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FELINE NEUTROPHILS IN ELECTRON MICROSCOPY

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The neutrophils of the cardiac blood obtained from 6 clinically healthy adult cats were observed by the use of electron microscopy. The fine structures of them were basically similar to those of the human and other animals.

However, the following interesting findings were obtained.

1) The specific granules of the cells were classified into 3 types such as the homogeneously compact ones with high electron density, less dense ones with granular matrix and light or almost empty ones.

2) As the internal structure of the specific granules, so-called middle plates were observed in some of the granules with high electron density.

INTRODUCTION

The fine structures of the feline leukocytes have been observed by some investigators^{3~5,11,16}), however, most of them are only on the eosinophils in the bone marrows, because the cells have very attractive internal structures in the granules. So far as the authors know, there are no electron microscopic observations on the feline neutrophils of the peripheral blood in the references.

In the present paper, the fine structures of the neutrophils in the feline cardiac blood will be described.

MATERIALS AND METHODS

The cats

Six clinically healthy adult cats were used in these experiments.

The leukocytes

The buffy coats of the blood obtained by cardiac punctures were provided for the observations.

Making the blocks

Fixation, dehydration and embedding were just the same as with those of the previous paper¹²).

Observations

After the sections were stained with uranyl acetate and lead citrate, they were examined in an electron microscope, JEM 7 type, at magnifications varying from 3,000~20,000.

OBSERVATIONS

The general figures of the feline neutrophils are fundamentally round or oval, however, there are so many cytoplasmic projections along the cell membrane that they look very irregular in their contours.

Nucleus

The nuclei of the cells show one to four nuclear lobes on the cut planes in accordance with the cut directions. The nuclear lobes are round, oval, short or irregular rod-like in form. The peripheral areas inside of the nuclear lobes are dark by the aggregations of the granular particles with high electron density. They sometimes occupy the central areas and give a maculous appearance.

Cytoplasm

The background of the cytoplasm is filled with fine dust-like particles and it looks gray. In the cytoplasm, there are a lot of granules variable in size and structures. These granules are divided into 3 types on the basis of their electron density, viz., the 1st type granules look very dark with high electron density, the 2nd type ones have medium density and the 3rd type ones have light or almost vacant contents. In the cytoplasm, the 3rd type granules are predominant and the granules of the former 2 types are fewer in their rate of appearance. The sizes of the granules are very variable such as $0.06 \sim 0.29 \mu$ in the 1st type, $0.05 \sim 0.37 \mu$ in the 2nd type and $0.06 \sim 0.20 \mu$ in the 3rd type, respectively.

The form and internal structures of the 1st type granules are round or oval, evenly compact and most electron dense. Among them, there are some granules with so-called middle plates which are more electron dense than those of the matrix. The structures of the middle plates are supposed to be the combinations of a number of the fibrous substances arranged parallel to each other. The middle plates are located in the central areas through the long axis of the granules. The granules with the middle plates are generally spindle-like in form.

The internal structures of the 2nd type granules consist of granular materials, and the 3rd type ones have a few granules or little materials in them. The granules of all the types are lined with clear unit membrane.

A small number of suspected mitochondria with unclear interiors are observed in the cytoplasm. Several of the vacuoles which seemed to be phagocytic or pinocytotic vacuoles are also seen in the areas near the peripheral cytoplasm.

CONSIDERATIONS

The specific granules of the neutrophils have been divided into 2 to 4 types in the human^{1,6~8,10,16,17)} and some animal species^{2,13~16,18)}. Watanabe¹⁶⁾ classified the specific granules into 2 types, A type with less density and C type with empty interiors in the feline neutrophils of the bone marrow, and he stated there were no B type granules with high electron density. In the present observations, however, the specific granules were divided clearly into 3 types by electron

density. The difference between his and the authors' findings may be due to the difference of the blood and bone marrow used in the experiments. Recently, the presence of the special structures in the specific granules has been pointed out in the human^{7,8,10,17}) and some animal neutrophils^{9,13}).

In the present observations, the special internal structures looking just like the so-called middle plates in the eosinophilic granules of the human eosinophils^{11,16}) were observed in some of the granules with high electron density classified as the 1st type by the present authors. Up to the present time, such structures similar to those of ours have not been reported in the neutrophilic granules of any human and other animal species.

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EXPLANATIONS OF PLATES

PLATES I & II

Figs. 1~3 × 17,500

General figures of 3 typical neutrophils are shown in the figures.

