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# CLINICO-PATHOLOGICAL STUDIES ON EPIDEMIOLOGY OF EQUINE INFECTIOUS ANEMIA. II.\*

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## DISCUSSION

Discussion is offered on two themes: the problems of affection and the nature of occurrence of the disease.

### 1. On the Problems of the Affection

*The Route of Affection* Among the problems of affection, the authors wish to consider, first, the route of affection. The problem has hitherto been very frequently discussed by many investigators.

People familiar with the disease know that the affection by blood sucking insects and the affection in stables have attracted attention. Some persons have claimed that the affection is spread by injection syringes. Persons who assert the theory of blood sucking insects have mainly given such reasons as the success of experiment and the spread by pasturage.

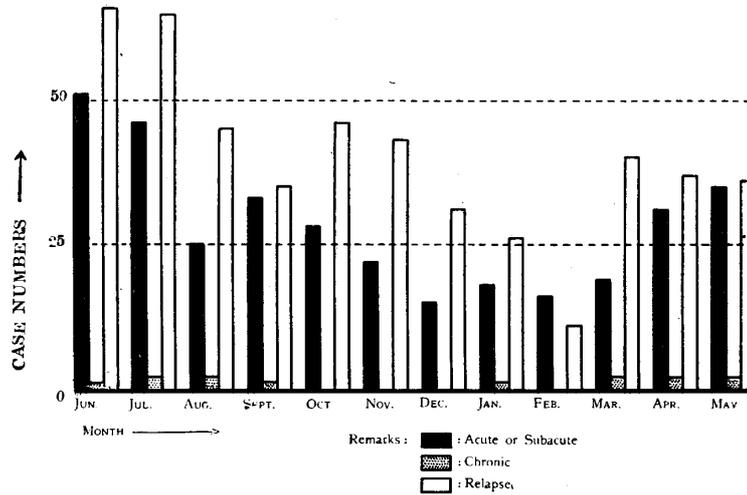
The present authors do not wish to make conjectures, but, on the basis of their results, do wish to express some confutations against the persons who lay stress merely on the spread by pasturage.

With the exceptions of special groups such as Se and Mu in stockfarm-cases and Hokken-group in which the disease occurred prevalently during the coldest season associated with strangles or equine paratyphoid, the relation between pathological types of equine infectious anemia and autopsied month is listed in figure 3.

The acute or subacute and the chronic cases are shown throughout the year in the figure. It is evident regarding the former types that the occurrence is more frequent from June to November than from December to May. This seems to support the idea that the disease is carried by blood sucking insects whose activity begins in about May; but the fact cannot be overlooked that also during the other half of the year, from December to May, the occurrence is pretty constantly experienced when the affection by blood sucking insects is difficult to affirm.

\* Continued from p. 99.

FIG. 3. *Distribution of the Types of Equine Infectious Anemia by Month in the Cases Examined (with Exceptions of the Groups Se, Mu and Hokken)*



Therefore for the present, the authors would attach importance to the affection in stables, because they found a quite high ratio of occurrence in the Ts-group among the cases of municipalities to support the idea of such a mode of affection.

The authors can find in the literature rather many investigators who attached importance to the failure of stable affection, but on that point the authors consider as follows;

Those who argue against stable infection, the authors fear, have a too simple view of the nature of the virus and of the physical conditions influencing the contraction of the disease in stables under the natural circumstances. For example considering from the side of virus, a horse raised with a horse of the acute or subacute type infectious anemia will be strongly exposed to the virus but it is supposed to be the contrary when the case is chronic. The chronic type, however, cannot be overlooked, because the circumstance of affection may become like the acute or subacute when the relapsed type of equine infectious anemia is kept in mind which was drawn extraordinarily to the attention of the authors; they cannot overlook the fact that the relapsed type is observed approximately throughout the year as shown in figure 3.

The chronic type of equine infectious anemia is distributed more frequently from June to December similarly to the acute or subacute type. However, such differences as appear are apparently accidental results dependent upon the circumstances of obtainment of materials. One reason for that is the predominance of the cases which were slaughtered after the periodical examination by law as formerly described. At any rate, as it is in general difficult to ascertain the period of affection, the authors consider it best to avoid discussion on the route of affection

as based upon such materials.

