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**HISTOGENETIC STUDIES ON ALLERGIC
DERMATITIS* OF HORSES I.
SYNTHETIC EXAMINATION OF BIOPSY FINDINGS**

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INTRODUCTION

Histopathological findings on a skin disease of horses which has been called "Kasen" in Japan were described in detail by ICHIOKA et al., SASAKI and co-workers, UENO and ISHIHARA, NAKAMURA et al., and TANIGUCHI. Active etiological discussions on the findings obtained by such authors were conducted, e. g. ICHIOKA et al. advocated parasite theory, NAKAMURA et al. and UENO and ISHIHARA allergy theory, whilst SASAKI and co-workers and TANIGUCHI laid emphasis on the part played by the microfilaria of *Onchocerca*.

The authors of this paper were also interested in the disease (SATOH—one of the present authors is participating in NAKAMURA's work), and at this time intended conducting histogenetic investigation on the changes of skin which were indispensable for etiological discussion.

The present authors, however, feel regret for being confronted with difficulty in collecting necessary materials for this investigation due to the character of the disease.

Therefore, cases obtained in Honshu and Hokkaido were employed for comparative study. A total of 188 cases examined microscopically including those already reported in the previous papers by other authors were investigated with results as described below.**

* To-date, the name "Kasen" has been employed in Japan's veterinary field. "Kasen", however, means "Sommerausschlag" literally and is not regarded to be a proper word.

** The authors are greatly indebted to Dr. ISHIHARA, Dr. SASAKI and Prof. NAKAMURA for kindly supplying the materials investigated.

MATERIALS

Materials investigated consisted of ISHIHARA's 14 cases (No. 1~No. 14) and SASAKI's 41 cases (E number 11 cases, F number 12 cases, Ft number 13 cases and others 5 cases)—which are all Honshu cases, NAKAMURA's 100 cases (44 cases in 1953, 17 cases in 1954, 38 cases in 1957 and one other case) and 33 cases in Obihiro.

Most of the materials were collected between June and August while those from Obihiro were collected between August and November. Except 2 autopsied cases, the skin materials investigated were all obtained through biopsy. Those pieces of skin were on an average a few millimeters in length, except a small number measuring 3~4 cm.

RESULTS

Description by Cases

The followings are the authors' histological findings on 24 cases, the majority of which are illustrated in the attached figures (Honshu cases: No. 7, No. 10, No. 13, E. 29, E. 30, E. 2435, E. 2437, E. 2439, Ft. 22 & Ft. 23, Hokkaido cases: E. 859, E. 861, E. 870, E. 885, E. 1491, E. 1536, E. 2348, E. 2413, Obi. 3, Obi. 5, Obi. 6, Obi. 7, Obi. 12 & Obi. 14).

No. 7 (Fuku 1, No. 4) Right side of the neck (Size of section preparation: 0.5×0.1 cm) (Fig. 5)

The surface of the skin was clean and somewhat smooth. In a part of the epidermis (0.1 cm diameter in the preparation), necrobiosis was manifested in all layers. In other part, one or two small focal lesions, such as vacuolar degeneration of spinosum cells were observed. In the papillary layer connected with necrobiosed area, focal necrobiosis was seen and pycnosis of wandering cells, chiefly eosinophils and fixed cells were both observable. On the other hand, eosinophils were scattered about in the superficial layer of the corium. In the profound layer of the corium perivascular tissues were slightly edematous and loosened. In such regions, marked eosinophilic cell infiltration was detected.

No. 10 (Fuku 1, No. 17) Right side of the neck (Size of section preparation: 0.5×0.3 cm)

The surface of the skin was clean and slightly uneven. The epidermis was thin. Slight eosinophilic cell infiltration was seen around the small blood vessels in the superficial layer of the corium. In the profound layer, perivascular and periglandular areas were slightly edematous and loosened. Cell accumulation such as chiefly eosinophils, small round cells and histiocytic cells was found in these areas.

