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PLASMACYTOID CELLS OF CANINE PERIPHERAL BLOOD IN ELECTRON MICROSCOPY

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The fine structures of the agranulocytes (plasmacytoid cells) with clear rough-surfaced endoplasmic reticulum in the peripheral blood of the clinically normal dogs were studied under an electron microscope. The results thus obtained were summarized as follows.

1) The general figures of the cells were round or oval; however, they had many small rod- or horn-like pseudopodic projections from the contours.

2) The nuclei of the cells had several nuclear indentations or sharp incisions; therefore, they generally looked irregular in shape.

3) The presence of poorly to moderately developed rough-surfaced endoplasmic reticulum, a large amount of free ribosomes and well-developed Golgi complex were the characteristics of the cytoplasm of the cells.

4) Judging from the frequency of their appearance, it was proposed that the cells of this type ought to be thought of as one of the usual cellular constituents of the canine peripheral blood.

INTRODUCTION

In the previous papers[10~13], the authors reported on the fine structures of 4 kinds of leukocytes such as neutrophils, eosinophils, monocytes and lymphocytes in the peripheral blood of clinically normal dogs. When these observations were conducted, several agranulocytes with clear rough-surfaced endoplasmic reticulum were detected.

In this paper, the fine structures of the cells of this type (abbreviated as plasmacytoid cells) will be described.

MATERIALS AND METHODS

The blocks used for the electron microscopic observations and methods of the observations were just the same as those used in the previous papers[10~13].

OBSERVATIONS

The general shapes of the cells of this type were round or oval, however, they had so many small rod- or horn-like pseudopodic projections that they looked irregular in the

contour.

Nucleus

The nuclei of the cells had several nuclear indentations or sharp incisions; therefore, they generally looked considerably irregular in shape on the cut planes. They showed usually one nuclear lobe, but nuclei with two lobes were sometimes seen. The nuclear chromatin was dense on the periphery of the nucleus; however, the maculous appearance was not so marked. In the nucleoplasm, a lot of small granular aggregations with high density were scattered at random. In some of the nuclei, the remnant of a nucleolus was present.

Cytoplasm

The characteristics observed in the cytoplasm of the cells of this type were the presence of poorly to moderately developed rough-surfaced endoplasmic reticulum, a large amount of free ribosomes, and well-developed Golgi complex. The endoplasmic reticulum was developed moderately and ran concentrically around the nucleus in the cytoplasm, but in some cells, it was ill-developed and several short, cut tubular ones were present irregularly in the cytoplasm. In a few cells in which the nucleus was located eccentrically in the cytoplasm, they were only in the wider area of the cytoplasm. In general, the endoplasmic reticulum was narrow canalicular in form, but sometimes, it dilated slightly at some parts and looked like cisterne. Inside the endoplasmic reticulum, there were less dense materials than those observed in the cytoplasm. The ribosomes adhered to the outside surface of the endoplasmic reticulum, in addition, free ribosomes were seen abundantly all over the cytoplasm.

Golgi complexes were seen in some cells of this type on the cut planes. They were moderately or well-developed and located in the area on one side of each cytoplasm. They consisted of lamellar, vesicular and granular structures. In or near the Golgi area, round dense granules in various sizes and of a dense mass, irregularly shaped, were sometimes observed. In the same area, a centriole was rarely observed. A few or several mitochondria were seen in the cytoplasm. They were gathered in a part of the cytoplasm; however, in some other cells, they were seen anywhere in the cytoplasm. They were round, oval or rod-like in form. Their sizes were 0.41 μ in diameter for the round ones and 0.43 by 0.70 μ for the rod-like ones on the average, respectively.

CONSIDERATIONS

In the human peripheral leukocytes, ANDERSON described the presence of the agranulocytes with clear rough-surfaced endoplasmic reticulum in the normal state. He thought them to be "the fourth type of agranulocytes" in the human blood.

Judging from the micrographs, the cells described as the monocyte-plasmacyte intermediate cells by LOW might be the same cells as this type.