There is no need now to discuss at length the affection by injection syringes. Among the groups examined by the authors, Sh, Ai, Mo and St of the cases of municipalities, it seemed to be the firm opinion of persons then concerned with prevention of the disease that it did occur prevalently as a result of being spread by injection syringes. However, as for the authors, any easy approval of that idea must be withheld.

As the authors consider that the above is in reality rather a phase of occurrence of equine infectious anemia in a rural community, they wish to demand of the persons concerned with equine infectious anemia that in future they decide similar cases in regard to the epidemiology of the disease with careful consideration. Although there seems to have been reported some trouble caused by injection in the U. S. A. and Germany, from the viewpoint of the authors' examination method, it is considered there are quite sufficient grounds for discussion with the exception of one or two special cases.

*The Chronic Type Case of Equine Infectious Anemia as the Source of Affection*

The problem of the source of affection has an inseparable relation with the route of affection when the epidemiology of equine infectious anemia is discussed. In this section the authors wish to discuss the chronic type of equine infectious anemia as a source of affection. The importance of the acute or subacute and furthermore relapsed type horse as a virus excretor under field conditions has been already discussed. However according to the authors' knowledge, it seems to be quite difficult to understand such an obstinate occurrence without any supposition of the possibility that a case of chronic type infectious anemia is a source of affection. In ordinary discussion of preventive medicine of this disease, it seems there is naturally much difficulty if such a possibility is not accepted. It is true that many cases of the chronic type infectious anemia seem at least clinically to be healthy and some investigators take the stand that such cases should be left out of account under the term "latent infection", but so far as equine infectious anemia may be concerned, it must not be forgotten that the chronic type manifests remarkable lesions pathomorphologically. When in the future, existence of the cases without morphological lesions may be surely proved, in regard to which, as the evidence of affection of equine infectious anemia, the characteristic change in component of serum protein is grasped and the specific serological reaction is proved, the point of discussion will naturally become quite another one.

For the purpose of considering whether the chronic type case of equine infectious anemia can really play a role as the source of affection, the authors wish to introduce the results of 5 experimental cases, of which materials have been preserved in the laboratory. The experiments were carried out in the Laboratory of Veterinary Pathology and Laboratory of Veterinary Hygiene & Microbiology by Drs. Koichi ICHIKAWA, Katsuya KASAI, Katsushichi HIRATO and co-workers. Sera or defibrinated blood obtained from chronically advanced cases (the chronic type lesions of equine infectious anemia were confirmed in 2 cases) were used as the

inocula. All inoculated cases manifested symptoms of equine infectious anemia; 3 acute cases and one case each of subacute and relapsed were confirmed.

Needless to say, in such experiments as the above, conditions of the virus in inocula obtained from chronically advanced cases were not to be uniform. Therefore, it was natural that the reported experimental results were also various according to the investigators and, therefore, such results can be found in the literature. The authors, at any rate, introduce at the present the above results as evidence that the chronic type case of equine infectious anemia does play a role, without fail, as the source of affection.

As to the cases examined for embryonic affection, the authors must discuss a problem about the mare cases of chronic type infectious anemia and their foals, embryos and aborted embryos. Among these cases of embryos and foals, 3 foals out of 8 which had lived with their mares showed the chronic type lesions and another 5 foals, 5 embryos and 1 aborted embryo were free from the lesions. It is not clear, however, whether the foals with chronic type lesions of equine infectious anemia had really been affected embryonally or not. Anyhow such a statement may suggest that the conclusion is contradictory to the information derived from the above introduced experiments. Recently, however, IRIE and KONNO\* have reported one aborted embryo case supplying basis for an important opinion about the problem. The point is that the mother horse of the aborted embryo was an infectious anemia case with chronic course, but no sign of changes characteristic to the sickness could be found pathologically on the embryo. Nevertheless, the inoculation of tissue emulsion of the embryo did provoke the chronic type lesion of equine infectious anemia on a healthy horse.

