HAEMACYTOLOGICAL CHANGES IN HOG CHOLERA

I. Observations on the "Substantia Granulo-Filamentosa" in red blood cell—Reticulocytes

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INTRODUCTION

The existence of some vital-stained substances in normal red blood-corpuscles of the horse, cattle, sheep, swine, cat, dog and rabbit was demonstrated by Natcheff Bojan in 1931. Further observations on such substances in red blood-corpuscles of several domestic animals, however, have not been made by others.

According to the original description of the first observer, it is concluded that such a substance must be a protoplasmatic residue derived during the embryonal course of erythrocytes, because it is generally observed in the circulating blood examined in the course of plastic anaemia.

Moreover, the same inclination to the appearance of this substance in blood-stream is observed in several animals, more in the younger animals than in the older: percentages of all red blood-corpuscles found are following: 0.2—0.9% in adult dogs while 72% in puppies, 0.3—0.7% in adult swine while 1.1—13.8% in sucklings of 2—3 months, 0.3% in adult cats while 40% in foetal cats and 30—80% in suckling rabbits.

These observations are limited to the normal circulating blood and the demonstration of such cells in blood-stream of some diseased animals seems to be rare.

Thus, we attempted some studies on this subject to demonstrate any change of cells in circulating blood of the swine affected with

hog cholera in which red blood-corpuscles usually are much reduced.

Judging from our experimental results, the numerical observations of erythrocytes containing "Substantia Granulo-Filamentosa" in circulating blood are considered to be worthy for the determination of the prognosis in cases of hog cholera and for its haemacytological differentiation from other bacillary diseases.

EXPERIMENTAL METHODS

(1) Varieties of the erythrocytes containing "Substantia Granulo-Filamentosa". Three types are found in blood-stream of swine and can be conveniently differentiated by the shape of the granule in stained preparations:

Type I containing coarse granules, Type II containing middle-sized, reticular granules and Type III containing small granules along the periphery of cell-body.

(2) The super-vital staining with a saline solution of brilliant cresylblau was employed.

(3) To make a differential count of above three types of erythrocytes, Max-Levy's haemacytometer was used. And the relative number of these three types was found by counting at least 1,000 erythrocytes. If any of the three types was not found, another 1,000—2,000 erythrocytes were counted.

RESULTS OF EXPERIMENTS

(I) Healthy swine.

10 healthy swine of different ages were strictly examined and the following results were obtained:

No. of swine	1	2	3	4	5	6	7	8	9	10	
Numbers of Erythrocytes (in 1 c.mm)	694	664	723	712	594	643	754	642	568	684	
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I Type II Type III	2 7 13	1 1 2	2 4 6	1 1 2	0 3 2	1 1 7	1 2 3	3 5 7	7 11 14	1 3 5
Haemoglobin (Sahli)	74	76	74	77	73	69	84	75	60	74	
Numbers of months after birth	2	18	20	10	8	8	7	7	6	8	

Group I

Months after birth	2	2.3	2.6	3	3.5	4	4.3	4.6	5	5.3	6	6.3	6.6	7	7.3	7.6	8.3	8.6	9	9.3	9.6	10
Erythrocytes (in 1 c.mm.)	694	692	736	760	760	776	748	780	692	744	772	732	768	748	764	820	800	836	864	724	672	680
Varieties of reticulocytes (in 1,000 Erythrocytes)	2 7 3	2 6 10	3 9 10	3 7 10	1 1 0	1 2 4	1 2 5	0 2 5	2 1 5	0 2 5	0 3 13	5 6 15	6 4 6	7 5 2	0 1 9	1 3 5	0 3 7	0 0 6	0 1 5	1 3 4	2 4 6	0 3 6
Haemoglobin	74	70	74	80	61	100	92	82	83	89	84	86	84	78	92	80	80	90	90	80	70	68

Group II

Months after birth	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16.5	17	17.5	18
Erythrocytes (in 1 c.mm.)	694	740	756	752	720	748	756	836	780	744	740	824	716	624
Varieties of reticulocytes (in 1,000 Erythrocytes)	2 2 4	0 1 1	3 2 5	1 1 2	1 0 4	0 1 3	1 1 3	0 1 4	0 2 1	0 0 2	0 1 1	0 0 4	0 2 3	0 1 2
Haemoglobin	70	74	82	94	88	80	80	90	88	92	80	91	77	78