No. 13 (Fuku 1, No. 5) Right side of the neck (Size of section preparation: 0.7×0.3 cm)

Two small microscopically visible depressed areas were found on the surface of the skin. The papillary layer which was pushed up from the profound layer was accompanied by a mass of necrobiosed tissue. This mass of tissue was covered with necrobiosed epidermis. Papillary layer was rich in cells. This papillary layer consisted of loose accumulation of roundish fibrocytes mixed with small round cells and a small number of eosinophils. Tissue around the small blood vessels of the epidermis was edematous and loosened. Wandering cell infiltration, chiefly eosinophils, was somewhat remarkable.

E. 29 Forebreast (Size of section preparation: 0.4×0.2 cm) (Fig. 20).

The surface of the skin was clean. Perivascular areas of the papillary layer were rich in fibrocytes and showed a compact appearance. The perivascular areas of the profound layer of the corium showed the same findings as the papillary layer, and eosinophils were accompanied. A somewhat demarcated necrobiosed focus was observed. A large number of degenerated eosinophils was also found in the focus.

Crest (Size of section preparation: 0.6×0.2 cm)

Perivascular area in the corium containing papillary layer was rich in cells. These cell elements were mainly fibrocytes which lost their freshness, small round cells and eosinophils. Degenerated naked nuclei were frequently observed.

E. 30 Papule on the left side of the upper part of the neck (Size of section preparation: 0.6×0.1 cm) (Figs. 17 & 18).

The corium was rather rich in cells. Mainly in the perivascular areas of the papillary layer, eosinophilic and small round cellular infiltration was detected. Two small necrobiosed foci were also found there. The foci were filled with degenerated nuclei and all of the foci had assumed pale eosinophilic color.

E. 2435 ("Ejiri") Papule (Size of section preparation: 0.5×0.3 cm) (Fig. 22)

The surface of the skin was clean. The corium was markedly rich in cells and edematous. The small blood vessels of the papillary layer were hyperemic and some of them showed perivascular fibrocytic accumulation. A good many eosinophils were accumulated in the loose connective tissue of the corium, and in some part of the area accumulated eosinophils became necrobiotic as well as around the connective fibers. Contacting with foci or independently, demarcated focal lesions consisting of roundish fibrocytes were scattered.

E. 2437 ("Nichigo") Papule (Size of section preparation: 0.5×0.3 cm) (Fig. 9)

The surface of the skin was clean and some of the spinosum cells showed vacuolar degeneration. Focal eosinophilic cell accumulation was observed in the papillary layer, particularly in the area where the small blood vessels congested. Interfibrillar areas or the surroundings of the small blood vessels of the corium were edematous and eosinophils were slightly infiltrated. These cell elements were all broken down and pycnotic nuclei were distributed. Granulae of eosinophils also occurred scatteringly.

E. 2439 ("Takeguro") Papule (Size of section preparation: 0.8×0.3 cm)

The surface of the skin was clean except one small circumscribed lesion (0.1 cm). This lesion consisted of pin-head sized masses of necrobiosed tissues. These tissues were the tissue of papillary layer and the surface was covered with necrobiosed epidermis which was separated from adjacent tissues. The surroundings of the small blood vessels of the papillary layer were somewhat rich in cells. Cell component was chiefly roundish fibrocytes and a small number of eosinophils. In the corium layer, the surroundings of the small blood vessels of the interfibrillar or periglandular areas were edematous. Increase of fibrocytes and chiefly eosinophilic wandering cell infiltration were somewhat conspicuous. A great deal of eosinophils was scattered about in the extraprotoplasm.

Ft. 22 Papule on the left side of the forebreast (Size of section preparation: 0.4×0.3 cm) (Figs. 3 & 19)

The surface of the skin was clean and blood vessels of the papillary layer were congested. Interfibrillar and perivascular areas were markedly edematous in the profound layer of the corium. Eosinophilic cell infiltration was remarkable. Granulae of eosinophils and degenerated nuclei were distributed all over. Irregularly shaped necrobiosed foci were found. The center of these foci consisted of several degenerated cell masses.

