-	-	-	-	-	Recovered
5	23	72	0	5	II-III	3	C	++	+	-	-	++	-	-	"
5.6	48	46.4	1.7	13	III	1	C	##	+	-	-	++	-	-	The mother of case No. 9 & 10

TABLE 2.
Total leucocyte count.

Total leucocyte count	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
Increased	9*	11	0	6	4	1	15	14	1
Unchanged‡	2	5	1	3	0	0	5	5	1
Decreased	6	4	3	2	1	0	8	6	3
Σ	17	20	4	11	5	1	28	25	5

* The number of cases.

† Stage of illness was classified as follows:—

I . . . Acute stage with toxic signs.

II . . . Protracted stage with diarrhoea, but without toxic sign.

III . . . Convalescent stage without diarrhoea.

‡ Within physiological fluctuations.

TABLE 3.

Opinions of different authors concerning total leucocyte count.

Author	Total leucocyte count			Remarks
	Increased?	Unchanged?	Decreased?	
V. Schilling ⁵⁾	Yes	No	No	Neutrophile leucocytosis
P. Piney ⁶⁾	Yes	No	No	
A. Galambos ⁷⁾	Yes	No	No	Parallel to seriousness of illness; neutrophile leucocytosis
Lampe ⁸⁾	Yes	No	Yes, short times before death	In serious cases increased remarkably
G. Wald ⁹⁾	Yes, slightly	Yes	No	In uncomplicated cases
	Yes, strongly	Yes	No	In complicated cases
E. Marcovici ¹⁰⁾	6%	34%	60%	In acute stage
T. Sasaki ¹¹⁾	Various			He classifies 6-types approximately according to kind of germs and stage of illness
M. Tsuchibashi ¹²⁾	Yes mostly			
Isizaka, Yanagawa and Takahashi		Inconstant		Independently of form and stage of illness
	53% (15 cases)	18% (5 cases)	29% (8 cases)	In acute stage

Many authors^{5) 6) 7) 8) 9) 12)} are of the opinion that leucocytosis is seen, but our results agreed with those of a few other investigators^{10) 11)} who stated that leucocytosis is inconstant.

5) V. Schilling, *Das Blutbild*, 5 and 6th edit., 1926 Jena, 118.

6) A. Piney, *Diseases of the Blood*, 2nd edit., 1932 Philadelphia, 244.

7) A. Galambos, *Wien. klin. Wschr.*, 1918, **31**, 381.

8) Lampe, *Med. Klin.*, 1923, **19**, 540.

9) G. Ewald, *Fol. haem.*, 1917, **22**, 1.

10) E. Marcovici, *Fol. haem.*, 1920, **26**, 41.

11) T. Sasaki, *Aichi Igakkai Zassi*, 1931, **38**, 1297.

12) M. Tsuchibashi, *Zika Zassi (Acta Paediatrica Japonica)*, 1921, No. 253,

2. Neutrophile leucocyte count.

As will be seen from our results (Table 4) there was a difference between the two forms of illness as to the neutrophile count. In the colitic form the rise and fall of the neutrophile count was inconstant, while, in the foudroyant form, on the contrary, there was always an absolute neutrophilia (Cf. Table 4).

TABLE 4.
Absolute count of neutrophiles.

Absolute count of neutrophiles		Form of illness					
		Colitic form			Foudroyant form		
		Stage of illness†					
I	II	III	I	II	III		
Strongly increased	Above 10,001	4*	4	0	4	2	0
Increased	10,000~4,201	7	12	0	7	2	1
Unchanged‡	4,200~3,500	2	1	0	0	1	0
Decreased	below~3,499	4	3	4	0	0	0
Σ		17	20	4			

* The number of cases.

† Cf. Foot note to Table 2.

‡ " "

As to the neutrophiles in dysentery various opinions were published. Ewald⁹⁾ stated that neutrophilia occurred in complicated cases, but that neutropenia was seen in cases without complication. Lämpe⁸⁾ asserted that there was always neutrophilia: the more serious the illness, the stronger was the grade of neutrophilia. We, however, cannot agree with both authors, as our results show (Table 5).

TABLE 5.
Opinions of different authors concerning neutrophile count.

