Further Report on the Blood Platelet Count of Mothers with Different Arakawa's Reaction

126th Report of the Peroxidase Reaction.

By

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Introduction.

Healthy mothers secreting milk negative* to Arakawa's reaction are, according to a number of papers published from this Laboratory, more or less in a state of Avitaminosis B** generally. Now it is well known that the blood platelet count increases remarkably in patients suffering from B-avitaminosis or beriberi. J. Kimura¹⁾²⁾³⁾ examined the blood platelet count of lactating mothers with different Arakawa's reaction and he found that the blood platelet count was high in apparently healthy mothers secreting Arakawa-negative milk, so that these mothers were, he concluded, highly probably B-avitaminotic already.

I have also studied the relationship between the blood platelet count and Arakawa's reaction in lactating mothers and been able to confirm his results.

* "Arakawa-positive" may be used in two different senses. One of these is Arakawa-positive in biochemical sense. A sample of human milk is said to have become Arakawa-positive, when it became blue on the addition of Arakawa's reagent. Here it means that the sample was not negative to Arakawa's reaction. The other of these two senses is: Arakawa-positive in a clinical sense. A sample of human milk is clinically Arakawa-positive only when it shows such a reaction as ++ or +++ in one minute of the addition of Arakawa's reagent. Another sample of human milk may be Arakawa-positive in the first described sense, but yet clinically negative.

** B mean B₁ throughout the article.

- 1) J. Kimura, Tohoku J. Exp. Med., 1934, 23, 494.
- 2) J. Kimura, Tohoku J. Exp. Med., 1935, 27, 360.
- 3) J. Kimura, Tohoku J. Exp. Med., 1935, 27, 374.

Method of Investigation.

1. Materials. Blood was taken from healthy lactating mothers of the breast-fed patients who visited our Dispensary.
2. Arakawa's reaction.
 - a. Milk was examined with Arakawa's reagent in each case.
 - b. I divided mother cases into 7 groups according to the intensity of Arakawa's reaction (Cf. Table 1).

TABLE 1.

*Grouping of cases according to the intensity of
Arakawa's reaction of human milk.*

Group	Intensity of Arakawa's reaction of human milk		
	Arakawa-positive or -negative in clinical sense	Expressed in signs	
		one side	the other side
I	Arakawa-positive case (normal case)	(#) 1' (+) 1'	$\left\{ \begin{array}{l} (++) 1' \\ (++) 1' \\ (++) 1' \end{array} \right.$
II	Arakawa-negative (or weakly-positive) case	(#) 1' (+) 1'	$\left\{ \begin{array}{l} (\pm) 1' \\ (-) 1' \\ (+) 1' \\ (\pm) 1' \end{array} \right.$
III	Arakawa-negative case	(+) 1' (+) 1'	$\left\{ \begin{array}{l} (-) 1' \\ (\pm) 1' \end{array} \right.$
IV	"	(+) 1' (\pm) 1'	$\left\{ \begin{array}{l} (-) 1' \\ (\pm) 1' \end{array} \right.$
V	"	(\pm) 1' (-) 1'	$\left\{ \begin{array}{l} (-) 1' \\ (-) 1' \end{array} \right. \begin{array}{l} (+) 3' \\ (+) 5' \end{array}$
VI	Almost completely Arakawa-negative case	(-) 5'	(\pm) 5'
VII	Completely Arakawa-negative case	(-) 5'	(-) 5'

Only Group I should be considered as normal in a clinical sense, and the others (Groups II, III, IV, V, VI and VII) are all of weak or negative Arakawa's reaction, though there are different classes among these negative groups.

c. The description of different Arakawa's reaction was simplified (Cf. Table 2).

3. Platelet count. I used Lampert's⁴⁾ method. The ear lobe was cleaned with ether, and a cut was made with Francke's needle. Blood was taken into the "A-thrombit" and diluted with Tyrodé's solution. After shaking the pipette for a few minutes, the sixth drop of the contents was examined for blood platelets, waiting over five minutes after counting chamber was filled.

4) H. Lampert, Verh. Dtsch. Ges. inn. Med., 1931, 43, 92.

TABLE 2.

Table of signs for showing different Arakawa's reaction.