Papule on the left shoulder (Size of section preparation: 0.4×0.2 cm)

The surface of the skin was clean. Roundish fibrocytes in the papillary layer were focally proliferated in some part of the layer. Loose connective tissue of the corium was slightly edematous and an increase of cells was rather outstanding. Cell elements comprised mainly fibrocytes, small round cells and plasma cells, and a small number of eosinophils.

Ft. 23 Papule on the left shoulder (Size of section preparation: 0.6×0.3 cm) (Figs. 15 & 16)

The surface of the skin was clean. Loose connective tissues in the interfibrillar and perivascular areas of the corium were edematous, and eosinophilic cell infiltration was remarkable to a certain extent. Naked nuclei and granulae of eosinophils were scattered. Around the small blood vessels of the papillary layer, roundish fibrocytes were slightly increased in number.

Papule on the right shoulder (Size of section preparation: 0.4×0.2 cm)

The finding on this portion was similar to the above, but manifestation was conspicuously slight in degree.

E. 859 Left side of the neck (Size of section preparation: 0.4×0.2 cm) (Fig. 8)

The surface of the skin was clean. Degenerated naked nuclei were scattered about in the corium. In the profound layer, two arteries showed homogeneous swelling of the wall and its cell nuclei disappeared.

E. 861 Nodule on the left side of the neck (Size of section preparation: 0.5×0.4 cm) (Fig. 6)

Epidermis remained taking the shape of an island. The rest of the area showed necrobiosis (nearly liquefaction) and necrobiosis expanded not only on the surface of the defective epidermis, but also on the remaining epidermis layer. Consequently the epidermis was covered with a thin layer of necrosed tissue. The superficial area of the papillary layer connected with epidermis showed necrobiosis and was occupied by a compact thin wall which consisted of naked nuclei. Loose connective tissue was edematous from papillary to profound layer of the corium of which a large portion showed abundant degenerated naked nuclei and granular fragmented nuclei. In the other area, roundish fibrocytes were slightly increased.

E. 870 Nodule on the left side of the neck (Size of section preparation: 0.3×0.4 cm) (Fig. 7)

The surface of the skin was clean. Interfibrillar and perivascular areas of the corium were edematous. Eosinophilic cell infiltration and slight proliferation of fibrocytes were

noted. In the subepidermic area, degenerated naked nuclei were slightly noticeable. One of the sebaceous glands had degenerated and showed atrophic appearance.

E. 885 Nodule on the left side of the crest (Size of the section preparation : 0.7×0.6 cm)

The surface of the skin showed an irregular appearance and a part of the epidermis was desquamated. There were focal lesions accompanied by edematous swelling of spinosum cells. Papillary layer under the epidermis lesions showed necrobiosis, and degenerated naked nuclei and neutrophilic leucocytes were accumulated sparsely or compactly. In these areas, mitoses were often noted in the Malpighian layer. In the papillary layer, some portions showed perivascular fibrocytic proliferation. Loose connective tissues of the corium were somewhat edematous and degenerated naked nuclei, eosinophils and neutrophils were noted.

E. 1491 Nodule on withers (Size of section preparation : 0.7×0.4 cm) (Figs. 13 & 14)

Some parts of the epidermis showed superficial small erosive surface, on some of which tissue detritus mixed with erythrocytes were adhered. In addition, vacuolar degeneration of spinosum cells was sporadically demonstrated on some parts of the epidermis. Edema and congestion of capillaries were conspicuously observed in the papillary layer right underneath such epidermis. In the corium, particularly in the area—rich in sudoriferous glands, considerably marked eosinophilic cell infiltration was manifested. Congestion and edema were also shown. Fibrocytic cells were slightly increased in number.