Recently, DOUGLAS et al. divided the mononuclear cells in normal human peripheral blood into 3 types, viz., small- and medium-sized lymphocytes, monocytes

and lymphoid-plasma cells which contained relatively prominent rough-surfaced endoplasmic reticulum. These 3 types of mononuclear cells also occurred in peripheral blood of infectious mononucleosis patients and there was an increase in the number of lymphoid-plasma cells.

The lymphoid-plasma cells reported by them seemed to be just the same as those shown by the present authors in their morphological characteristics.

Furthermore, the fine structures of the atypical lymphocytes of the infectious mononucleosis showed by AMAGI & HIGO were very similar to the cells of this type.

In the report on canine normal peripheral leukocytes, SHIVELY et al. pointed out the presence of cells of the same types as those described by the present authors. They described them under the name of plasma cells.

In the equine blood, SONODA and SONODA & KOBAYASHI reported the presence of the cells of this type in both clinically healthy[8] and infectious anemia[9] horses. In their studies, the cells of this type were observed more abundantly in the blood of the latter group, and they divided them into 4 sub-types of I~IV from the structures and distribution of the endoplasmic reticulum.

Furthermore, SONODA & MARSHAK reported the presence of the cells of this type in the peripheral blood of the clinically normal and lymphosarcoma cattle.

In the paper on the thoracic duct cells of the calf by WEBER & JOEL, the cells of this type were described under the names of plasmacyte or proplasmacyte.

During the course of the present electron microscopy of the canine peripheral blood, several cells of this type were observed, however, basophilic leukocytes had not been detected in them at all. Furthermore, as shown in the hematological findings of the previous paper[10], the basophilic leukocytes were scarcely seen in the peripheral blood of the same dogs. On the other hand, so-called atypical lymphocytes differentiated from the usual lymphocytes by the severe basophilic stain were detected in 0.5~1.5% or so of the cells.

Judging from the characters of the stain, the fine structures and the frequency of appearances, the atypical lymphocytes in light microscopy and the plasmacytoid cells in electron microscopy are thought to be the very same cells.

From the fact that the atypical lymphocytes or the plasmacytoid cells were detected more frequently than the basophilic leukocytes which are one of the usual cellular constituents of the blood, the authors would like to propose that the atypical lymphocytes or plasmacytoid cells ought to be thought of as one of the usual cellular constituents of the canine peripheral blood, though they were observed in small numbers.

On the mechanism of the appearance of such cells in the peripheral blood, SHIVELY et al. considered that it seemed to them that some cells transformed

to cells having characteristics of plasma cells after antigenic stimulation of the host left the organ and circulated in the vasculature. On the other hand, it has been shown that the cells of this type were present among the thoracic duct cells of the dogs[4], though they were described under the name of the plasma cell. Therefore, the authors would like to consider that the cells of this type will appear in the peripheral blood from the lymph of the thoracic duct.

In the present paper, the authors did not use the name of plasma cell for the cells of this type as used by some other workers[4,7,15], because of the presence of nuclei of irregular form, the simple lamellar structure of the endoplasmic reticulum and because there exists some doubt concerning the possibility of the appearance of histiocytes such as plasma cells in the peripheral blood in the normal state.

The character of the cells described under the name of plasmacytoid cells in this paper need to be clarified by further studies.

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Explanation of Plates

Plate I

Figs. 1~4 Four plasmacytoid cells are shown in this plate. All the nuclei of these cells had a few or several indentations, therefore, they are all irregular in form. In the cell in fig. 1, the nucleus is divided into two lobes and rough-surfaced endoplasmic reticulum are present concentrically around the nucleus in the cytoplasm. On the other hand, in figs. 2~4, they are distributed irregularly in each of the cytoplasm.