		1'	2'	3'	4'	5'			1'	2'	3'	4'	5'
1.	1 (##) stands for	##	##	##	##	##	25.	8 (±) stands for	±	±	±	±	##
2.	1 (++)	"	++	##	##	##	26.	9 (±)	"	±	±	±	##
3.	2 (++)	"	++	++	##	##	27.	10 (±)	"	±	±	±	++
4.	3 (++)	"	++	++	++	##	28.	11 (±)	"	±	±	±	++
5.	4 (++)	"	++	++	++	##	29.	12 (±)	"	±	±	±	++
6.	5 (++)	"	++	++	++	++	30.	13 (±)	"	±	±	±	++
7.	1 (+)	"	+	++	##	##	31.	14 (±)	"	±	±	±	±
8.	2 (+)	"	+	++	++	##	32.	15 (±)	"	±	±	±	±
9.	3 (+)	"	+	++	++	##	33.	1 (-)	"	-	±	±	##
10.	4 (+)	"	+	++	++	++	34.	2 (-)	"	-	±	±	##
11.	5 (+)	"	+	++	++	##	35.	3 (-)	"	-	±	±	++
12.	6 (+)	"	+	++	++	##	36.	4 (-)	"	-	±	±	++
13.	7 (+)	"	+	++	++	++	37.	5 (-)	"	-	±	±	++
14.	8 (+)	"	+	++	++	##	38.	6 (-)	"	-	±	±	++
15.	9 (+)	"	+	++	++	++	39.	7 (-)	"	-	±	±	++
16.	10 (+)	"	+	++	++	++	40.	8 (-)	"	-	±	±	±
17.	11 (+)	"	+	++	++	++	41.	9 (-)	"	-	±	±	++
18.	1 (±)	"	±	+	++	##	42.	10 (-)	"	-	-	±	++
19.	2 (±)	"	±	+	++	##	43.	11 (-)	"	-	-	±	++
20.	3 (±)	"	±	+	++	++	44.	12 (-)	"	-	-	±	±
21.	4 (±)	"	±	+	++	##	45.	13 (-)	"	-	-	-	±
22.	5 (±)	"	±	+	++	++	46.	14 (-)	"	-	-	-	±
23.	6 (±)	"	±	+	++	++	47.	15 (-)	"	-	-	-	±
24.	7 (±)	"	±	+	++	++	48.	16 (-)	"	-	-	-	-

Explanation to the table:—

Take, for instance, the sign: 2 (++). This stands for Arakawa's reaction with the course (++) 1' (++) 2' (##) 3' (##) 4' (##) 5'. The sign does not express any prompt result of the reaction, so the prompt reaction of the sign: 2 (++) may be (-) 0', (±) 0', (+) 0' or even (++) 0', but this will not matter much, as the result of the reaction in one minute is the most important.

I examined the platelet count of 30 healthy unmarried women. Blood was taken about 11 o'clock a.m. They were as will be seen from Table 3, of an averaged count of 314 thousands (Cf. Table 3). This count is far smaller than the count which was shown to be the normal by Lampert himself. Behr⁵⁾ and Baedorf⁶⁾ compared the platelet count between the method by Fonio⁷⁾ and that by Lampert, and published the result that Lampert's method gives a slightly larger count than Fonio's method. Neither of these authors obtained so large figures as Lampert showed to be the normal. Behr showed the average platelet count to be 210 thousands by Lampert's method and 167.8 thousands by Fonio's method in 10 healthy persons. Baedorf showed in 10 healthy persons 172 thousands by Lampert's method and 157.2 by Fonio's

5) C. H. Behr, Klin. Wschr., 1933, 12, 1771.

6) K. Baedorf, Dtsch. med. Wschr., 1933, 59, 1643.

7) A. Fonio, Dtsch. Zschr. Chir., 1912, 177, 176.

TABLE 3.
Blood platelet count in 30 healthy women.

Case No.	Name	Date of experiment	Age (years)	Blood platelet count (thousands) per cmm.	Case No.	Name	Date of experiment	Age (years)	Blood platelet count (thousands) per cmm.
1	T.I.	1. II	28	400	16	T.A.	8. II	26	260
2	C.T.	1. "	30	340	17	H.I.	8. "	33	220
3	Y.T.	2. "	23	220	18	Y.O.	9. "	31	310
4	J.N.	2. "	24	270	19	S.S.	10. "	32	250
5	T.H.	3. "	19	240	20	Y.T.	10. "	28	380
6	T.Y.	3. "	20	360	21	A.A.	12. "	19	260
7	T.M.	3. "	31	390	22	T.F.	12. "	23	280
8	M.K.	4. "	20	500	23	M.N.	14. "	24	290
9	K.S.	4. "	29	390	24	M.K.	26. "	23	380
10	H.S.	5. "	34	270	25	Y.H.	2. III	26	310
11	K.I.	5. "	24	360	26	M.Y.	4. "	20	200
12	H.O.	5. "	20	300	27	F.K.	4. "	19	240
13	S.T.	7. "	20	500	28	S.I.	5. "	21	310
14	F.K.	7. "	19	280	29	F.H.	5. "	39	190
15	T.M.	7. "	32	350	30	M.S.	7. "	28	370
									Maximum 500
									Minimum 190
									Average 314

to be the average count. And Baedorf recommends the use of Lampert's thrombocyte counting method for its simplicity's sake. Fonio showed the average count as 234 thousands and Suzuki⁸⁾ of our Laboratory showed 200-300 thousands by Fonio's method to be the normal count. My results by Lampert's method was 314 thousands, which was reasonable if Fonio and Suzuki's counts are taken into consideration. At any rate, I always tried to use the same technique in all the cases examined, so that the counts might well be compared with each other in the present paper.