E. 1536 Root of the tail (Size of section preparation : 0.6×0.5 cm) (Figs. 1, 2 & 4)

The surface of the skin was almost normal, but some parts of the epidermis showed small necrobiosed foci. Degenerated naked nuclei, neutrophilic leucocytes and erythrocytes were sparsely contained in the foci. Papillary layer under the foci showed similar changes. The other corium layer showed no outstanding change.

E. 2348 Papule on the root of the tail (Size of section preparation : 0.7×0.6 cm) (Figs. 10 & 11)

The surface of the skin was almost normal, but edematous loosening was conspicuous in two or three portions of the papillary layer. Epidermis cells covering such places showed slight vacuolar degeneration. Loose connective tissue of the corium from surface to reticular layer was edematous and eosinophilic cell infiltration was manifested. A small portion close to the surface of the corium was focally necrobiotic.

E. 2413 Submaxillary area (Size of section preparation : 2.4×0.6 cm)

The surface of the skin was clean and a hemispherical projection (1 cm in diameter) was seen, where marked eosinophilic cell infiltration was noted from the profound layer of the corium to the subcutaneous muscle tissue. Perivascular small round cells were rich in number. One pin-head sized necrobiosed focus was detected. This focus was covered with thin fibrous tissue and some giant cells accompanied it. Around the projected area, slight eosinophilic cell infiltration was noticeable.

Neck (Size of section preparation : 1.7×0.4 cm)

Almost normal.

Withers (Size of section preparation : 4.0×1.4 cm) (Fig. 12)

Keratinous substance depositing tissue detritus was attached to the surface of the skin. The epidermis itself showed no substance defect nor other lesions. In general, slight eosinophilic cell infiltration was seen in corium. Papillary layer manifesting sporadic proliferation of fibrous tissues was edematous and outstanding eosinophilic cell infiltration was to be seen.

Upper side of the root of the tail (Size of section preparation : 2.3×1.9 cm)

Papillary layer showed slight edema and eosinophilic cell infiltration. In some parts of the layer, infiltration was somewhat remarkable.

Foreleg (Size of section preparation : 1.4×0.3 cm)

Fibrous tissue proliferation was noted in two or three portions of the papillary layer.

Obi. 3. Withers with worn-out hair and thickened skin (Size of section preparation : 0.4×0.4 cm)

Keratinous substance which deposited tissue detritus was attached to the surface of the skin. Erosion was found in the epidermis. On the other hand, spinosum cells with vacuolar degeneration were found showing small focus or sporadic distribution. Papillary layer was edematous and the blood vessels were congested. Degenerated naked nuclei and neutrophilic leucocytes were very noticeable. Coarse argyrophilic fibers were proliferated.

Obi. 5. Withers with worn-out hair and thickened skin (Size of section preparation : 0.4×0.5 cm)

Keratinization of the epidermis was striking. Loose connective tissue of the corium was edematous and eosinophils slightly infiltrated. A small necrobiosed focus was found. Around the small blood vessels of the papillary layer, fibrocytes were increased in number. An increase of argyrophilic fibers were also found.

Obi. 6. Withers with worn-out hair and thickened skin (Size of section preparation : 1.5×0.6 cm) (Fig. 21)

Keratinization of the epidermis was prominent. Perivascular fibrocytic cell proliferation in the papillary layer was considerably marked. Argyrophilic fibers were also proliferated. Eosinophilic cell infiltration was slight. Eosinophilic and small cell infiltration was somewhat remarkable in some parts of the loose connective tissue of the profound layer of the corium.

Obi. 7. Withers with depilated long hair (Size of section preparation : 1.1×0.5 cm) (Fig. 24)

Keratinization of the epidermis was very noticeable. Subepidermic papillary layer was rich in cells. These cell elements consisted mainly of histiocytic elements which proliferated around the blood vessels. One mass of circumscribed fibrous tissues was found in the profound layer of the corium.