Author	Count	Increased?	Unchanged?	Decreased?	Remarks
V. Schilling ⁵⁾		Yes	No	No	Neutrophile leucocytosis
A. Piney ⁶⁾		Yes			In case with complication
A. Galambos ⁷⁾		Yes	No	No	
G. Lämpe ⁸⁾		Yes, slightly	No	No	In serious cases strongly increased

TABLE 5. (Continued).

Author \ Count	Increased?	Unchanged?	Decreased?	Remarks
G. Ewald ⁹⁾	No	No	Yes, slightly	In uncomplicated cases
	Yes	No	No	In complicated cases
E. Marcovici ¹⁰⁾	No		Yes	In acute stage
	No		Yes	In convalescent stage
T. Sasaki ¹¹⁾	Various			Parallel to total leucocyte count
M. Tsuchibashi ¹²⁾	Yes, in acme relatively, mostly in absolute count		Yes, in convalescence	
Isizaka, Yanagawa and Takahashi	Yes	Yes	Yes	Colitic form in acute stage
	Yes	No	No	Foudroyant form in acute stage

3. Nuclear shift of neutrophiles.

We always found a strong nuclear shift to the left in the cases of colitic form. In the acute stage of the foudroyant form we sometimes

TABLE 6.

Nuclear shift of neutrophiles.

Shifting cells	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
100 80.1	7*	1	0	3	1	0	10	2	0
80 55.1	6	8	0	5	2	0	11	10	0
55 30.1	4	9	1	1	0	0	5	9	1
30 5	0	2	3	2	2	1	2	4	4
Σ	17	20	4	11	5	1	28	25	5

* Cf. Foot note to Table 2.

†

"

"

found unexpectedly a shift rather slight in contrast to the seriousness of the toxic symptoms. Of course, all the cases producing a nuclear shift to the left came back to the normal with the recovery of the illness (Cf. Table 6).

4. Lymphocytes.

Our results are tabulated in Table 7.

TABLE 7.
Absolute count of lymphocytes.

Absolute count of lymphocytes	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
Increased	3*	6	1	1	1	1	4	7	2
Unchanged‡	1	4	1	1	0	0	2	4	1
Decreased	13	10	2	9	4	0	22	14	2
Σ	17	20	4	11	5	1	28	25	5

* Cf. Foot note to Table 2.

† " " "

‡ " " "

There were many cases, in which lymphocytes decreased especially at the beginning of illness. Many authors⁽⁶⁾⁽⁸⁾⁽⁹⁾⁽¹⁰⁾ are of the opinion that it increases, as a rule, in the acute stage of illness, and that when it decreases the prognosis will be unfortunate.

We, however, can not agree with these authors, but are of an opinion similar to that of Sasaki⁽¹¹⁾ and Tuchibashi⁽¹²⁾ who asserted that, in cases of children, lymphopenia occurred in the acute stage of illness (Cf. Table 8).

TABLE 8.
Opinions of different authors concerning lymphocyte count.

Author	Count	Increased?	Unchanged?	Decreased?	Remarks
A. Piney ⁽⁶⁾		Yes, slightly			
Lampe ⁽⁸⁾		Yes			In slight cases
		Yes			In serious cases
				Yes	In extraordinarily serious cases

TABLE 8. (Continued).

Author	Count	Increased ?	Unchanged ?	Decreased ?	Remarks
G. Ewald ⁹⁾		Yes, slightly (especially large lymphocytes)			In complicated cases
				Yes, strongly	In complicated cases
E. Marcovici ¹⁰⁾		Large lymphocytes		Small lymphocytes	In acute stage
		Yes			Postinfectious lymphocytosis
T. Sasaki ¹¹⁾				Yes	In acute stage
		Yes		Bad prognosis	In convalescence
M. Tsuchibashi ¹²⁾		Yes, in convalescence		Yes, in acme	In percentage, also in absolute count mostly
Isizaka, Yanagawa and Takahashi		14% (slightly)	7%	79%	In acute stage

5. Eosinophiles.

No difference was found between the two forms, colitic and foudroyant form. In both forms, eosinophiles disappeared in most cases in the acute stage, and later it appeared again, then rising in percentage with the recovery of illness (Cf. Table 9).

TABLE 9.
Absolute count of eosinophiles.