I classified all my cases into 4 groups according to their platelet count: the group with "no increase" (or with the platelet count of 200-400 thousands), the group with "slight increase" (or with the platelet count of 400-500 thousands), the group with "moderate increase" (or with the platelet count of 500-600 thousands) and the group with "intense increase" (or with the platelet count of over 600 thousands).

Results of Investigation.

As will be seen from Tables 4, 5, 6, 7, 8, 9 and 10, the total cases I examined were 266 lactating mothers. The range between the smallest and the largest count is very wide, from 210 thousand platelets to 760 thousands.

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

1. Group I: There were 27 cases belonging to Group I, namely, the group of mothers strongly or normally positive to Arakawa's reaction, and 23 cases (85%) out of them showed a normal blood platelet count i.e. 200-400 thousands. In only 4 cases (15%) the blood platelet count was between 400 thousands and 500 thousands, showing a slight increase. The average count of blood platelets in Group I was 340 thousands (Cf. Table 4).

TABLE 4.
Blood platelet count of mothers belonging to Group I.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	Y.H.	July	30	8	210	1(++)	1(++)	No increase (23 cases) 85%
2	M.S.	Oct.	28	11	220	1(++)	1(++)	
3	K.I.	Nov.	24	2	240	1(++)	1(++)	
4	U.I.	Sep.	23	1	260	1(++)	1(++)	
5	N.M.	July	24	4	280	1(++)	1(++)	
6	K.Y.	Aug.	22	14	290	1(++)	1(++)	
7	R.O.	March	21	6	290	1(++)	1(++)	
8	M.I.	May	25	5	300	1(++)	1(++)	
9	U.S.	July	36	2	300	1(++)	1(++)	
10	H.S.	Feb.	35	11	300	1(++)	1(++)	
11	K.S.	March	28	12	310	1(++)	1(++)	
12	S.K.	June	26	5	320	1(++)	1(++)	
13	K.O.	March	24	14	330	1(++)	1(++)	
14	M.W.	July	25	3	350	1(++)	1(++)	
15	M.I.	Sep.	36	3	350		1(++)	
16	T.H.	June	29	4	360	1(++)	1(++)	
17	Y.Y.	"	25	4	360	1(++)	1(++)	
18	I.S.	Dec.	44	6	380	1(++)	1(++)	
19	E.O.	"	26	11	380	2(++)	1(++)	
20	S.Y.	Jan.	32	12	390	1(++)	1(++)	
21	K.I.	"	26	6	400	1(++)	1(++)	
22	T.H.	"	45	11	400	1(++)	1(++)	
23	E.H.	April	22	8	400	1(++)	1(++)	
24	Y.T.	Nov.	26	9	420	1(++)	1(++)	Slight increase (4 cases) 15%
25	M.A.	"	44	5	440	1(++)	1(++)	
26	S.I.	Oct.	28	10	450	3(++)	1(++)	
27	C.I.	Nov.	32	3	460	1(++)	1(++)	
					Minimum	210		
					Maximum	460		
					Average	340		

2. Group II: There were 13 cases belonging to Group II, and 7 cases (54%) out of them showed a normal count, and in 5 cases (38%) a slight increase was seen. There was only one case with a moderate increase. The blood platelet count in Group II was averaged 385 thousands (Cf. Table 5).

TABLE 5.

Blood platelet count of mothers belonging to Group II.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per emm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	S. K.	June	36	1	290	1(++)	1(±)	} No increase (7 cases) 54%
2	T. K.	Dec.	29	2	310	1(++)	1(+)	
3	Y. I.	Feb.	25	7	320	2(++)	5(+)	
4	C. K.	March	23	5	350	1(++)	5(+)	
5	K. S.	June	28	4	350	3(+)	1(++)	
6	M. S.	May	24	4	350	1(++)	13(±)	
7	I. S.	Jan.	44	6	400	1(+)	1(±)	
8	M. S.	July	23	5	410	1(++)	1(±)	} Slight increase (5 cases) 38%
9	T. S.	March	34	4	410	1(++)	13(±)	
10	S. H.	May	26	4	420	1(++)	1(±)	
11	R. S.	Sep.	24	5	430	1(±)	6(-)	
12	M. Y.	July	28	5	460	1(+)	1(++)	
13	M. I.	March	23	1	560	1(+)	2(++)	→ Moderate increase (1 case) 8%
					Minimum	290		
					Maximum	560		
					Average	385		

3. Group III: There were 33 cases belonging to Group III. Only 13 cases (40%) out of them showed a normal platelet count, and in the other 20 cases (60%) the count was increased. This relation was different from that seen in the former two groups in that the majority showed no increase. 8 cases (24%) showed a slight increase, and 10 cases (30%) a moderate increase. The remaining 2 cases (6%) showed a rather intense increase. The average count in Group III was 447 thousands (Cf. Table 6).