Obi. 12. Root of the tail with thickened skin and short hair (Size of section preparation : 0.7×0.6 cm)

Keratinization of the epidermis was striking. The loose connective tissue of the corium was rich in fibrocytes and these degenerated naked nuclei were found in a cluster. Eosinophilic cell infiltration was slight. Argyrophilic fibers were perivascularly

proliferated. Just one giant cell was detected in the papillary layer closely subjacent to the epidermis.

Obi. 14. Root of the tail with depilated long hair and thickened skin (Size of section preparation: 1.0×0.4 cm) (Fig. 23)

Keratinization of the epidermis was marked. An increase of fibrocytes was found in the loose connective tissue of the corium and these tissues showed small round cell infiltration. Such findings were conspicuous especially in the papillary layer right underneath the epidermis, around the area of sudoriferous glands and the root of the hair, etc.

General Findings on the Skin

Epidermis The lesions originate in vacuolar degeneration of spinosum cells and later form circumscribed necrobiotic foci. During the course of these changes, eosinophilic and small round cell infiltrations are always found in the papillary layer of the corium (Figs. 1 & 2). In further advanced stage, minute substance defects are formed. Tissue clusters mixed with serous fluid are attached to the marginal surface of the epidermis as well as to the deeper region (Figs. 4 & 6). The appearance of such serial epidermic changes is not limited only to focal lesions which are clinically called papules, nodules etc. These lesions are frequently observed in section preparations by means of microscopy (descriptions follow later).

Corium Exudation in all the layers of the corium is the main finding. Exudation by serous fluid, regardless of its extent, takes place in interfibrillar and perivascular portions, and in the other loose connective tissue area (Figs. 10 & 11). Eosinophils predominate over other infiltrated cells in number (Figs. 9 & 13). It is not clear which comes first in the infiltrative changes, fluid or cell element. The most interesting changes observed are dispersion of granules resulting from degeneration of infiltrated eosinophils (Figs. 14 & 16). These changes can easily be found in the area where infiltration takes place remarkably. Degenerated naked nuclei simultaneously attracted the attention of the present authors. Most of these degenerative cell elements must be eosinophils, but some of them are fibrocytes or others. In this way, large or small clusters are formed by degenerated cell nuclei (Figs. 3 & 4). Necrobiosed foci are formed in a cluster together with histiocytic cell elements in a somewhat larger focus (Figs. 17~20). A thin layer with a wall-like appearance of destroyed cells is formed in the papillary layer closely subjacent to the epidermis as a change belonging to the same category with the above mentioned (Figs. 5 & 6).

Exudative change in the corium is always accompanied by congestion of the small blood vessels. Hemorrhages are not conspicuous. The end result of exudative and degenerative changes in the corium can be classified as due to two processes. The one is a superficial process and in most cases lesions are advanced with epidermis lesions. That is, large or small ulcers are formed. Under such circumstances, the lesions are of course contaminated and rubbing by animals or other mechanical agents causes the lesions to become complicated (eczema, abscess and crack etc.). The other process indicates that the lesions exist in the corium, accompanied by following described reactive changes. In

the corium, some other degenerative changes are found. That is, necrobiosis of sebaceous glands (Fig. 7) and fibrinoid swelling of the arterial wall (Fig. 8).

The former change illustrates a complete loss of normal structure in glands and formation of masses of degenerated and atrophied glandular cells. The latter of the degenerative changes is found in the deeper layer of the corium where one side of the vascular wall was thickened and showed a homogeneous appearance with loss of nuclei.

Reactive changes in the corium present pictures of proliferation, one of them is a sequel to the above described focal exudative necrobiotic changes and exhibits an accumulation of fibroblastic cells (Figs. 22, 23 & 24). Around the lesions giant cells often appear. Some cell accumulations show a part of local tissue figure. Small round cell infiltration is also found. The other reactive change appears in the exudated area of the papillary and subpapillary layer. That is to say, the figure which forms the dense cuffing along the blood vessels can easily be pointed out (Fig. 21). Proliferative changes depend on the foregoing changes in terms of extent.