Group III

Months after birth	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19.5	20	20.5	21
Erythrocytes (in 1 c.mm.)	682	682	616	540	560	642	634	568	588	680	604	592	552	604	556	652	624
Varieties of reticulocytes (in 1,000 Erythrocytes)	0 21 7	4 12 16	11 12 17	4 6 3	0 1 1	4 5 5	1 6 7	2 0 5	4 5 5	2 2 5	3 1 3	0 2 3	0 0 3	2 0 4	1 0 7	0 6 4	1 4 5
Haemoglobin	64	72	65	66	74	78	65	79	70	75	88	84	90	78	73	73	70

As shown in the above table, the number of erythrocytes belonging to the three types was large in the young animals for a definite period after birth while lower in the aged ones, even in a 20-month old animal; the total number of such erythrocytes were about 12.

Although swine of different ages were not yet examined in a number of cases sufficient to make a definite statement for each type of red blood-cells, it is reasonable to consider that such special red blood-corpuscles are found in circulating blood of the healthy swine for a long time after birth. And the average number of erythrocytes found in swine was 6.68 millions per c.mm—the maximum being 7.54 while the minimum being 5.68. Moreover, the counts of the red blood-cells belonging to type III were usually higher than those of other types in normal condition.

Then, we attempted further successive blood examinations in three groups of healthy swine of different ages.

The results obtained are as follows:

As shown in the above table, the total number of red blood-cells belonging to three types in circulating blood gradually decreased in proportion to the number of months after birth. However, the appearance of such red blood-corpuscles in blood-stream will possibly be dependable upon the difference of individual constitution beside the age.

Of the three types, the counts of type III were usually more numerous than the other two, as seen in the former experiment, and the percentage of the total numbers was 0.2—4.0, varying for a period of 3—20 months after birth.

(2) The swine affected with hog cholera.

Although changes occurring in the blood of the animal affected with hog cholera were studied by several authors, descriptions concerning the reticulocytes seem to be very rare. Thus, the first attempt was made to determine whether any changes in them is recognizable or not. For this purpose eight healthy swine of different ages were artificially infected by inoculating the virus, and blood examinations were successively made in the course of the disease.

The result of these examinations is tabulated as follows:

Case 1 (about 10 months after birth) †

Date	16/10	19/10	21/10	0.5cc of Shinkanagawa virus injected subcutaneously	24/10	27/10	31/10	2/11
Temperature	—	—	39.1		39.5	40.4	40.7	40.3
Erythrocytes	612	568	512		524	524	470	405
Varieties of reticulocytes (in 1,000 Erythrocytes)	{ Type I Type II Type III	7	5		2	2	0	0
		11	13		4	2	0	0
		4	14		4	4	0	0
Haemoglobin	65	60	57		64	56	59	43

Case 2 (about 10 months after birth) †

Date	15/9	19/9	21/9	1 cc of Saitama virus injected subcutaneously	23/9	25/9	26/9	
Temperature	—	39.0	39.2		39.9	41.2	40.7	
Erythrocytes	684	680	662		—	—	878	
Varieties of reticulocytes (in 1,000 Erythrocytes)	{ Type I Type II Type III	1	3		—	—	0	
		3	6		—	—	0	
		5	2		—	—	0	
Haemoglobin	79	73	77		—	—	100	

Case 3 (about 8 months after birth) †

Date	8/8	10/8	12/8	1 cc of Shinkanagawa virus injected subcutaneously	15/8	17/8	19/8	22/8	24/8
Temperature	—	—	39.5		40.0	40.5	41.2	41.3	41.0
Erythrocytes	552	582	648		640	592	608	460	512
Varieties of reticulocytes (in 1,000 Erythrocytes)	{ Type I Type II Type III	2	1		0	0	0	0	0
		5	1		0	1	0	1	0
		5	2		1	2	1	0	0
Haemoglobin	66	66	73		76	60	64	45	46

Case 4 (about 8 months after birth) †

Date	19/10	21/10	24/10	27/10	30/10	31/10	2/11	4/11	7/11
Temperature	—	39.0	39.4	39.4	7.5 cc of Ibaragi virus injected subcutaneously	40.8	40.5	4.06	40.8
Erythrocytes	632	648	740	636		614	524	612	484
Varieties of reticulocytes (in 1,000 Erythrocytes)	{ Type I Type II Type III	8	4	14		0	0	0	0
		3	8	12		0	0	0	0
		3	2	10		1	0	0	0
Haemoglobin	71	66	83	68		63	52	64	49