4. Group IV: There were 33 cases belonging to Group IV. In 11 cases (33%) the blood platelet count was normal and in the other 22 cases (67%) an increase was seen. Namely, 11 cases (33%) of them showed a slight increase of the count, 6 cases (19%) a moderate increase and the remaining 5 cases (15%) an intense increase of the count. The average platelet count was 470 thousands (Cf. Table 7).

5. Group V: There were 74 cases belonging to Group V. In only 16 cases (22%) out of them the blood platelet count was normal and in the other 58 cases (78%) an increase was seen. Namely, 25 cases (34%) of them showed a slight increase of the count, 24 cases (32%) a moderate increase and the remaining 9 cases (12%) an intense increase. Cases with the platelet count over 510 thousands was 44% in this group. The average platelet count was 490 thousands (Cf. Table 8).

TABLE 6.
Blood platelet count of mothers belonging to Group III.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per emm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	T.Y.	Feb.	39	3	280	1(+)	1(±)	No increase (13 cases) 40%
2	K.S.	May	34	2	300	1(+)	5(±)	
3	Y.S.	March	23	6	330	4(+)	1(+)	
4	M.K.	April	25	2	330	1(+)	1(±)	
5	A.I.	June	30	9	330	13(±)	2(+)	
6	K.H.	March	40	2	330	3(-)	2(++)	
7	S.M.	Feb.	26	8	330	1(++)	14(-)	
8	T.M.	Jan.	40	13	330	16(-)	1(++)	
9	T.S.	May	25	4	340	2(+)	2(±)	
10	T.T.	"	25	12	340	2(+)	4(±)	
11	M.H.	July	21	9	350	1(±)	1(+)	Slight increase (8 cases) 24%
12	I. I.	Feb.	25	15	370		2(++)	
13	K.Y.	Aug.	22	14	380	1(+)	6(±)	
14	K.O.	Dec.	28	11	430	1(+)	1(+)	
15	N.M.	March	26	15	430	1(+)	1(+)	
16	H.K.	"	35	9	430	7(+)	7(+)	
17	U.E.	"	37	3	430	1(±)	1(+)	
18	Y.T.	May	30	2	430	5(±)	1(+)	
19	K.I.	June	27	16	440	1(±)	1(+)	
20	K.C.	Dec.	26	3	470	5(++)	4(-)	
21	T.C.	"	23	6	500	11(±)	7(+)	
22	C.T.	Sep.	32	2	510	4(+)	4(+)	
23	K.H.	"	29	5	520	14(±)	9(+)	
24	M.K.	Nov.	25	10	520	7(+)		
25	T.E.	Sep.	25	15	540	13(±)	4(+)	
26	M.H.	"	32	12	570	11(+)	7(+)	
27	T.F.	"	28	12	570	4(+)	4(+)	
28	T.T.	Oct.	33	13	570	6(+)	13(±)	
29	H.K.	Aug.	28	9	590	7(±)	1(+)	Intense increase (2 cases) 6%
30	T.N.	Feb.	25	10	590	5(+)	14(±)	
31	K.S.	Aug.	30	13	600	4(+)	1(+)	
32	T.M.	April	31	7	630	7(+)	10(±)	
33	S.S.	March	29	11	650	1(+)	4(±)	
					Minimum 280			
					Maximum 650			
					Average 447			

6. Group VI: There were 45 cases belonging to Group VI. In 8 cases (18%) out of them the blood platelet count was normal and in the other 37 cases (82%) an increase was seen. 16 cases (36%) of them showed a slight increase, 15 cases (33%) a moderate increase and the remaining 6 cases (13%) an intense increase of the count. The average platelet count was 470 thousands (Cf. Table 9).

7. Group VII: There were 41 cases belonging to Group VII. Only 6 cases (15%) out of them showed a normal platelet count, and in the other 35 cases (85%) the count was increased. The reverse is the relation between cases with and without an increase of the platelet

TABLE 7.

