Brief Report

Nuclear Bodies of Normal and Pathological Human Lymph Node Cells: An Electron Microscopic Study

By Robert E. Brooks and Benjamin V. Siegel

A DISTINCT MORPHOLOGIC ENTITY, termed a nuclear body, which occurs in the interphase nucleus of several cell types, has been described in detail in the calf by Weber and co-workers.1,2 A similar body has also been noted within the nucleus of various animal and plant cells.3-16

Continuing studies on the ultrastructure of normal17 and pathologic18 human lymph nodes in this laboratory have revealed the occurrence of nuclear bodies in a number of normal and abnormal lymph node cells. In this brief report, a description is presented of these observations, and attention is drawn to the apparent variability of structure occurring in the nuclear body of abnormal cells.

MATERIAL AND METHODS

Tissues were fixed in the buffered osmium tetroxide, embedded in epoxy resins, sectioned, and stained in the manner previously described.17

OBSERVATIONS

In normal human lymph nodes, nuclear bodies were observed most frequently in the nuclei of endothelial cells and reticuloendothelial cells. A typical nuclear body (Fig. 1) is observed to have an almost round configuration. Centrally located dense granules are embedded in a fibrillar matrix and a relatively clear zone separates the nuclear body from the surrounding nucleoplasm. It is not uncommon to observe more than one nuclear body in an endothelial cell (Fig. 2). Nuclear bodies differ in size, shape, and electron density from the nucleolus. Multiplicity of nuclear bodies is somewhat more common in abnormal human lymph node cells. In a reticuloendothelial cell from a node diagnosed as reticuloendothelial hyperplasia (Fig. 3), three nuclear bodies, two of which are in contact, have been noted.

Structural irregularity in addition to multiplicity of nuclear bodies was relatively common in reticular cells from a human lymph node diagnosed as Hodgkin's disease. Of the four nuclear bodies noted in a section of a reticular cell from such a case (Fig. 4), three are in apparent contact. Alternatively, it may be that the several structures constitute an abnormally large nuclear...
Fig. 1.—Endothelial cell in normal human lymph node. The nuclear body (NB) within the nucleus (NU) appears as a circular structure, about 0.4 microns in diameter, having an electron density distinctly greater than the surrounding nucleoplasm. Dark granules, present in the interior of the nuclear body, are encircled by concentrically oriented fine fibrils which constitute the remainder of the body. × 31,500.

Fig. 2.—Endothelial cell in normal human lymph node. Three nuclear bodies (NB) occur in this section of the cell nucleus. The nuclear bodies are clearly different in appearance, and are spatially removed, from the nucleolus (NC). × 12,500.

body. The latter interpretation is suggested by the atypical nuclear body seen in Figure 7.

The morphologic relation of nuclear body to nucleolus is most readily seen in a normal cell (Fig. 5). The relatively round nuclear body in this reticular cell is about 0.6 microns in diameter and has dark granules, about 300–400 Å in diameter, in the central portion. The fine fibrils which make up most of the remainder of the nuclear body have a thickness of about 60–80 Å. The generally ovoid nucleolus, in contrast, is over a micron in diameter, has few fibrils
in the 60–80 Å range, and the granules which are associated with this organelle are about 200 Å in diameter.

In almost all cells, the inner, granule-containing zone of the nuclear body is distinctly delimited from the fibrillar zone (Figs. 4 and 6). It is on the basis of this type of delimitation that the typical appearance of nuclear bodies from abnormal lymph node cells (Figs. 4 and 7) can be interpreted to represent either a union of two or more granule-containing core areas with shared peripheral fibrils, or an incomplete separation of two or more joined
Fig. 5.—Reticular cell from normal lymph node. A comparison of nuclear body (NB) to nucleolus (NC) is afforded by this illustration. The nucleolus has about twice the diameter of the nuclear body and has no fine fibrillar component. The granule associated with the nucleolus is about half the size of that present in the central portion of the nuclear body. × 48,000.

Fig. 6.—Lymphocyte from normal lymph node. The nuclear body (NB) in this cell has a granule-containing core area which appears to be separated from the encircling fibrils by either a somewhat thickened fibril or a limiting membrane. × 45,000.

nuclear bodies. The number of dense granules within the nuclear body appears to be limited as to number, 5–20 granules occurring per section of central core zone.

