

LYMPH NODE STRUCTURE IN *DICEROS BICORNIS*

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PLATE 20

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## SYNOPSIS

The lymph nodes of a second young specimen of the African Black Rhinoceros (*Diceros bicornis*) prove to be, like those of an earlier specimen, hæmolymph nodes. An unusual (and doubtless pathological) feature thereof is a metamorphosis of the endothelial lining of the precapillary arteries within all nodes examined. Histological evidence suggests that the ordinary lymph node may assume hæmolymph characters under appropriate physiological stimulus.

## INTRODUCTION

In earlier communications (Cave & Aumonier, 1960, 1962a, b) we have given descriptions of the histological structure of certain of the lymph nodes in various species of rhinoceros, namely: the renal and bronchial nodes of *Rhinoceros unicornis*, the carotid, bronchial, pericardial, gastric, and intestinal nodes of *Didermocerus sumatrensis*, the cervical and intercostal nodes of *Ceratotherium simum*, and the renal, tracheal, and epicardial nodes of *Diceros bicornis*. The range of our study of rhinoceros lymph nodes has necessarily been limited by the availability of material and in no species have we as yet been able to investigate all the groups of lymph nodes present. In particular our *Diceros* material was limited to nodes from three regions only of a single animal, so that opportunity has been taken recently to investigate additional material of wider topographical distribution. This new material consists of lymph nodes from the mesentery, the ileo-cæcal region, the posterior abdominal wall, the pericardium, and the splenic and renal hila; it was obtained from a young male *Diceros bicornis* (an animal slightly older than our earlier *Diceros* specimen) which died unexpectedly on November 16th, 1962 in Whipsnade Zoological Park. The terminal illness had been brief and necropsy findings were confined to a bladder distended with blood and urine plus some slight gross evidence of pyelonephritis. Microscopically the liver showed a centrilobular necrosis and pigment within both the Kupffer's cells and the ordinary hepatic cells.

To the Zoological Society of London we tender our gratitude for access to this new material, as also to Mr. E. H. Tong, Director of Whipsnade Zoological Park, who facilitated its collection.

## MATERIAL AND METHODS

The various groups of mesenteric, ileo-cæcal, posterior abdominal, cardiac, renal, and splenic nodes were removed and formalin-fixed; nodes from each group were then paraffin-

blocked and sectioned at a thickness of  $10\ \mu$ . the sections being then stained by hæmatoxylin and eosin and by the Van Gieson and Weigert stains.

#### OBSERVATIONS

A mesenteric node shows a thick capsule of white fibrous tissue and unstriped muscle, and correspondingly thick trabeculæ of similar composition. Marginal and paratrabeular sinuses are present. There is no very distinct separation of cortex and medulla, and the latter, limited in quantity, is related to the blood-vessels near the hilum. The cortex presents an abundance of secondary nodules. The entire node is extremely vascular, the arterial vessels being relatively large and thick-walled and surrounded by a ladderwork of venæ comitantes. Intratrabeular vessels are plainly visible. Hæmosiderin is abundant within the macrophages. A few plasma cells are detectable. The greater portion of the node shows "typical" lymph-node structure, but some of the sections reveal the presence of erythrocytes within the tissue spaces, so that the organ is, partially at least, a hæmolymph node.

An ileo-cæcal lymph node agrees in all essential particulars with this mesenteric node but manifests the presence of numbers of erythrocytes in the tissue spaces and is clearly of a hæmolymph nature.

In a node from the posterior abdominal wall, features of capsule, trabeculæ, and sinuses again resemble those of the mesenteric node; the intrinsic nodal arteries are likewise relatively large and surrounded by a venous ladderwork. Cortex and medulla are distinct, but of irregular demarcation; the medulla is extensive and well marked. Hæmosiderin is again plentiful in the sections. No extravascular erythrocytes are detectable, and the node is of the "ordinary" variety.

A node from the splenic hilum shows a relatively thin capsule, of white fibrous tissue admixed with unstriped muscle; the trabeculæ, of similar composition, are disproportionately thick and show intratrabeular blood-vessels, both arterial and venous. There is no clear distinction between medulla and cortex and secondary nodules abound in the latter. Marginal and paratrabeular sinuses are prominent. Erythrocytes are plentiful both within and without the blood-vessels, and the general appearance of this obviously hæmolymph node is strikingly akin to that of splenic tissue. Hæmosiderin is practically absent from all the sections, since the lymph circulating through this node has already been filtered in the spleen. Several large lymphatic vessels are visible, each of which branches into four or more subdivisions to become continuous with a mosaic of spaces; erythrocytes lie both within and without these lymph vessels. In any single field there may be seen long, sinuous, thin-walled venous sinusoids, containing erythrocytes and, alongside these, curious vessels which can only be precapillary arterioles whose walls have disintegrated and whose endothelium has so swollen as to resemble cubical epithelium (Pl. 20, fig. 2). Such peculiar vessels (containing erythrocytes) occur in all the nodes examined from other situations and are characteristic of all the sections studied: they have, at first sight, the appearance of ducts of some type. These "duct"-like vessels are closely associated topographically with other vessels which are undoubtedly venous sinusoids. The lumen of each is surrounded by large, rounded, darkly-staining cells which have every appearance of epithelial cells; these profoundly altered endothelial cells protrude into the lumen and are everywhere disposed internally to the internal elastic lamina. The initial stage of such endothelial metamorphosis is clearly indicated in certain of the sections (Pl. 20, fig. 3); in others (Pl. 20, fig. 2) the process has attained its maximal development. This peculiar and unexpected histological finding, so obtrusive in all the sections examined,

may be due to the pathology of the animal's terminal illness or to post-mortem change: it is however unique in our experience and has been considered worthy of mention if only as a guide to future workers upon similar material.