Blood platelet count of mothers belonging to Group IV.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	T.T.	July	25	5	290	2(±)	2(±)	No increase (11 cases) 33%
2	A.R.	Nov.	29	4	320	1(±)	1(±)	
3	M.O.	"	32	5	350	1(±)	1(±)	
4	H.K.	July	29	10	350	1(±)	1(±)	
5	T.I.	Feb.	29	11	350	9(-)	1(+)	
6	T.S.	March	27	3	390	2(-)	1(+)	
7	Y.A.	June	24	14	390	6(-)	1(+)	
8	T.K.	Dec.	28	5	390	14(±)	14(±)	
9	E.T.	Jan.	23	9	400	6(±)	1(+)	
10	A.K.	March	29	11	400	6(±)	6(±)	
11	T.S.	Feb.	33	4	400	9(+)	7(-)	Slight increase (11 cases) 33%
12	K.O.	March	30	6	410	6(±)	6(±)	
13	M.T.	July	24	4	410	1(+)	2(-)	
14	T.K.	Feb.	33	4	420	9(+)	7(-)	
15	M.K.	March	26	12	430	5(±)	6(±)	
16	Y.K.	May	31	5	440	4(±)	15(±)	
17	S.W.	March	26	8	460	1(±)	1(±)	
18	Y.M.	Aug.	27	13	460	16(-)	2(++)	
19	U.N.	May	23	6	470	5(±)	10(±)	
20	Y.J.	March	31	6	480	7(±)	7(±)	
21	S.S.	June	35	12	490	10(±)	1(+)	Moderate increase (6 cases) 19%
22	M.S.	Dec.	24	1.5	500	1(+)	1(±)	
23	T.K.	June	31	4	510	15(±)	7(±)	
24	T.Y.	March	33	3	510	9(+)	15(-)	
25	M.Y.	Sep.	30	1.5	520	15(+)	5(±)	
26	M.T.	July	26	9	540	7(±)	7(±)	
27	H.K.	Sep.	27	12	580	1(±)	9(±)	
28	M.H.	"	30	3	600	11(+)	7(±)	
29	Y.O.	Oct.	33	14	610	12(-)	1(+)	Intense increase (5 cases) 15%
30	M.A.	June	33	4	620	5(±)	6(±)	
31	T.M.	Nov.	25	4	630	3(±)	3(±)	
32	T.Y.	"	24	6	630		3(±)	
33	Y.Y.	Sep.	33	1	770	13(±)	13(±)	
					Minimum	290		
					Maximum	770		
					Average	470		

count in Group I and in this group. 15 cases (37%) of them showed a slight increase, 12 cases (29%) a moderate increase and the remaining 8 cases (19%) an intense increase of the count. The average count in Group VII was 516 thousands (Cf. Table 10).

Comment.

None of the lactating mothers examined in my experiment was suffering from beriberi, but there were many mothers who showed an increase of the platelet count—a symptom of B-avitaminosis. And

TABLE 8.

Blood platelet count of mothers belonging to Group V.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	S.H.	April	28	8	250	3(±)	14(-)	No increase (16 cases) 22%
2	T.S.	July	24	1.5	260	1(±)	7(-)	
3	K.M.	Feb.	35	15	260	6(-)	6(-)	
4	H.K.	Jan.	38	10	300	3(-)	10(-)	
5	A.Y.	May	28	7	310	10(±)	14(-)	
6	T.S.	Dec.	40	15	320	8(-)	2(±)	
7	H.I.	March	24	5	350	3(-)	1(±)	
8	H.A.	Nov.	32	9	350	14(±)	16(-)	
9	H.F.	March	27	9	360	1(-)	1(-)	
10	J.E.	July	36	16	360	5(±)	16(-)	
11	T.E.	June	28	16	380	6(-)	16(-)	
12	Y.U.	Feb.	39	10	390	6(-)	6(-)	
13	C.M.	Dec.	29	4	390	14(-)	10(-)	
14	S.H.	"	35	1.5	390	8(±)	15(-)	
15	S.C.	July	34	2	400	7(-)	1(±)	
16	M.S.	Feb.	29	1.5	400	11(-)	16(-)	
17	M.K.	June	27	14	410	2(-)	7(-)	Slight increase (25 cases) 34%
18	R.K.	Nov.	27	7	410	12(-)	11(±)	
19	Y.I.	Feb.	25	7	410	15(-)	11(-)	
20	K.I.	July	27	9	420	11(-)	4(-)	
21	M.A.	March	33	1	420	15(-)	11(-)	
22	Y.N.	Jan.	28	15	440	9(±)	2(-)	
23	H.S.	March	24	2	440	6(-)	6(-)	
24	H.N.	Jan.	26	4	450	1(±)	16(-)	
25	R.Y.	April	22	7	450	6(-)	6(-)	
26	M.T.	July	30	2	450	12(-)	11(±)	
27	M.S.	Jan.	30	11	450	7(±)	16(-)	
28	H.E.	"	26	4	450	1(±)	16(-)	
29	N.B.	July	40	14	460	14(-)	4(-)	
30	Y.S.	Jan.	24	7	470	1(±)	3(-)	
31	F.G.	Aug.	22	6	470	10(-)	11(-)	
32	K.K.	Dec.	29	9	470	7(-)	16(-)	
33	K.S.	Sep.	35	2	480	13(-)	5(±)	
34	H.U.	Feb.	30	10	480	4(-)	10(-)	
35	K.S.	July	26	2	480	11(-)	16(-)	
36	H.O.	Jan.	21	1.5	480	13(-)	15(-)	
37	R.T.	March	24	15	490	6(±)	6(-)	
38	S.N.	"	26	4	490	7(-)	7(-)	
39	J.S.	Dec.	29	14	490	12(-)	11(-)	
40	T.I.	May	25	1.5	490	16(-)	6(-)	
41	A.H.	Feb.	24	3	490	16(-)	11(-)	
42	Y.T.	March	39	6	510	6(±)	4(-)	
43	M.M.	Dec.	25	4	510	4(-)	15(-)	
44	S.U.	Jan.	25	9	510	14(-)	11(-)	
45	H.T.	Feb.	34	5	510	13(-)	14(-)	
46	Y.M.	March	26	11	520	14(-)	6(-)	
47	K.M.	Dec.	33	4	520	5(±)	16(-)	
48	T.K.	"	23	6	530	10(±)	12(-)	
49	F.S.	March	37	2	530	14(±)	15(-)	
50	K.S.	July	35	16	530	16(-)	6(-)	
51	J.O.	March	24	1	540	12(-)	11(±)	
52	J.T.	Sep.	27	4	540	4(-)	4(-)	