Although this is the result of only one case, the term "latent infection" of equine infectious anemia must be applied only to such a case if it is truly applicable. In case it is established that such cases as IRIE and KONNO's do occur ordinarily in the field, the authors' construction with regard to the embryonally affected cases will naturally become another one.

## 2. The Nature of Occurrence of Equine Infectious Anemia

Already the authors have somewhat expressed the outline of epidemiology of equine infectious anemia according to the examined groups, but they wish to conclude their discussions after production of a few supplementary considerations.

*On the Types of Lesions of Equine Infectious Anemia in Experimentally Affected Cases* Valuable data were obtained by the authors' pathological examinations of the experimental cases provided by Drs. KASAI, KUCHII and co-workers in the former Military Veterinary School.

At the experiment, fore- and after-inoculations of *Salmonella abortus-equi* were performed on eight 3-year-old horses, but no influence was observed with regard

\* IRIE, Ryosaku & Satoru KONNO: Experimental Report No. 25 of Government Experimental Station for Animal Hygiene, 93 (1952).

to pathological changes; the equine passage virus was used for the experiment of equine infectious anemia by means of subcutaneous injection of 50 ml sera uniformly. The resultant cases divided 4 cases acute or subacute and 4 chronic; the former all died and the latter were all slaughtered with the exception of one which unexpectedly died as a result of bone fracture.

Another result of inoculation to be noted is that of 27 cases including the above introduced 5 experimental cases which were inoculated with materials from chronically advanced cases of equine infectious anemia. Among those experimental cases, the acute or subacute type accounted for 17 cases, the chronic 8 and the relapsed 2; among them 14 cases terminated in death.

In the above two experiments, the number of the chronic type cases was about a half that of the acute or subacute. In not only equine infectious anemia but also in other disease, it is not acceptable to apply the result of experiment to the state of occurrence of the disease in the field; so that, the authors wish not to discuss at any length the differences of results between experimentally produced cases and field cases. However at this time of studying on the nature of epidemiology, the authors desire to mention for reference the fact that no considerable number of cases of the chronic type infectious anemia can be found among experimental cases.

TABLE 8. *The State of Disposal of Equine Infectious Anemia in the Municipalities which Showed High Rate of Detection in the Examinations from 1950 to 1952 (According to the Statistics by the Hokkaido Prefectural Office)*

DISTRICT & MUNICIPALITY	PERCENTAGE OF DETECTION			NUMBER OF CASES EXAMINED CLINICALLY*
	1950	1951	1952	
Kamikawa, Higashitakasu	0.59	25.14	2.63	875 (1951)
Ishikari, Hamamasu	2.69	13.20	3.40	250 ( " )
Shiribeshi, Bikuni	10.63	7.18	2.02	94 (1950)
Abashiri, Tsubetsu	5.67	9.09	1.98	1584 (1951)
Kamikawa, Nagayama	1.04	8.35	1.08	695 ( " )
Shiribeshi, Furubira	8.13	6.72	3.48	108 (1950)
Kamikawa, Kagura	2.30	8.13	2.27	984 (1951)
Shiribeshi, Iwanai	5.69	7.47	5.14	174 ( " )
Abashiri, Kamishokotsu	7.13	2.13	0.57	939 (1950)
Oshima, Mori	6.83	1.69	2.32	805 ( " )
Kamikawa, Kamifurano	6.39	2.26	0.19	1548 ( " )
Abashiri, Takinoue	5.34	2.87	1.36	1423 ( " )
Tokachi, Rikumbetsu	2.45	4.99	3.63	1123 (1951)

\* Remarks: Every municipality of those listed from amongs the municipalities of Hokkaido showed the highest ratios of detection in the parenthesized year during the 3 years. The arrangement is according to the height of detection ratio; all municipalities showed more than 4.49% during the 3 year period.

*The State of Occurrence of Equine Infectious Anemia in the Statistics Concerning the Prevention* The Hokkaido Prefectural Office has established a "5 Year Programme for Stamping-out of Equine Infectious Anemia" and is executing it. Under such a programme, the Office actively examined all horses in Hokkaido in 1952 by means of the application of ISHII's method.