Case 5 (about 8 months after birth) slaughtered

Date	10/7	13/7	15/7	18/7	20/7	0.5 cc of Kanagawa virus injected subcutaneously	22/7	25/7	27/7	29/7	1/8	3/8
Temperature	39.0	38.8	38.8	38.9	38.7		39.7	40.5	39.8	41.1	40.9	—
Erythrocytes	552	526	580	558	566		564	526	580	504	486	540
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I	9	7	3	1		1	4	0	0	0	0
	Type II	26	18	9	7		2	1	1	0	0	0
	Type III	30	16	11	5		4	0	0	0	1	0
Haemoglobin	76	78	76	72	73	75	66	73	73	72	73	

Case 6 (about 8 months after birth) †

Date	01/7	13/7	15/7	18/7	20/7	0.5 cc of Kanagawa virus injected subcutaneously	22/7	25/7	27/7	29/7	
Temperature	—	39.0	38.9	38.9	39.1		39.7	41.4	41.1	41.0	
Erythrocytes	756	742	762	765	776		776	684	748	556	
Varieties of re- ticulocytes (in 1,000 Erythrocytes)	Type I	4	2	1	1		3	2	0	0	0
	Type II	15	7	2	2		3	1	0	0	0
	Type III	7	5	2	5		2	0	0	1	0
Haemoglobin	86	85	85	90	89	87	81	88	76		

As seen the above table, the counts of reticulocytes gradually decreased in accordance with the appearance of characteristic symptoms in hog cholera and they were scanty or absent in the blood-stream when the diseased animal was feverish. Of course, the counts of whole red blood-corpuscles were also reduced in the same condition.

However, in Cases 7 and 8 which survived, different numerical changes of reticulocytes were observed; the gradual diminution of cells was found at the feverish stage, but a sudden increase over the counts before injection of the virus was demonstrated in the case gradually recovered.

In all the cases, the numerical ratio of each type of the reticulocytes was almost constantly observed, Type I and II disappearing earlier than Type III.

(3) The swine vaccinated against hog cholera.

Case 7 (about 8 months after birth) survived

Date	19/9	21/9	1 cc of Kyoto virus injected subcutaneously																											
Temperature	38.9, 39.0		26/9	28/9	30/9	2/10	5/10	7/10	10/10	12/10	14/10	16/10	19/10	21/10	24/10	27/10	31/10	2/11	4/11	7/11	9/11	11/11								
Erythrocytes	660, 642		40.8	40.8	41.6	41.4	40.5	40.6	40.0	39.7	39.5	39.5	39.1	39.2	39.2	39.5	38.9	—	—	—	—	—								
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I	7	3	508	556	548	370	522	453	378	458	416	428	372	384	434	560	474	572	444	536	565	530							
	Type II	7	5	1	0	0	0	0	0	0	0	1	1	22	26	12	4	1	5	20	22	20	9							
	Type III	4	7	0	1	0	0	0	0	0	0	0	1	10	12	24	12	12	0	16	22	21	10							
Haemoglobin		7	3	0	0	0	0	0	0	0	0	0	0	6	14	12	12	1	8	16	17	12	12							
		75	76	73	71	68	54	55	61	54	50	54	45	40	43	50	60	70	52	60	73	61								

Case 8 (about 10 months after birth) survived and slaughtered

Date	8/8	10/8	12/8	1 cc of Shinkagawa virus injected subcutaneously										15/8	17/8	19/8	22/8	24/8	26/8	29/8	31/8	2/9	5/9	7/9	9/9	12/9	14/9
Temperature	—	—	39.0	39.6										39.6	41.0	40.7	40.8	40.7	40.7	40.7	40.5	39.7	39.4	39.3	39.3	38.8	38.8
Erythrocytes	632	658	656	636										636	600	623	612	524	346	218	244	306	304	358	380	572	552
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I 1 Type II 2 Type III 3	3 4 2	1 1 0	1 0 2										1	0	0	0	0	0	0	1	1	1	16	16	0	6
Haemoglobin	80	72	77	72										72	54	84	64	44	38	21	26	29	30	40	44	65	65

Basing upon the observations above described, another experiment was carried out on six swine which received the injection of hog cholera vaccine for the protective purpose.