Table 8. Continued.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
53	N.S.	March	27	11	540	3(-)	16(-)	Moderate increase (24 cases) 32%
54	T.M.	Feb.	28	3	540	14(-)	13(-)	
55	T.S.	April	28	2	550	10(±)	12(-)	
56	F.O.	Dec.	21	3	550	1(-)	10(-)	
57	K.Y.	Jan.	34	7	550	7(-)	12(±)	
58	A.K.	"	36	2	550	3(±)	16(-)	
59	M.A.	June	33	4	560	12(-)	10(±)	
60	I. I.	Jan.	25	4	560	10(±)	16(-)	
61	K.I.	Feb.	32	5	560	11(-)	12(-)	
62	R.F.	Oct.	35	14	570	4(-)	11(±)	
63	T.N.	March	30	0.5	570	11(-)	16(-)	
64	C.T.	"	34	8	590	6(-)	14(-)	
65	E.K.	Sep.	35	1.5	590	15(±)	8(-)	Intense increase (9 cases) 12%
66	S.F.	Jan.	34	4	650	8(-)	5(±)	
67	T.S.	Oct.	32	15	680	11(-)	8(-)	
68	T.M.	Feb.	34	3	680	13(-)	13(-)	
69	K.M.	July	22	6	680	16(-)	7(-)	
70	Y.O.	March	29	10	690	3(-)	7(-)	
71	S.S.	Feb.	26	2	710	15(±)	8(-)	
72	A.M.	Oct.	26	4	720	11(±)	8(-)	
73	N.I.	"	29	10	860	16(-)	11(-)	
74	T.S.	March	31	2	950	6(-)	6(-)	
					Minimum	250		
					Maximum	950		
					Average	494		

generally the count ran parallel to the intensity of Arakawa's reaction, or the average count was 340 thousands in Group I, 385 thousands in Group II, 447 thousands in Group III, 470 thousands in Group IV, 490 thousands in Group V, 494 thousands in Group VI and 516 thousands in Group VII. Mothers with an increase of the platelet count were 15% in Group I, 46% in Group II, 60% in Group III, 67% in Group IV, 78% in Group V, 82% in Group VI and 85% in Group VII (Cf. Tables 4-10).

Table 11 shows a simplification of the results described above, and the parallelism between the intensity of Arakawa's reaction and the blood platelet count—stronger reaction and lower count, and weaker reaction and higher count will be seen at a glance. The ratio of the blood platelet count in the groups of mothers with normal, intermediate and negative Arakawa's reaction was 7 : 9 : 10 (Cf. Table 11).

From my results (Cf. Table 11) will be seen again that the difference of the platelet count is smaller between the groups of intermediate Arakawa's reaction and the group of the negative, than between

TABLE 9.