Frequency in Occurrence of Skin Lesions

Materials are classified into groups (Table).

TABLE *Frequency in Occurrence of Skin Lesions*

ORIGIN OF MATERIALS	NUMBER OF INVESTIGATED CASES	KINDS AND NUMBER OF HISTOLOGICAL CHANGES				
		Epidermis		Corium		
		Degeneration· Necrosis	Exudation	Degeneration· Necrosis	Proliferation	
Honshu	ISHIHARA's cases	14	10	2	1	2
	SASAKI's cases	41	4	20	10	12
Hokkaido	NAKAMURA's cases	100	21	59	21	16
	Obihiro cases	33	4	15	3	30

It will be important and useful to conduct critical studies on the clinical findings and courses of the individual 188 cases investigated in connection with the localization and extent of lesions. Setting side the question of the satisfactoriness of materials, the following are the noticeable points obtained in the present investigation. First of all, as for corium lesions, the occurrence of these changes is exclusively high in ISHIHARA's cases on account of his use of biopsy materials which were obviously obtained from cases of initial lesions, according to his own report. SASAKI's cases in the Honshu materials and NAKAMURA's cases in Hokkaido also show relatively high frequency in occurrence, but Obihiro cases are low. The majority of collected materials among Obihiro cases are normally composed of cases with the later changes, for the biopsy materials were collected starting from the cool autumn season and were obtained from the long hair region of the neck,

tail and other part of the body with worn-out hair and thickened skin.

In regard to SASAKI and NAKAMURA's cases, it is impossible to make a definite comment, as the materials were collected under various conditions. However, it may be significant to make reference to the cases in an advanced stage and in NAKAMURA's cases which allow the mingling with a large number of biopsy materials collected from long hair portions of the neck, tails and other parts of the body. It is obvious that various tissue lesions mentioned above were observed in examined materials regardless of any distinction between Honshu and Hokkaido. It is also undeniable that a distinctive connection exists among the described lesions.

DISCUSSION

Nature of the Lesions

In domestic veterinary literature, importance has not been attached to the epidermis lesions of the disease. One of reasons is that etiological discussions for this disease had been concentrated on the role of microfilaria which is parasitic on the corium. For example, it should not be fully agreed that these lesions such as ulcer, crust formation and others have been clinically described as attributable only to rubbing or bites.

Degenerative and necrotic process in epidermis apparently is a characteristic essential process of the disease. According to ISHIHARA's close investigation on the stadium of the pathological changes, there, however, might be many possibilities that small foci of the epidermis may be completely healed without leaving trace of the development of the disease.

In regard to the lesions of the corium, no remarkable distinction was noticed in describing them; exudation as the main figure of the disease is described by many investigators. But the authors could not surely observe the figure of fibrinoid swelling as UENO and ISHIHARA did.

At any rate, exudative changes in the corium are relatively remarkable regardless of material groups. The authors therefore will have to state that the intensity of degenerative and necrotic changes of cells consist mainly of infiltrated cells as the most curious finding. Normally degenerative figures of infiltrated cells, usually seen as lesions under microscope, are not rare. The authors, however, would like to place emphasis on infiltrated cells which give an impression of having degenerated one after the other without any special circumscribed lesions in cell infiltrated tissue area. Therefore, in the superficial layer of the corium, substance defect and its sequela appeared with epidermis lesions, and a nucleus of small necrotic focus is formed in various portions of the corium layer. In the final stage, this nucleus become an anlage of fibrous tissue mass. But the authors consider from the synthesization of many biopsy findings that morphological changes in tissue which remain as sequels of exudation are generally

slight and possibly disappear during the course of the disease in comparatively many cases.