TABLE 9. *The State of Disposal of Equine Infectious Anemia in the Municipalities from 1950 to 1952 which Showed 0% of Detective Ratio in 1952 (By the Statistics of the Hokkaido Prefectural Office)*

DISTRICT & MUNICIPALITY		PERCENTAGE OF DETECTION			NUMBER OF CASES EXAMINED CLINICALLY
		1950	1951	1952	(1952)
Oshima	Otoshibe	0.24	0.77	0	362
	Sahara	0.90	1.38	0	300
	Kojima	2.79	—	0	143
	Ôshima	—	—	0	49
	Todobokke	—	3.03	0	45
	Ôsawa	—	3.33	0	39
	Matsumae	—	—	0	33
	Shikabe	2.77	—	0	25
	Usujiri	3.03	—	0	22
Shiribeshi	Osatsube	—	—	0	16
	Tarukishi	—	—	0	302
	Isoya	—	—	0	170
	Nishishimamaki	—	—	0	65
	Higashishimamaki	—	—	0	62
	Irika	5.26	7.50	0	48
	Suttsu	—	—	0	22
	Kamoenai	—	—	0	20
	Utasutsu	—	6.67	0	20
Hiyama	Okushiri	—	—	0	513
	Kumaishi	—	—	0	57
	Kaitorima	—	—	0	49
	Kudo	—	7.69	0	13
Nemuro	Wada	0.24	0.19	0	1596
	Shibetsu	0.12	—	0	1005
	Nakashibetsu	1.93	0.34	0	1005
	Habomai	0.36	—	0	680
	Nemuro	—	—	0	442
Sôya	Wakkanai	0.47	0.21	0	1626
	Sôya	—	—	0	119
Abashiri	Ikutahara	2.13	0.29	0	762

Tables 8 and 9 are made by the authors according to the statistics of the Office and they wish to discuss problems with regard to the state of occurrence of equine infectious anemia.

From table 8, it may be seen that among 270 municipalities in Hokkaido a certain 13 as listed produced more than 5% disposals at some time during the recent 3 years and in some of those 13 the detection ratio was considerably high. However, the authors cannot speak with authority, because they know nothing pathologically about the disposed horses. It is, however, considered about the municipalities of especially high ratio that the conditions may be supposed similar to those of groups Sh, Ai, Ho, Mo and St which were examined by the authors.

Importance must be attached to the fact that chronic type cases of equine infectious anemia especially can often be detected under such circumstances as trade of horses, too heavy labour etc. According to the results obtained by the authors from Ts-group among the examined cases of municipalities, the fact of considerably frequent transfer of horses was ascertained in course of investigation. Also from F-group among the standard cases, the prevalent occurrence of equine infectious anemia was discovered in the areas where lumbering during the winter was undertaken.

Zero % detection ratio, on the other hand, was found in 30 municipalities in 1952, as listed in table 9. With the exceptions of a few of those municipalities, it can be seen that the ratio is generally low in every year.

Regarding the ratios it cannot be overlooked that those of table 8 are rather high, but usually show the tendency to become lower year by year. In some municipalities, however, the ratio is sometimes higher than the previous year, but the authors wish it to be understood that such a slight fluctuation is not worthy of consideration.

*Relation between the Detection of Equine Infectious Anemia and the Results of Using Ishii's Method* Recently in Japan, ISHII's method for the detection of equine infectious anemia has been highly valued. The authors wish to discuss in short

TABLE 10. *Relation between the Types of Equine Infectious Anemia and the Results of Ishii's Method in the Cases Examined by the Authors. I.*

LESIONS	SIDEROCYTES IN PERIPHERAL BLOOD		
	+	-	
Equine Infectious Anemia	Acute or Subacute	47	13
	Chronic	165	42
	Relapsed	15	3
Non Equine Infectious Anemia	59	140	

Remarks: The cases quoted in the table are only a part, because the ISHII's method has begun to be used more recently than the date of authors' earliest materials. The table was not made designedly.

the results of the use of ISHII's method based upon the cases among those actually examined by them (Table 10).