Blood platelet count of mothers belonging to Group. VI.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	T.O.	Feb.	38	3	260	14(-)	14(-)	No increase (8 cases) 18%
2	T.H.	Nov.	25	3	280	16(-)	14(-)	
3	T.H.	"	30	8	290	14(-)	14(-)	
4	K.O.	April	33	6	330	12(-)	12(-)	
5	Y.K.	March	23	3	340	16(-)	15(-)	
6	T.N.	May	30	16	350	16(-)	12(-)	
7	F.K.	"	24	12	380	15(-)	15(-)	
8	T.T.	Jan.	26	4	390	15(-)	15(-)	
9	K.O.	May	22	5	410	15(-)	15(-)	Slight increase (16 cases) 36%
10	M.T.	July	30	3	420	12(-)	12(-)	
11	Y.M.	Nov.	28	10	420	12(-)	16(-)	
12	K.C.	Jan.	24	4	420	15(-)	15(-)	
13	Y.N.	"	23	13	430	14(-)	16(-)	
14	C.M.	"	25	14	440	16(-)	15(-)	
15	F.S.	March	23	14	450	15(-)	15(-)	
16	C.O.	Feb.	23	4	450	15(-)	16(-)	
17	T.O.	March	30	12	460	12(-)	12(-)	
18	M.O.	Feb.	39	12	460	16(-)	15(-)	
19	Y.T.	April	29	15	480	12(-)	16(-)	
20	I.K.	March	23	1	490	14(-)	15(-)	
21	H.Y.	May	28	1.5	490	14(-)	16(-)	Moderate increase (15 cases) 33%
22	T.S.	June	33	1.5	490	15(-)	16(-)	
23	S.S.	March	28	1.5	490	16(-)	8(-)	
24	T.A.	April	28	1	490	14(-)	16(-)	
25	I.K.	Jan.	26	5	510	8(-)	8(-)	
26	K.O.	Aug.	25	1	510	15(-)	15(-)	
27	T.N.	March	23	2	520	8(-)	14(-)	
28	K.O.	April	30	6	530	12(-)	12(-)	
29	S.O.	Jan.	27	2	530	14(-)	16(-)	
30	S.O.	March	33	3	530	16(-)	15(-)	
31	S.I.	"	26	1.5	540	8(-)	16(-)	
32	T.K.	Jan.	25	5	540	15(-)	15(-)	
33	M.S.	March	36	1.5	540	15(-)	15(-)	Intense increase (6 cases) 13%
34	R.T.	Aug.	31	12	550	12(-)	12(-)	
35	A.O.	Nov.	21	1	550	16(-)	8(-)	
36	M.S.	"	40	2	550	14(-)	16(-)	
37	Y.A.	"	29	1	550	15(-)	16(-)	
38	T.O.	Aug.	24	1	570	12(-)	16(-)	
39	D.S.	March	34	1.5	580	16(-)	15(-)	
40	K.I.	Nov.	29	3	620	16(-)	14(-)	
41	Y.Y.	"	35	13	620	14(-)	16(-)	
42	K.M.	April	22	3	640	14(-)	14(-)	
43	T.S.	Oct.	27	10	670	14(-)	15(-)	
44	M.S.	Jan.	28	9	800	16(-)	8(-)	
45	N.S.	Feb.	25	1.5	890	14(-)	16(-)	

Minimum 260
Maximum 890
Average 494

the group of normal Arakawa's reaction and the groups of the intermediate.

TABLE 10.
Blood platelet count of mothers belonging to Group VII.

Case No.	Name	Month of experiment	Age of mother (years)	Age of infant (month)	Blood platelet count (thousands) per cmm.	Arakawa's reaction		Increase of blood platelets
						Right	Left	
1	Y.H.	Jan.	31	6	290	16(—)	16(—)	No increase (6 cases) 15%
2	M.S.	Dec.	26	9	310	16(—)	16(—)	
3	A.T.	June	26	3	350	16(—)	16(—)	
4	N.K.	Feb.	34	14	350	16(—)	16(—)	
5	H.K.	June	29	10	360	16(—)	16(—)	
6	K.O.	Feb.	27	13	400	16(—)	16(—)	
7	T.T.	March	27	4	440	16(—)	16(—)	Slight increase (15 cases) 37%
8	T.I.	Sep.	33	4	440	16(—)	16(—)	
9	T.E.	March	22	1.5	450	16(—)	16(—)	
10	S.I.	Feb.	23	4	450	16(—)	16(—)	
11	N.S.	June	31	1	460	16(—)	16(—)	
12	K.M.	Feb.	29	1	460	16(—)	16(—)	
13	K.S.	June	22	3	470	16(—)	16(—)	Moderate increase (12 cases) 29%
14	A.T.	"	30	5	470	16(—)	16(—)	
15	Y.A.	Nov.	38	7	470	16(—)	16(—)	
16	N.M.	Feb.	27	12	480	16(—)	16(—)	
17	K.K.	"	30	12	480	16(—)	16(—)	
18	A.I.	May	28	1.5	480	16(—)	16(—)	
19	T.B.	"	35	0.5	480	16(—)	16(—)	Intense increase (8 cases) 19%
20	T.H.	Dec.	24	11	490	16(—)	16(—)	
21	S.Y.	March	24	6	490	16(—)	16(—)	
22	M.H.	Feb.	30	11	510	16(—)	16(—)	
23	Y.A.	Jan.	28	5	520	16(—)	16(—)	
24	T.A.	Sep.	21	3	540	16(—)	16(—)	
25	Y.Y.	Jan.	24	1	540	16(—)	16(—)	Intense increase (8 cases) 19%
26	Y.W.	"	32	3	540	16(—)	16(—)	
27	A.O.	"	26	0.5	550	16(—)	16(—)	
28	Y.S.	March	27	3	560	16(—)	16(—)	
29	A.I.	April	35	9	560	16(—)	16(—)	
30	I. M.	Jan.	23	2	560	16(—)	16(—)	
31	T.N.	Feb.	25	10	570	16(—)	16(—)	Intense increase (8 cases) 19%
32	M.K.	Nov.	25	9	590	16(—)	16(—)	
33	K.S.	"	26	7	600	16(—)	16(—)	
34	H.K.	Jan.	29	2	610	16(—)	16(—)	
35	M.O.	Sep.	27	1	640	16(—)	16(—)	
36	M.K.	Jan.	40	1	660	16(—)	16(—)	
37	M.A.	"	27	2	670	16(—)	16(—)	Intense increase (8 cases) 19%
38	C.T.	Sep.	41	8	680	16(—)	16(—)	
39	S.S.	Nov.	38	15	680	16(—)	16(—)	
40	C.T.	April	25	4	740	16(—)	16(—)	
41	T.S.	Oct.	32	12	760	16(—)	16(—)	
					Minimum	290		
					Maximum	760		
					Average	516		

It is now an indubitable fact that mothers secreting milk negative to Arakawa's reaction are in a state of avitaminosis B. From the reports published by Ido,⁹⁾ Kubo,¹⁰⁾ Nakamura¹¹⁾ and Iijima,¹²⁾

9) Y. Ido, Fukuoka Ikwaigaku Zasshi, 1912, 6, 217.