The nucleus of the cell in fig. 4 is severely eccentric. Large Golgi complexes are present in the cytoplasm of the cells in figs. 2~4. They consist of lamellar, vesicular and granular structures. A few mitochondria are seen in each area of cytoplasm in the cells.
× 11,000

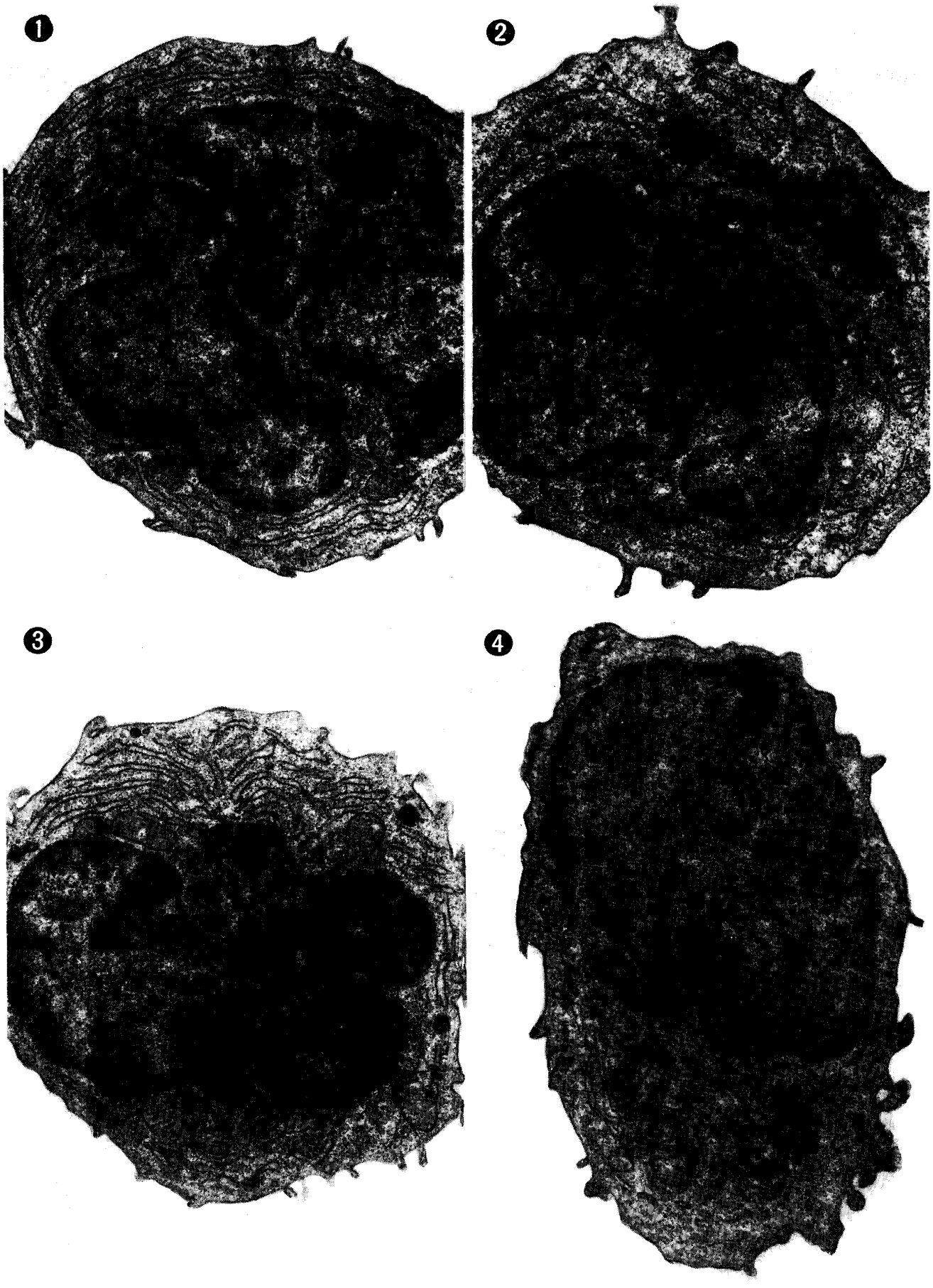
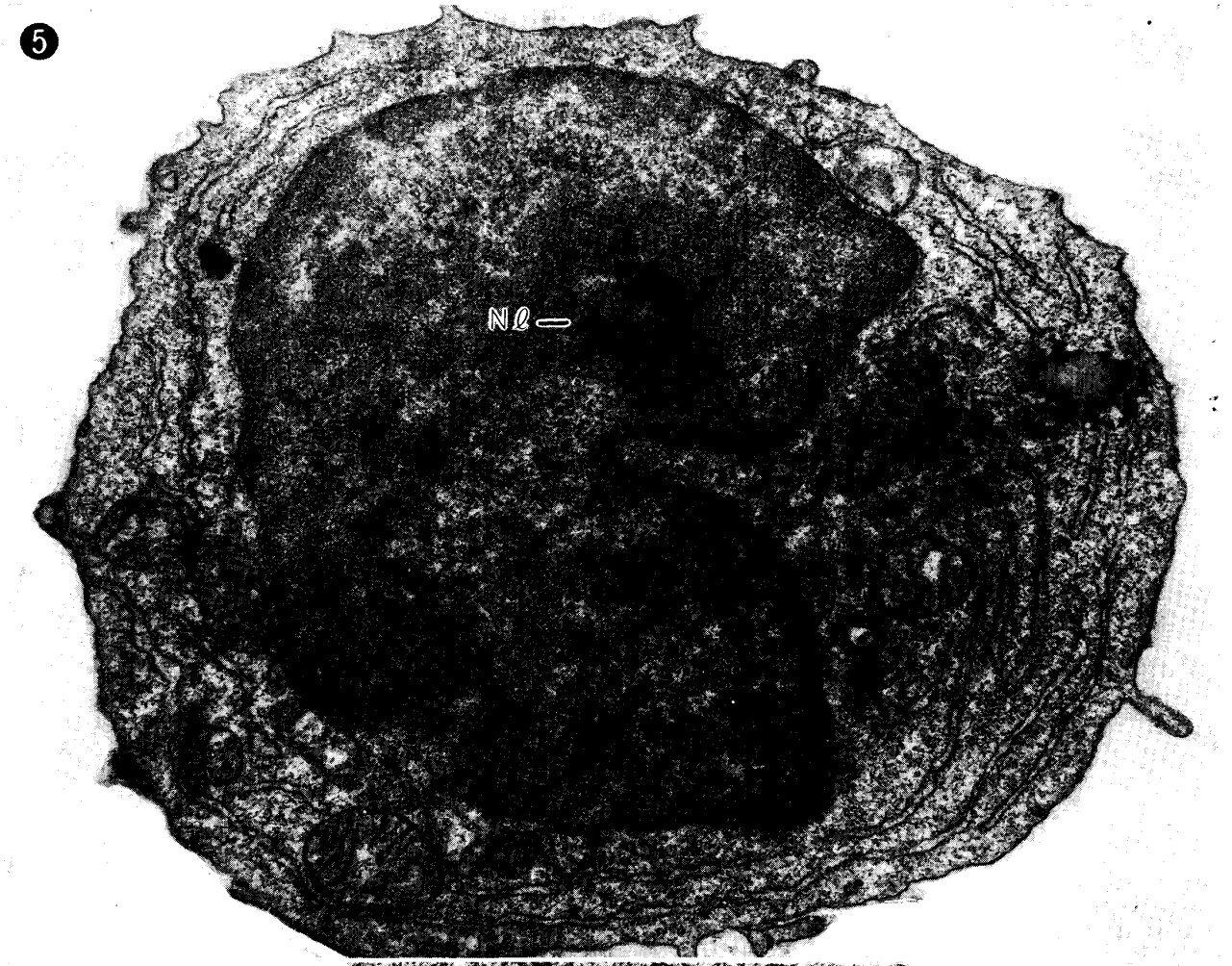