It can be affirmed from the table that the method is a powerful weapon for the detection of equine infectious anemia. However, (a) the 42 cases of chronic type equine infectious anemia with negative result for ISHII's method and (b) the 59 cases of non equine infectious anemia with positive result cannot be overlooked easily.

The authors wish to investigate these two points, (a) and (b), as follows (Table 11);

TABLE 11. *Relations between the Types of Equine Infectious Anemia and the Results of ISHII's Method in the Cases Examined by the Authors. II.*

LESIONS	CASES EXAMINED				
	Group-Ts : Autopsied Cases in Tokachi- shimizu	Group-Fu : Liver Punctured Cases in Kamifurano	K- & S- Stockfarms	Autopsied Liver Punctured Cases	
Siderocytes in Peripheral Blood +	Acute or Subacute	6	—	—	2
	Chronic	25	8	1	8
	Relapsed	—	—	—	12
	Non Equine Infectious Anemia	11	1	25	—
Siderocytes in Peripheral Blood -	Acute or Subacute	—	—	—	—
	Chronic	1	21	1	—
	Relapsed	1	—	—	1
	Non Equine Infectious Anemia	—	69	35	—

- Remarks: 1) For the cited 4 groups, ISHII's method was thoroughly applied and in all cases in the table with positive result the siderocytes were counted to more than "fixed number by law".
- 2) In the existing law, an article to the effect of the following translation is prescribed as the standard of diagnosis of equine infectious anemia.  
 "The case is determined as the patient of equine infectious anemia in such case that on the smear of gathered leucocytes more than 1 siderocyte (the term "fixed number" is applied to the following parts) is detected per about 10 thousands of leucocytes (equivalent to 10 visual fields and 1 field is obtained by combination of 5 magnification eye lense and 90~100 magnification object with oil immersion), or that pathological changes are observed on the piece of liver tissue obtained by liver puncture".

As to point (a), it must be noted that about a half of the 42 cases belong to the Fu-group which became a subject of discussion in regard to the detection of

TABLE 12. *Relation between the Types of Equine Infectious Anemia and Results of ISHII's Method Examined Repeatedly on the Autopsied Liver Puncture Cases*