The frequency of observed nuclear bodies in cells from normal and abnormal lymph nodes is not high. Nuclear bodies have been noted most often in endothelial and reticuloendothelial cells, and rarely in lymphocytes, macrophages, and plasma cells. They have not, as yet, been observed in immature
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Fig. 7.—Reticular cell from a lymph node diagnosed as Hodgkin's disease. This atypical nuclear body (NB) presents the appearance of three joined bodies which share the same system of peripheral fibrils. × 60,000.

cells of the lymph node. In abnormal lymph nodes, we have observed nuclear bodies in lymphocytes from a node diagnosed as malignant lymphoma, in lymphocytes and reticular cells from a node of a patient suffering from chronic lymphocytic leukemia, and in reticular cells from nodes diagnosed as reactive hyperplasia. In our material, nuclear bodies have been observed to be most numerous in reticular cells from Hodgkin's disease lymph nodes, but have not been noted in Sternberg-Reed cells.

DISCUSSION

Few investigators, who have noted the nuclear body, have offered suggestions as to its significance. Weber and co-workers suggested that it is most plausible to consider the nuclear body related in some manner to the nucleolar organizer. Evidence in support of such a view may be adduced from the study of Stevens on the grasshopper neuroblast. On the other hand, Lafontaine, in a study of a similar body in meristematic plant cells, noted an association of nuclear spherical bodies with chromosome strands and suggested that these bodies represented “extranucleolar ribonucleoprotein materials synthesized by specific chromosomal loci.”

There is little information, at present, concerning the chemical nature of the nuclear body. Lafontaine noted that nuclear spherical bodies in plant cells fixed in glutaraldehyde were Feulgen negative but stained metachromatically with azure B in the same manner as the nucleolus. This would indicate that there may be some ribonucleic acid in the nuclear body.

The possibility that the nuclear body may be related to virus was raised by illustrations appearing in a paper by Granboulan et al. concerning the development of the SV40 virus in cultured monkey kidney cells. Round bodies were shown in the nucleus which had an appearance similar to nuclear bodies. The bodies were about 0.5 microns in diameter, and one of the bodies illustrated had dense granules in the center. The authors considered that the dense
granules in the latter body were virus particles. Other round bodies, of similar size but entirely filled with SV40 virus particles and delimited by what appeared to be an enveloping membrane, were also illustrated. Comparison of the virus-filled bodies with those that appear to be similar to nuclear bodies do not indicate to us a definite morphologic relation between the two.

In our electron microscopic studies of human lymph node cells, nuclear bodies have been observed primarily in endothelial and reticular cells. Although these bodies have also been seen in the nuclei of macrophages, plasma cells, and lymphocytes, their occurrence was relatively infrequent in these cell types. Nuclear bodies were not observed in primitive reticular cells or blast cells of human lymph nodes. In a case of Hodgkin's disease, atypical, irregularly shaped nuclear bodies were observed in reticular cells. This atypical structure could be interpreted either as contact and perhaps fusion of two or more typical nuclear bodies, or as enlargement and irregularity of a single body.

**Summary**

Nuclear bodies in normal and pathologic human lymph node cells have been examined with the electron microscope and their structure has been illustrated and described. In normal lymph node cells, nuclear bodies are 0.3-0.5 microns in diameter, are slightly less electron dense than the nucleolus, and consist of peripheral fibrillar material with centrally located, dense granules, 200-400 Å in diameter. Morphologically abnormal nuclear bodies have been observed in a case of Hodgkin's disease. The appearance of these atypical bodies would suggest either contact and fusion of two or more atypical bodies, or possibly the existence of single, large, irregular bodies.

**SUMMARIO IN INTERLINGUA**

Corpores nucleari in normal e pathologic cellulas de nodo lymphatic human esseva examinate con le microscopio electronic, e lor structura es illustrate e describite. In normal cellulas de nodo lymphatic, corpores nucleari ha diametros de inter 0,3 e 0,5 μ, es levemente minus electrono-opac que le nucleolo, e consiste de peripheric material fibrillar con dense granulos de location central que ha diametros de inter 200 e 400 Å. Morphologicamente anormal corpores nucleari esseva observate in un caso de morbo de Hodgkin. Le apparition de iste corpores atypic suggestionarea o contacto o fusion de duo o plus corpores atypic o possibilemente le existentia de solitari e grande corpores irregular.

**REFERENCES**

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