Clinically, according to the regions where the lesions occur, the disease is classified into the types of short hair, long hair, and long hair with short hair (ISHIHARA, SASAKI and NAKAMURA). The present authors, however, have no fundamental data for discussing this point now. UENO and ISHIHARA offered discussion in connection with these types and agents, while NAKAMURA et al. paid special attention to the connection of these types and regions of occurrence. According to the results obtained in the present investigation, such types do not seem to have significant connection with the nature of the lesions.

Sequence of Appearance of Lesions

It has been described clinically that itchiness appears before papular lesions (UENO and ISHIHARA)⁸⁾ or that papular lesions appear with itchiness (NAKAMURA et al.)⁹⁾, and it has also been stated that small circumscribed lesion of rice-grain size is the initial lesion (SASAKI and SANO)⁴⁾.

The authors, are unable to illustrate the lesions which are clinically characteristic up to today, described as papular swellings or nodules within the range of the present investigation. In a word, it seems that so-called "papule" or "nodules" are only elevations of specially remarkable area of the exudative lesions. In consequence, in the neck, crest and root of the tail etc. which are covered with long hair, the lesions, different from those in short hair region, seem to be first mentioned by veterinarians after the disease had reached an advanced stage. It is usual that in this disease itchiness naturally disappears in the cool autumn season and the external appearance of the skin normally indicates healing by the time of spring. In Obihiro cases in this report, the existence of hyperplasia of the epidermis and proliferative changes of the corium endorsed the foregoing stated findings. In other words, the lesions in all cases manifest similar changes—that degenerative changes of epidermis and corium appear in parallel with the exudative change in corium, except favorable localization of the lesions which vary depending on where materials are obtained. In respect to its causal genesis, the authors can hardly agree with the theory of microfilariasis for only in a small number of cases among many biopsy materials were microfilariae detected under microscope and the parasites were rarely found even by painstaking effort. This, however, does not mean disregarding SASAKI et al. and, UENO and ISHIHARA who advocated that the parasitism of many microfilariae in the disease will cause itchiness and the existence of direct reactive changes to parasites.

SUMMARY

The authors synthetically examined histopathological findings of biopsy materials in allergic dermatitis of the horse in Japan. Results obtained showed that short hair type in Honshu and long hair type in Tohoku and Hokkaido both essentially present the same skin changes. In conclusion, the authors could state definitely that the initial lesions were exudation in the corium and the degeneration and necrosis in both skin layers which appeared in parallel with the former.

There are grounds still left for the extension of knowledge on the pathology of allergy by detailed systematic investigation of diseased horses in the future.

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EXPLANATION OF PLATES

Each plate illustrates microscopically photographed preparations which are paraffin-embedded and hematoxylin-eosin-stained sections. For explanation of plates see text of this report.

PLATE I.

Fig. 1.	E.	1536	× 150.
Fig. 2.	E.	1356	× 150.
Fig. 3.	Ft.	22	× 300.
Fig. 4.	E.	1536	× 150.
Fig. 5.	No.	7	× 150.
Fig. 6.	E.	861	× 90.

PLATE II.

Fig. 7.	E.	870	× 90.
Fig. 8.	E.	859	× 150.
Fig. 9.	E.	2437 ("Nichigo")	× 150.
Fig. 10.	E.	2348	× 150.
Fig. 11.	E.	2348	× 150.
Fig. 12.	E.	2413	× 90.

PLATE III.

Fig. 13.	E.	1491	× 90.
Fig. 14.	E.	1491	× 600.
Fig. 15.	Ft.	23	× 90.
Fig. 16.	Ft.	23	× 600.
Fig. 17.	E.	30	× 90.
Fig. 18.	E.	30	× 300.

PLATE IV.

Fig. 19.	Ft.	22	× 90.
Fig. 20.	E.	29	× 90.
Fig. 21.	Obi.	6	× 90.
Fig. 22.	E.	2435 ("Ejiri")	× 90.
Fig. 23.	Obi.	14	× 90.
Fig. 24.	Obi.	7	× 90.