TYPE OF EQUINE INFECT. ANEMIA	CASES EXAMINED		NUMBERS OF SIDEROCYTES DETECTED IN PERIPHERAL BLOOD*	PERIOD OF EXAMINATION
	Case No.	Termination		
Acute or Subacute	No. 10	Died	13/30	
	No. 9	"	{ 36/10, 3/10, 75/20, 51/10, 231/10, 375/10, 98/10, 86/10, 125/10, 266/10, 158/10, 245/10,	1/27 ~ 2/9 '50
Chronic	No. 1	"	9/10, 1/50, 0/50	8/4 ~ 9/20 '50
	No. 4	"	{ 3/50, 4/200, 16/100, 4/10, 3/50, 0/30, 8/500, 3/500, 13/200, 8/100	7/25 ~ 8/8 '50
	No. 15	"	40/10	
	No. 14	Slaught.	3/250, 5/100, 4/100, 3/300, 2/100, 6/200	1/27 ~ 2/4 '50
	No. 16	"	234/10, 130/10	7/1 ~ 7/2 '51
Relapsed	No. 3	Died	{ 2/10, 27/10, 24/10, 8/10, 13/10, 21/10, 5/10, 4/10, 6/10, 8/10, 54/10, 323/10	6/27 ~ 8/5 '50
	No. 5	"	{ 32/10, 98/10, 36/10, 8/10, 21/10, 8/50, 6/100, 2/300, 11/20, 8/100, 6/100, 6/50, 18/20, 44/10	1/20 ~ 2/14 '49
	No. 6	"	3/100, 3/100, 42/100, 15/100	5/16 ~ 6/8 '50
	No. 8	"	{ 35/10, 21/10, 31/10, 2/10, 15/100, 23/100, 3/100, 3/100, 10/100, 2/150, 4/150, 4/100, 0/250, 1/250, 0/300, 0/100, 0/300, 0/300, 0/300, 0/150, 0/150, 0/150, 0/150, 0/150, 0/150, 0/300, 0/10, 3/350, 1/200, 0/300, 0/250, 0/200, 0/200, 0/200, 3/250, 3/250, 1/10, 25/320, 1/150, 0/100, 0/100, 0/100, 0/100, 1/50, 0/50, 3/40, 2/150, 4/150, 1/50, 0/100, 1/100, 4/100, 1/50, 1/50 1/100, 3/20, 5/20, 6/20, 0/100, 3/20, 4/20, 3/20, 1/20, 0/30, 1/20, 0/50, 1/20, 1/30, 1/20, 4/20, 0/50, 3/50, 3/30	5/24 ~ 8/4 '50
	No. 21	"	{ 0/500, 0/500, 6/200, 5/100, 21/300, 6/50, 31/500, 26/300, 27/50	2/6 ~ 2/18 '49
	No. 22	"	{ 93/10, 52/10, 44/10, 75/10, 81/10, 195/10, 49/10, 18/10, 203/10, 127/10, 105/10, 115/10, 45/10, 13/10, 40/10, 8/10, 12/10, 40/10	7/31 ~ 8/2 '49
	No. 23	"	{ 2/10, 3/10, 17/10, 48/10, 55/10, 105/10, 82/10, 125/10, 18/10, 95/10, 112/10, 651/10, 220/10	6/28 ~ 8/22 '49
	No. 24	"	0/200, 0/200, 0/200, 0/200, 0/200	9/3 ~ 9/15 '49
	No. 25	"	20/40	
	No. 26	"	20/10, 7/10, 5/10, 2/10, 4/10, 4/10, 2/10	8/14 ~ 8/29 '50
No. 7	Slaught.	Min. 40/10, Max. 406/10	8/25 ~ 8/27 '51	
No. 18	"	6/50, 6/20, 3/50, 2/50, 14/10	11/16 ~ 12/3 '48	
No. 19	"	13/10, 63/10, 95/30, 18/20, 21/10, 32/20, 44/20	1/26 ~ 2/1 '50	

\* The results were obtained by the Laboratory of Veterinary Internal Medicine, Hokkaido University.

The authors wish to express their gratitude to that Laboratory for the kind communication of the data.

The denominator indicates the numbers of leucocytes on smear preparations (unit : thousand) and the numerator indicates the numbers of siderocytes.

siderocytes as numerous more than the fixed number provided in the law. That is to say, it may be said, seemingly, that one can consider the fluctuation of detection ratio as influenced by the degree of examination.

To judge the problem, it is good to quote the results of autopsied cases of liver punctured (Table 12).

As to cases 4, 14, 6, 8 and 21 in the table, it is comprehensible that the siderocytes could be barely detected only after extraordinary endeavour.

On the other hand in the cases of S-stockfarm, in spite of evidence gained by painstaking examination for the siderocytes, the lesions of equine infectious anemia were entirely lacking (Table 13).

TABLE 13. *The Results of ISHII's Method Applied on the Si-group of Stockfarm Cases*

LESIONS	CASES EXAMINED	TERMINATION	DETECTED NUMBERS OF SIDERO-CYTES IN PERIPHERAL BLOOD	DATE EXAMINED
Non Equine Infectious Anemia	D. No. 1	Slaughtered	3/100, 1/100, 0/100, 1/100, 2/100	7/18~12/3
	D. No. 2	"	0/100, 6/100, 1/100, 0/100, 5/100	"
	D. No. 3	"	0/100, 2/100, 0/100, 0/100, 4/100	"
	D. No. 4	"	0/100, 0/100, 1/100, 0/100, 6/100	"
	D. No. 5	"	0/100, 0/100, 2/100, 1/100, 0/100	"
	D. No. 6	"	0/100, 0/100, 3/100, 2/100, 2/100	"
	D. No. 7	"	0/100, 0/100, 1/100, 0/100, 2/100	"
	D. No. 8	"	0/100, 0/100, 0/100, 0/100, 0/100	"

The results were obtained by Obihiro Zotechnical University, to whose concerned staff members the authors wish to express cordial gratitude for their kind permission to reproduce the data.