The results obtained are tabulated as follows :

Case 1 (10 months after birth)

Date	15/2	7.5 cc of hog cholera vaccin injected subcutaneously	17/2	20/2	22/2	24/2	27/2	1/3
Temperature	38.7		38.8	38.7	38.6	38.5	38.5	38.8
Erythrocytes	958		888	724	788	778	812	844
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I 1		0	0	2	0	2	1
	Type II 2		0	0	0	0	0	3
	Type III 3		1	1	0	1	3	3
Haemoglobin	98		80	74	81	78	80	88

Case 2 (10 months after birth)

Date	2/2	8 cc of hog cholera vaccin injected subcutaneously	5/2	7/2	9/2	11/2	14/2	16/2	19/2	21/2	23/2
Temperature	39.5		39.6	39.6	39.5	39.2	39.1	38.8	38.6	38.6	38.9
Erythrocytes	594		638	600	667	664	728	638	624	582	536
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I 0		1	1	0	5	2	1	0	0	0
	Type II 3		2	2	0	3	3	3	1	0	1
	Type III 2		3	5	1	9	3	4	4	3	1
Haemoglobin	73		84	80	83	80	80	71	69	75	64

Case 3 (10 months after birth)

Date	2/2	7 cc of hog cholera vaccin injected subcutaneously	5/2	7/2	9/2	12/2	14/2	16/2	19/2	21/2	23/2
Temperature	—		38.8	39.5	39.2	39.7	38.6	38.6	38.6	38.8	38.9
Erythrocytes	712		792	836	740	680	678	664	656	721	640
Varieties of reticulocytes (in 1,000 Erythrocytes)	Type I 1		1	1	3	2	0	0	0	0	0
	Type II 1		1	2	2	3	1	0	0	0	0
	Type III 2		2	1	1	3	1	0	0	0	0
Haemoglobin	77		93	105	85	81	84	78	72	95	65

Case 4 (12 months after birth)

Date	19/12	21/12	23/12	12 cc. of hog cholera vaccin injected subcutaneously	26/12	28/12	30/12	4/1	6/1	8/1	
Temperature	—	—	88.5		38.8	38.6	38.6	39.1	38.9	38.8	
Erythrocytes	596	554	548		620	586	576	552	512	542	
Varieties of re- ticulocytes (in 1,000 Erythrocytes)	Type I	0	1		0	0	—	1	1	0	0
	Type II	1	1		0	0	—	1	1	0	1
	Type III	0	0		1	1	—	0	0	1	0
Haemoglobin	74	65	72		84	73	62	68	56	59	

Case 5 (10 months after birth)

Date	15/2	11 cc of hog cholera vaccin injected subcutaneously	17/2	20/2	22/2	24/2	27/2	1/3
Temperature	38.5		38.9	38.8	38.7	38.5	38.7	38.9
Erythrocytes	922		834	698	750	828	624	736
Varieties of re- ticulocytes (in 1,000 Erythrocytes)	Type I		0	0	4	1	2	1
	Type II		0	0	2	2	3	2
	Type III		1	0	0	2	1	4
Haemoglobin	94		84	69	68	59	83	90

Case 6 (10 months after birth)

Date	15/2	12 cc of hog cholera vaccin injected subcutaneously	17/2	20/2	22/2	24/2	27/2	1/3
Temperature	38.6		39.0	38.8	38.8	38.5	38.6	38.5
Erythrocytes	882		798	792	876	932	900	868
Varieties of re- ticulocytes (in 1,000 Erythrocytes)	Type I		0	1	0	1	1	2
	Type II		1	0	0	2	1	2
	Type III		1	1	1	2	1	2
Haemoglobin	87		71	75	82	108	84	84

From the summarized observations of the five cases, no numerical changes in each type of reticulocytes were demonstrated in circulating blood of the swine inoculated with an attenuated hog cholera virus, compared with the counts of such cells before the vaccination.

On the contrary, in only one case (Case 3) which received the injection of an incompletely attenuated virus without fever, scarcely any type of reticulocytes was demonstrated in blood-stream, but when survived plenty of those cells appeared, Types I and II earlier than Type III.

Thus, it may be observed from these experiments that the injection of the attenuated virus used in practice, did not result in the disappearance of reticulocytes in circulating blood.

(4) Swine affected with swine plague or swine erysipelas.