A node from the renal hilum presents a very thick fibro-muscular capsule and trabeculae of corresponding composition and stoutness, with a marginal sinus varying in calibre and in some places crammed with erythrocytes; the paratrabecular sinuses are likewise choked with erythrocytes. This hæmolymph node has a long narrow spike of well demarcated medulla running inwards from the nodal hilum. Thin-walled lymphatic vessels are again observable, full of erythrocytes, as also are the curious duct-like precapillary arterioles with pseudo-epithelial walls. Blood-vessels are also present within the trabeculae (Pl. 20, fig. 1).

An epicardial node presents a relatively thin capsule but enormously thick trabeculae, all composed of white fibrous tissue and unstriated muscle. Intratrabecular arterioles are obtrusively noticeable and marginal and paratrabecular sinuses are well developed. There is little obvious distinction between cortex and medulla. The latter is disposed principally in the hilar region: it is of a very loose texture, and accompanies the major trabeculae into the interior of the node. Hæmosiderin is absent. Lymphatic vessels are clearly recognizable as a branching system of endothelial-walled tubes continuous with the paratrabecular sinuses. A completely branched system of "epithelium"-walled arterioles is also prominent in all the sections.

#### DISCUSSION

The constitution of the nodes of this present specimen differs in no essential from that of other rhinoceros species examined.

With the exception of the node from the posterior abdominal wall, all the nodes studied in this young *Diceros* specimen are emphatically hæmolymph nodes, either wholly (the majority) or partially (mesenteric nodes). The histological evidence is such as to suggest that the distinction between "ordinary" and "hæmolymph" nodes is much less permanent than commonly held, and that, under the appropriate physiological conditions, any "ordinary" node may assume hæmolymph appearance and function, though whether temporarily or permanently cannot be determined by microscopical criteria alone.

Our studies of rhinoceros lymph nodes remain incomplete because limited in topographical range. Thus far it was proved practicable to study the histology of certain nodes only from but a few animals, viz. from single adult specimens of *Rhinoceros unicornis*, *Didermoceros sumatrensis*, *Ceratotherium simum*, and from two young specimens (a male and a female) of *Diceros bicornis*. Material from *Rhinoceros sondaicus* was not available for examination and is likely so to remain, since this species is now restricted to some forty individuals closely protected in the Udjong Kulon reserve in Java. The *Didermoceros* specimen was an old captive female, dying of multiple acute infection: though no extravascular erythrocytes were detectable in its nodes, their exact resemblance to the undoubted hæmolymph nodes of the other species examined and the striking likeness of their parenchyma to splenic tissue left no doubt that, in the normal animal, the nodes must be of the hæmolymph variety. In all the other species studied extravascular erythrocytes were abundantly present in the nodes, whence the general conclusion that in the Rhinocerotidae hæmolymph nodes are the rule.

#### REFERENCES

- ACMONIER, F. J. & CAVE, A. J. E. (1960).—A note on the visceral histology of *Ceratotherium*. *J. R. micr. Soc.*, 78, 120.

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## DESCRIPTION OF PLATE 20 (see after page 110)

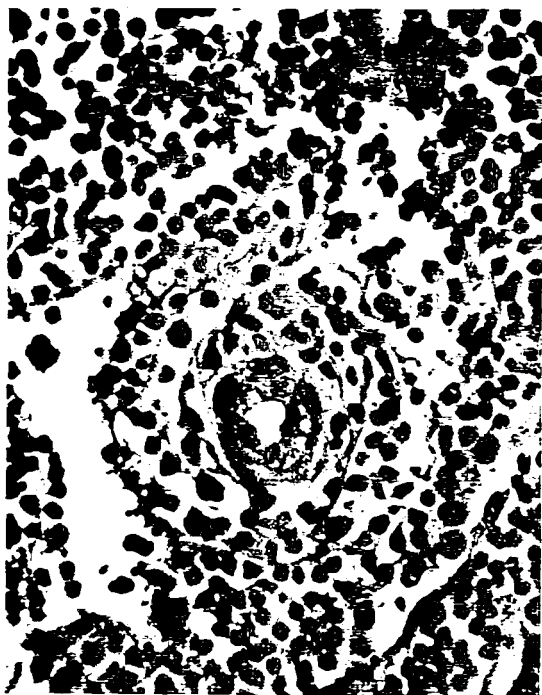
- FIG. 1.—*Diceros bicornis*, juv. Renal lymph node, showing an intratrabecular vein containing a few blood cells.  $\times 500$ . Hæmatoxylin and eosin.
- FIG. 2.—*Diceros bicornis*, juv. Epicardial lymph node, showing a precapillary arteriole in longitudinal section and the "epitheloid" appearance of its lining endothelial cells.  $\times 500$ . Hæmatoxylin and eosin.
- FIG. 3.—*Diceros bicornis*, juv. Renal lymph node, showing an arteriole in transverse section and initial swelling of its lining endothelial cells.  $\times 500$ . Hæmatoxylin and eosin.



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