The denominator indicates the numbers of leucocytes and the unit in thousands. The numerator, the number of siderocytes.

It seems from the two tables that any cases can not be diagnosed as equine infectious anemia so long as only a few siderocytes are detected. And then regarding 21 chronic type infectious anemia cases of formerly described Fu-group it cannot be concluded that the negative reaction by ISHII's method is a result of roughness of examination.

There seems to be no question since the cases in table 13 were diagnosed in accordance with the standard of diagnosis in law, in which the definition of equine infectious anemia is provided as the case with siderocytes of more than the fixed number, because those cases were categorized as non equine infectious anemia according to ISHII's method and, therefore, the lesion and such diagnosis coincide with each other. However, on the contrary, in the cases of table 12 results inapplicable to such a standard are often found. Therefore, the authors consider that the legal standard that provided "the siderocytes of more than fixed number"

is, at any rate, not always absolute.

In regard to ISHII's method, it must be always carefully remembered that sometimes the detection ratio fluctuates considerably according to the time of examination in the same horse. It is unexpectedly frequently experienced that some certain horse shows positive reaction to the method at one time of examination and at another no siderocyte can be detected in spite of extraordinary endeavour.

The second point of discussion (b) is the fact that non equine infectious anemia cases (Table 10) with positive result for ISHII's method were confirmed on 59 cases; 25 cases out of those 59 were raised in K- and S-stockfarms and result of S-stockfarm has been recorded above in table 13. This is not without a tinge of duplication, but the authors have prepared a table concerning the results obtained from K-stockfarm cases (Table 14).

TABLE 14. *The Results of ISHII's Method Applied on the Ku-group of Stockfarm Cases*

LESIONS	CASES EXAMINED	TERMINATION	DETECTED NUMBERS OF SIDEROCYTES IN PERIPHERAL BLOOD
Chronic	C. No. 2	Slaughtered	738/100 (M), 1254/100 (F)
Non Equine Infectious Anemia	C. No. 6	"	27/100 (M), 91/100 (F)
	C. No. 7	"	10/100 (M), 36/100 (F)
	C. No. 8	"	4/100 (M), 30/100 (F)
	C. No. 9	"	12/100 (M), 25/100 (F)
	C. No. 10	"	12/100 (M), 25/100 (F)
	C. No. 11	"	21/100
	C. No. 12	"	1/319, thereafter +
	C. No. 13	"	1/10
	C. No. 14	"	+
	C. No. 1	"	1/304 (M), 2/100 (F)
	C. No. 3	"	8/100
	C. No. 5	"	2/100

Remarks: 1) The denominator indicates the number of visual fields.  
 2) M and F indicate methanol and formalin fixation respectively.  
 3) + indicates numbers higher than number fixed by law.

Three of the slaughtered cases at K-stockfarm, for which result for ISHII's method was obtained, showed the detection ratio less than the number fixed in law and other 10 cases showed more than fixed number. As to the pathological lesions, however, only one case was diagnosed as equine infectious anemia. Furthermore, among the non equine infectious anemia cases in table 10 with exception of the cases of K- and S-stockfarms, 34 cases showed positive reaction for ISHII's

method and most of them also showed the detection ratio of more than the fixed number of siderocytes.

Under the circumstances described above, the numbers listed in the statistics by the Hokkaido Prefectural Office seem to be unsuitable to accept as the true number of cases without pathological studies on all disposed horses, even if ISHII's method were applied which is usually considered to be the minute examination. However on the other hand, it is natural that ISHII's method need not be accepted as playing an absolutely sure role in the detection of equine infectious anemia, because for the diagnosis of equine infectious anemia by law, in addition to ISHII's method, it is provided that pyrexia, decrease of erythrocytes, functional disturbances of heart etc. may be taken into consideration. Actually in practice, as formerly stated, the role of ISHII's method must be highly valued for the detection of the chronic type equine infectious anemia of which clinical diagnosis is very difficult. Therefore, the statistics by the Hokkaido Prefectural Office must be considered to be valuable for the study on the nature of epidemiology of equine infectious anemia at the present time.