The nuclei of the cells have two or three nuclear lobes, respectively. The maculous appearances are evident on the nuclear lobes of the cells. The specific granules with variable size and density are observed in the cytoplasm except on the peripheral areas and pseudopodic projections of the cytoplasm. They are classified into three types of granules. Some granules of each type are shown by Arabic numerals 1~3. A granule with a middle plate in spindle form is pointed out by arrow in figure 2.

Suspected mitochondria (M) are seen in the cytoplasm.

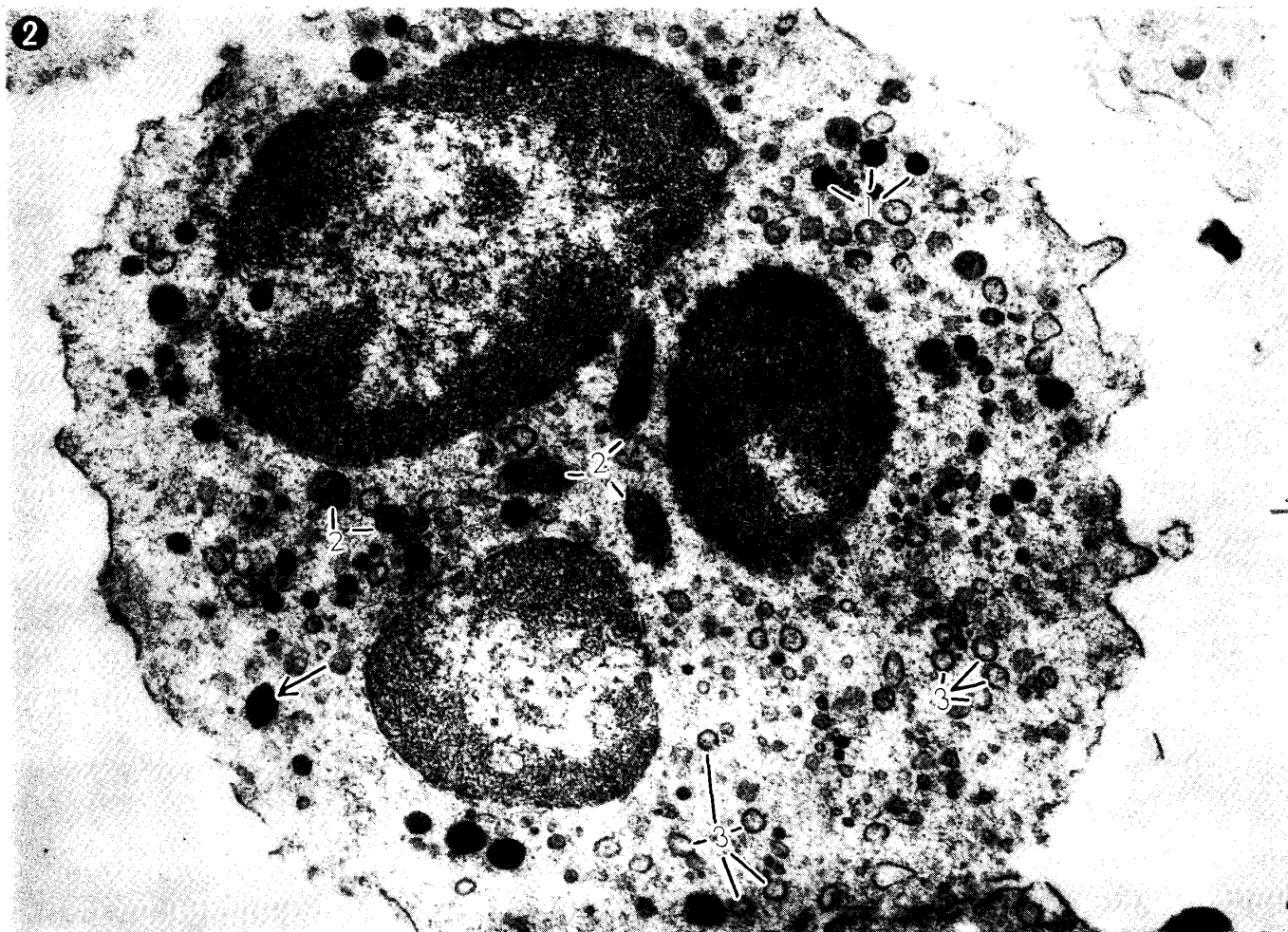


PLATE II

Figs. 4~6 $\times 35,000$

Enlarged figures of the specific granules are shown in the figures. The granules in 3 types of granules are markedly classified. In the 4 granules in figures 5~7, the middle plates are clear (arrows).