Absolute count of eosinophiles		Form of illness								
		Colitic form			Foudroyant form			Both forms combined		
		Stage of illness†								
I	II	III	I	II	III	I	II	III		
Strongly increased	Above 501	0*	2	0	0	0	1	0	2	1
Increased	500~251	0	4	2	0	1	0	0	5	2
Unchanged‡	250~150	1	3	1	1	1	0	2	4	1
Decreased	149~1	2	5	1	1	2	0	3	7	1
Disappeared	0	14	6	0	9	1	0	23	7	0
Σ		17	20	4	11	5	1	28	25	5

* Cf. Foot note to Table 2.

† " "

‡ " "

Many authors are of the same opinion as ours. But some investigators maintain that eosinophiles increase early from the beginning of illness (Cf. Table 10).

TABLE 10.
Opinions of different authors concerning eosinophile count.

Count Authors	Disappeared?	Decreased?	Increased?	Remarks
V. Schilling ⁵⁾	Yes			
A. Piney ⁶⁾	No		Yes	
Lampe ⁸⁾	Yes, in serious and extraordinarily serious cases		Yes, in convalescence	
G. Ewald ⁹⁾			Yes, slightly, often remarkable	In uncomplicated cases
	Yes, completely			In complicated cases
E. Marcovici ¹⁰⁾	No		Yes	In acute stage
	No		Yes	In convalescent
T. Sasaki ¹¹⁾	Yes, in acme	Appeared with recovery of illness		
M. Tsuchibashi ¹²⁾	Yes, at the beginning of illness			
Isizaka, Yanagawa and Takahasi	Yes, in mostly		No	In acute stage
	No		Yes, mostly	In protracted and convalescent stage

6. Monocytes.

In both forms monocytes increased in the comparatively early stage of illness, later coming back slowly to the normal value (Cf. Table 11).

TABLE 11.
Absolute count of monocytes.

Absolute count of monocytes	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
Strongly increased (above 1,000)	8*	6	0	3	3	0	11	9	0
Increased	8	7	2	6	2	1	14	9	3
Unchanged‡	1	4	1	1	0	0	2	4	1
Decreased	0	3	1	1	0	0	1	3	1
Σ	17	20	4	11	5	1	28	25	5

* Cf. Foot note to Table 2.

† " " "

‡ " " "

Within our knowledge no different opinion has been published concerning this question (Cf. Table 12).

TABLE 12.
Opinions of different authors concerning monocyte count.

Author \ Count	Increased ?	Unchanged ?	Decreased ?	Remarks
Lampe ⁸⁾	2-3% on the average			In slight cases
		Normal		In serious cases
E. Marcovici ¹⁰⁾	Yes			Postinfections increase
T. Sasaki ¹¹⁾	Yes, slightly			In the stage transient to convalescence
M. Tsuchibashi ¹²⁾	Yes, in acme			
Isizaka, Yanagawa and Takahasi	Yes			In comparatively early stage

7. Basophiles.

As to basophiles there are but few investigations. Sasaki¹¹⁾ said that it changed almost parallel to the change of eosinophiles; we are of the same opinion (Cf. Table 13).

TABLE 13.
Absolute count of basophiles.

Absolute count of basophiles	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
Increased (above 60)	0*	1	2	0	0	1	1	1	3
Appeared	2	7	2	1	0	0	3	7	2
Disappeared	15	12	0	9	5	0	24	17	0
Σ	17	20	4	11	5	1	28	25	5

* Cf. Foot note to Table 2.

† " " "

8. Plasma cells.

We can not say anything definite about this kind of cells, because we had but few cases in which plasma cells were seen. It seems that plasma cells increased in the convalescent stage.

The opinions of different authors are tabulated in Table 14 (Cf. Table 14).

TABLE 14.
Opinions of different authors concerning plasma cells.

Author	Count	Appeared ?	Disappeared ?	Remarks
A. Piney ⁶⁾		Yes, commonly		In acute stage
E. Marcovici ¹⁰⁾		Yes, slightly		In acute stage
T. Sasaki ¹¹⁾		Increased in antifebrile stage		
M. Tsuchibashi ¹²⁾		Yes		In convalescent stage
Isizaka, Yanagawa and Takahasi				We can not say anything definite

9. Red cells and hemoglobin.

At the beginning of illness red cell count often increased in both forms; Sasaki¹¹⁾ attributed it to exsiccosis of the body. In the cases of colitic form red cell count often decreased in the stage after acme. Hemoglobin value in both forms changed almost parallel to the red cell count (Cf. Table 15).