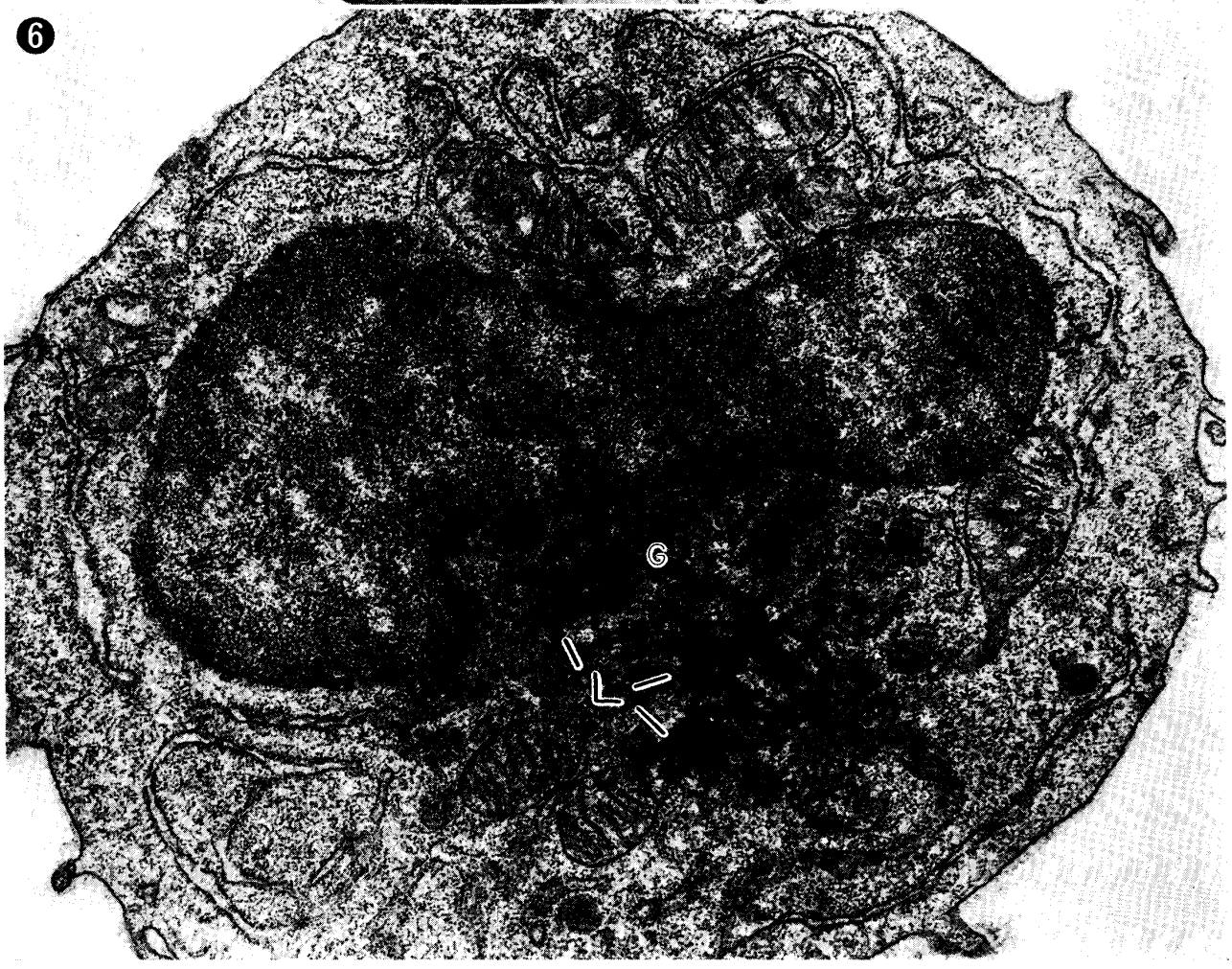

1
2
3
4

PLATE II

Fig. 5 The nucleus has a deep indentation and it looks like a broad bean. The rough-surfaced endoplasmic reticulum are present concentrically around the nucleus in the periphery of the cytoplasm. A remnant of a nucleolus (Nl) is seen in the nucleus. A lot of free ribosomes are in the cytoplasm. × 17,000

Fig. 6 A few rough-surfaced endoplasmic reticulum are distributed irregularly in the cytoplasm. A Golgi complex (G) is well-developed near the central area. In this area, a few clusters of lipid (L) with high density are seen. Free ribosomes are abundant in the cytoplasm. × 15,000


5
Nℓ


6
G