So far in swine affected with swine plague or swine erysipelas the histological examination has not yet been carried out of reticulocytes in circulating blood. Thus, attempts were made in a sufficient number of cases definitely to differentiate types of reticulocytes as shown in following tables :

A. Swine Plague

Case 1 (12 months after birth)

Natural infection (†)

Date	26/2	29/2
Temperature	41.2	40.5
Erythrocytes	522	508
Varieties of R. (in 1.000 Erythrocytes)	{ Type I 8 Type II 3 Type III 2	{ Type I 9 Type II 7 Type III 9
Haemoglobin	49	46
Leucocytes	57.000	59.700

Case 2 (15 months after birth)

Natural infection (†)

Date	1/3	2/3
Temperature	41.5	40.9
Erythrocytes	506	521
Varieties of R. (in 1.000 Erythrocytes)	{ Type I 3 Type II 5 Type III 6	{ Type I 1 Type II 8 Type III 10
Haemoglobin	46	47
Leucocytes	28.000	36.000

Case 3 (12 months after birth)

Artificial infection by the method of pneumoinjection (slaughtered)

Date	6/11	10/11	13/11	15/11
Temperature	38.3	39.4	39.9	39.9
Varieties of R. (in 1.000 Erythrocytes)	{ Type I 1 Type II 2 Type III 3	{ Type I 1 Type II 4 Type III 3	{ Type I 1 Type II 2 Type III 5	{ Type I 2 Type II 1 Type III 5

Case 4 (12 months after birth)

Artificial infection by the method of pneumoinjection (slaughtered)

Date		6/11	10/11	18/11	15/11
Temperature		38.7	38.3	39.8	39.6
Varieties of R. (in 1,000 Erythrocytes)	{ Type I Type II Type III	1 2 3	1 4 2	3 4 7	3 2 7

B. Swine Erysipelas

Case 1 (3 months after birth)

Artificial infection by the method of subcutaneous and intravenous injection

Case 2 (3 months after birth)

Artificial injection similar to case 1

Temperature	41.5
Erythrocytes	610
Varieties of R. (in 1,000 Erythrocytes)	<div><div>Type I</div><div>Type II</div><div>Type III</div><div>2</div><div>6</div><div>8</div></div>
Haemoglobin	46
Leucocytes	20.300

Temperature	41.3
Erythrocytes	690
Varieties of R. (in 1,000 Erythrocytes)	<div><div>Type I</div><div>Type II</div><div>Type III</div><div>2</div><div>4</div><div>6</div></div>
Haemoglobin	52
Leucocytes	28,000

In short, the histological changes regarding the reticulocytes in blood-stream of swine affected with both diseases were not same as those in hog cholera.

In the two diseases, the counts of such cells constantly increased in the course of high fever. Moreover, total red blood-corpuscles decreased in cases of swine plague, but no change demonstrated in swine erysipelas.

Therefore, the results of comparative observations on the counts of red blood-corpuscles in circulating blood of swine affected with one of the three diseases are simply tabulated as follows :

The results of our studies on numerical changes of red blood-stream of swine in different conditions are briefly summarized as follows :

	Hog cholera	Swine plague	Swine erysipelas
Erythrocytes with the S. G. F.	decreased or disappeared	increased or no change	increased or no change
Erythrocytes	decreased	decreased	no change

SUMMARY

1. The reticulocytes are demonstrated in blood-stream of healthy swine and the counts different according to ages, higher in young animals but lower in the older. Their proportion to all red blood-corpuscles in blood-stream is 0.2–4.0%, varying for a period of 3–20 months after birth.

2. In circulating blood of swine affected with hog cholera, numerical changes of reticulocytes are noticeably affected in the course of the disease. A gradual decrease of the cells is constantly demonstrated until an attack of fever, but they were rare or absent in blood-stream after the appearance of characteristic symptoms.

Of course, the counts of whole red blood-cells are also reduced in the disease.

3. On the other hand, in case of recovery from the disease, counts of reticulocytes in circulating blood is demonstrated higher than those before the injection of the virus.

4. Three types of reticulocytes are differentiated by the shape and the situation of stained granules; the Type I and Type II disappear earlier from the blood-stream, when the swine affected with hog cholera are feverish. Moreover, these two types also reappear in circulating blood earlier than the Type III, when the animals recovered from the disease.

5. The swine which receive the injection of an weakly attenuated virus, usually showed the same numerical changes of reticulocytes in circulating blood as in the swine affected with hog cholera.

6. In cases of swine plague and swine erysipelas, no diminution of reticulocytes is found in blood-stream, but the counts are higher, even in feverish condition.

Therefore, on the basis of the numerical change of reticulocytes in circulating blood, hog cholera may also be differentiated from cases of swine plague or swine erysipelas.

7. Judging from the histological changes in blood-stream of the swine affected with hog cholera, the diminution of erythrocytes in the disease may be reasonably considered as a result of a temporary aplastic anaemia.