The authors carried out clinico-pathological studies on epidemiology of equine infectious anemia on the basis of recorded cases. In studying the problems, the authors know full well that there can be various other avenues of approach. For the present, it is difficult to secure sufficient data to provide the basis for arguments, no matter how hard one may try to find some original line of approach. For example, one student brings up a chronic type case of equine infectious anemia for the purpose of comparison with such an experimental case as one inoculated by inconsiderably small quantity of materials, or another person conjectures on the acquisition of immunity with regard to horses raised in an area where the chronic type equine infectious anemia has sporadically occurred. However such persons glance at only a phase of the occurrence. Of course, as for the present authors, as they analyze the various phases of occurrence of equine infectious anemia, it is regretted that they cannot know more than only a little about the reasons for such phases.

Actually, the present authors must be satisfied with the belief that they could touch up some parts of those various phases of the occurrence by means of the organization and analysis of the precious materials which have been painstakingly collected by their seniors and colleagues over many years.

Finally the authors wish to conclude the present paper with the following summary statements:

- 1) The occurrence of equine infectious anemia shows the character

of being likely to *settle constantly* in an area where the disease has once occurred. This character is, however in reality, due to the nature of the disease itself, as shown in the experimental cases.

The state of settlement of the disease in municipalities and stock-farms remarkably varies by reason of such things as likelihood of half-way measures of prevention resulting from difficulty of diagnosis, and of frequent trade or transference of horses among the various districts. Therefore essentially, with regard to the occurrence of equine infectious anemia, there is no variation in its true nature whenever and wherever it may happen.

2) As a second conclusion, *the sporadic occurrence of fatal cases* which is closely related with the constant settlement of the occurrence of the disease must be stated. At the present time, there can be found at any time and everywhere such cases as exhaustive death of the chronic type equine infectious anemia, new occurrence and death of the acute or subacute and, furthermore, death of the relapsed cases. Therefore, in accordance with the cause which leads to a lethal termination, a phase of seemingly prevalent occurrence appears in certain districts and towns. It is considered, after careful analysis, that the so-called "calamity induced by injection-syringes" may be identified as nothing more serious than such a phase of the occurrence of equine infectious anemia. Besides, the cases by themselves which proceed to a lethal termination pose various problems connected only with horses of the chronic type equine infectious anemia.

For these reasons at the time of the sporadic occurrence of death, sufficient investigations upon the interior and exterior conditions which can become the cause of death must be carried out.

It may be also said that the seriousness of the phase in respect to the sporadic occurrence of deaths should differ according to the degree of frequency of settled occurrence. One of reasons for such a saying is very simply that there used to be many deaths of equine infectious anemia in former days may be attributed to such a difference.

3) It has been conclusively proven that association of equine paratyphoid, strangles and other illnesses in conjunction with equine infectious anemia plays an important role in *the successive occurrence of deaths* without doubt. Such a phase, indeed, shows a serious epidemic state worthy of the term "prevalence of equine infectious anemia".

4) Finally the authors wish to express a few ideas with regard

to a scientific plan for prevention of equine infectious anemia in connection with the following problems which must be discussed as the important main points of argument.

a) A plan of rigorous quarantine and slaughter must be executed to control the settled occurrence which in turn becomes the source of disease.

b) It is needful to recognize anew the significance of the sporadic occurrence of deaths which is most dangerous as the source of affection.

c) Special precautions must be taken upon the occurrence of equine paratyphoid, strangles etc. which become the beginning of the successive occurrence of equine infectious anemia.

Observing the present practical circumstances of prevention of equine infectious anemia in certain districts of Hokkaido, the authors consider that as for the a)-problem more elaboration of plan, for example application of such a method as liver puncture, is now required, and that as for b) carrying out of very careful complete investigations on the carcasses of horses is at any cost desirable.