10) T. Kubo, Tokyo Iji Shinshi, 1912, 1417.

11) M. Nakamura, Nippon Naikwagakkwai Zasshi, 1925, 13, 317.

12) R. Iijima, Rinsho Byorigaku-Ketsuekigakkwai Zasshi, 1935, 4, 531.

TABLE 11.
*Relation between Arakawa's reaction and blood
platelet count of lactating mothers.*

Platelets (thousands) Group	200—400 No increase	400—500 Slight increase	500—600 Moderate increase	600— Intense increase	Average count of blood pla- telet count (thousands) per cmm.
I 27 cases	84% (23 cases)	15% (4 cases)	0	0	340
II+III 46 cases	43 " (20 ")	28 " (13 ")	24% (11 cases)	5% (2 cases)	431
IV+V 107 cases	25 " (27 ")	34 " (36 ")	24 " (30 ")	13 " (14 ")	487
VI+VII 86 cases	16 " (14 ")	36 " (31 ")	32 " (27 ")	16 " (14 ")	504

an increase of the blood platelet count is a symptom of beriberi or B-avitaminosis. And J. Kimura^{1) 2) 3)} said that the high count of blood platelets in apparently healthy mothers with negative Arakawa's reaction was an early sign of B-avitaminosis. The fact mentioned above will also be seen from the present paper.

When one compares my own results with J. Kimura's (Cf. Table 12), one will find that the blood platelet count in lactating mothers with normal Arakawa's reaction is larger in the former than the lat-

TABLE 12.
*Comparison of average count of blood platelets between
J. Kimura's and own results.*

		Strongly Arakawa- positive cases	Cases with intermediate Arakawa's reaction	Completely (or almost completely) Arakawa-negative cases
J. Kimura	1st publication (100 cases)	256,000 (52 in all)		575,000 (48 in all)
	2nd publication (100 ")	267,000 (11 " ")	428,000 (44 in all)	586,000 (45 " ")
	3rd publication (125 ")	277,000 (4 " ")	430,000 (109 " ")	678,000 (12 " ")
	My own 266 cases	340,000 (27 " ")	467,000 (153 " ")	*504,000 (86 " ")

* Arakawa's reaction ($\pm$) 5' was included here as in the reports J. Kimura tried.

ter, but that the count in mothers with negative Arakawa's reaction is smaller in the former than in the latter (Cf. Table 12).

Using Lampert's thrombocyte counting method, I waited longer than five minutes after the diluted blood was placed in the counting chamber. The difference of the results may be due to a difference of the technique used, yet the difference was small compared with that between Lampert's own figures of normal count and my own average of 30 healthy women. Besides, the relation as a whole—the relation between Arakawa's reaction and platelet count—is exactly the same in my own trial as well as in J. Kimura's experiment.

Summary.

I examined the blood platelet count of 266 apparently healthy lactating mothers with different Arakawa's reaction.

The platelet count of 27 Arakawa-positive mothers was within normal limits in 84% of the cases, and only 15% showed a slight increase of the count, the average count being 340 thousands in all the Arakawa-positive cases. The count of Groups II and III (the groups of the better intermediate Arakawa's reaction) showed a normal count in 43% of the cases, a slight increase in 28%, a moderate increase in 24% and in intense or remarkable increase in 5%, the average count being 431 thousands. The count of Groups III and IV (the groups of the worse intermediate Arakawa's reaction) showed a normal count in 25%, a slight increase in 34%, a moderate increase in 24% and a remarkable increase in 13%, the average count being 487 thousands. The count of Groups VI and VII (the groups of completely or almost completely negative Arakawa's reaction) showed a normal count in only 16%, a slight increase in 36%, a moderate increase in 32% and a remarkable increase in 16%, the average count being 504 thousands (Cf. Table 11). Thus, the platelet count ran parallel to the intensity of Arakawa's reaction.

Conclusion.

In the present paper I performed a further study on the relationship between the blood platelet count and Arakawa's reaction in apparently healthy lactating mothers. The blood platelet count was low (or within the normal limits) in most of Arakawa-positive mothers and was more or less high (or over the normal limits) in Arakawa-negative mothers; the results obtained by J. Kimura in 1934 and 1935 were thus confirmed by the present paper again. We can say on principle that the weaker the Arakawa reaction, the higher the blood platelet count is.