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EXPLANATION OF PLATES

- Fig. 1. a..... Type I }
 c..... Type II } show the varieties of reticulocyte in the red blood-
 Fig. 2. b..... Type III } corpuscles of swine.

豚これらノ血球變化 (第1報)

赤血球特ニソノ網狀物質ニ就テ

石井 進 渡邊昇藏 三浦勇治

(農林省獸疫調査所)

(昭和10年2月18日受附)

家畜ノ赤血球内ニ存スル超生體染色性物質ニ就キテ研究セン學者ハ僅ニ

Natscheff Bojan (1931) ノミナリ。同氏ハ馬、牛、綿羊、豚、犬、猫、家兎ニツキ健康體ニ於テハ如何ナル割合ニ流血赤血球内ニ本物質ガ存在スルヤヲ研究シ併セテ人工貧血ヲ來サシメソノ結果本物質ハ新生赤血球内ニ多ク見ラル、所見ヲ指摘シテ再生貧血ニ於テ多數流血中ニ移行スルモノナリトノ結論ヲ下セリ。而シテ本物質ノ何物ナルヤニ就キテハ今日多數議論ノ存スル所ナリトス余等ハ該物質ガ豚これらニ於テ如何ニ流血赤血球内ニ消長スルカヲ試験セリ。豚これらハ周知ノ如ク一種ノ敗血症狀ヲ來サシメ過度ノ貧血ヲ伴フ場合多キヲ以テ本物質トノ關係ハ實驗的ニモ理論的ニモ興味アリト考ヘタレバナリ。即チ得タル實驗成績ヲ示スニ (1) 健康豚生後 3 ヶ月以後ニ於テハ流血赤血球ノ 0.2—4.0% ノ割合ニ本物質ヲ含有スル赤血球存在ス。而シテコノ比率ハ年齡ノ増加スルト共ニ減少スル傾向アリ。(2) 豚これらニ於テハ發病ト併行シ本物質含有赤血球ハ次第ニ流血球中ヨリ減少シ病ノ極期ニ近ズクニ從ヒ至ク流血赤血球ヨリソノ存在ヲ消散スルモノ、如シ而シテ危機去リ熱分利シ次第ニ經過スルニ從ヒ本物質赤血球ハ常體ヨリモ遙ニ多數流血中ニ移行ス。(3) 而シテコノ減少乃至消散期ニ於テハ最初第 1 型並第 2 型ガ減少シ初メ第 3 型ハ永ク殘留シ次デ消失ス。更ニ熱分利後本物質含有赤血球發生期ニ於テハ第 1 型並第 2 型早く出現シ少シ遲レテ第 3 型ノ存在ヲ流血中ニ認ム。斯ル事實ヨリ之ヲ考察スル時第 1 型並第 2 型ハ第 3 型ニ比シ新ラシキ新生赤血球ナリト云フヲ得ベシ。實際再生貧血ニ於テハ第 1 型並第 2 型共ニ多數存在ス。第 3 型ハ同様再生貧血ニ多數所見スト雖モ又貧血進行期ニモ比較的多ク殘存スル所見ヲ肯定シ得ヘシ。(4) 豚これら豫防液接種後ニ於ケル網狀赤血球ノ消長ヲ見ルニ大多數ハ注射前ニ比シ全ク變化ナシ。然ルト雖モ 1 例ニ於テ熱發ニハ到ラザリシトハ雖本細胞ノ減少並ニ消失ヲ所見シタリ。斯ル所見ヲ推理スルニ之豚これら豫防液ノ減毒不充分ナリシ結果ナラント思考ス。從ツテ斯ル事實ヨリ豚これら豫防液ノ減毒程度ヲ試験スルニ本細胞ハ甚ダ意義アルナランヲ追考ス。(5) 豚疫、豚丹毒ニ於テハ病ノ極期ニ於テスラ本物質ヲ依然多數赤血球内ニ證明存在ス。從ツテ本物質ノ流血赤血球ニ於ケル檢出ハ豚これら類症鑑別上意義アルモノト信ズ。更ニ赤血球數ニ於テハ病勢ノ進行ニ比例シ減少スル傾向アリ。之ニこれら病毒ニヨル一時的骨髓ノ赤血球生産機能抑制ニヨリ生ズル現象却チ一時的ノ無力性貧血ナルベク組織學の所見ハ次回報告スル所アルベシ。

(自抄)

Fig 1

Fig 2