TABLE 15.
Red cell count.

Red cell count	Form of illness								
	Colitic form			Foudroyant form			Both forms combined		
	Stage of illness†								
	I	II	III	I	II	III	I	II	III
Above 551	4*	2	0	2	2	0	6	4	0
550~501	6	8	2	3	2	1	9	10	3
500~451	5	4	0	2	0	0	7	4	0
Below~450	1	5	3	1‡	0	0	2	5	3
Σ	16	19	5	8	4	1	24	23	6

* Cf. Foot note to Table 2.

†

‡ Blood examination after intestinal bleeding.

10. Blood sedimentation rate.

From our results (Cf. Table 16), we can find a fall of the sedimentation rate of red cells usually from the beginning of illness on. According to the opinion of Kano and Shingu¹³⁾ the maximum value of the fall of the sedimentation rate corresponds to the 3rd~4th day of illness. Our opinion agrees practically with theirs.

TABLE 16.
Blood sedimentation (Yoshida's¹⁴⁾ micromethod).

Sedimentation of red cells†		Form of illness					
		Colitic form			Foudroyant form		
		Stage of illness†					
I	II	III	I	II	III		
Most intensely accerelated	above 26 (m.m. in 1 hour)	0*	0	0	1	0	0
Intensely accerelated	25 ~ 21	2	2	0	3	1	0
Moderately accerelated	20 ~ 14	6	6	2	2	0	1
Slightly accerelated	13 ~ 00	6	4	2	4	2	0
Normal	Normal value for each age	0	5	0	0	2	0
Protracted	Below the normal value	3	1	0	1	0	0
Σ		17	18	4	11	5	1

* Cf. Foot note to Table 2.

† " " "

‡ Sedimentation value is classified according to Suzuki's¹³⁾ opinion.

As to the type of blood sedimentation no written reports have been issued so far as we know. We found that it shifted to the left more strongly in the foudroyant form than in the colitic form, especially in the acute stage (Cf. Table 17).

TABLE 17.
Type of blood sedimentation.

Type of sedimentation		Form of illness								
		Colitic form			Foudroyant form			Both forms combined		
		Stage of illness†								
		I	II	III	I	II	III	I	II	III
Shifted to the left ↑	I	0*	4	0	4	1	0	4	5	0
	I—II	1	0	0	0	0	0	1	0	0
	II	5	2	3	4	0	0	9	2	3
	II—III	0	0	0	0	0	0	0	0	0
	III	4	8	1	1	1	1	5	9	2
	III—IV	2	0	0	0	0	0	2	0	0
	IV	3	3	0	0	2	0	3	5	0
Σ		15	17	4	9	4	1	24	21	5

* Cf. Foot note to Table 2.

† " " "

13) M. Kano and R. Shingu, Nippon Densenbyogakkai Zassi, 1936, 10, 670. .

14) T. Suzuki, Rinsho no Nippon, 1937, 5, 972.

TABLE 18.
Summarizing table of blood change.

Stage of illness*		I	II	III	
Red cell count		± or +	+ or -	± or -	←
		± or +	+	±	←
Total leucocyte count		+ or -	+ or -	+ or -	←
Absolute count of	Basophiles	- -	+	±	←
	Eosinophiles	-	++	+ or ±	←
	Neutrophiles	## or -	++ or -	± or -	←
		##	++	±	←
	Monocytes	##	++	±	←
	Lymphocytes	- or +	± or +	+ or ±	←
Nuclear shift to the left		##	++	+	←
		## or +	++ or +	±	←
Nuclear picture of neutrophiles†	C O	-	-	±	←
		++	++	+ or ±	←
		-	++	+ or ±	←
Hemosedimentation rate		- or ++	++	+ or ±	←
Sedimentation of red cells shifted to the left		++ or ±	+ or ±	±	←
		##	± or ++	±	←

Colitic form

Foudroyant form

Colitic form

Foudroyant form

* Cf. Foot note to Table 2.

† Cf. K. Isizaka, S. Yanagawa and K. Takahasi (57th Hematological Paper), will be published in near future.

Summary and Conclusion.

1. The change of blood picture according to the course of bacillary dysentery, which was described in "Result with Comment" is briefly shown in Table 18 (Cf. Table 18).

2. Various differences were found between the two forms of illness, the foudroyant form and the colitic (Cf. Table 18).