

## The Assessment of Epididymal Lymphatics within the Concept of Immunologically Privileged Sites

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### Summary

This paper seeks to provide background information for future studies of immunological responses in the epididymis. Immunologically privileged sites afford anomalous protection to foreign grafts and this is usually thought to be related to absence of intrinsic lymphatics. A search through the literature reveals lack of any attempt to implant foreign tissue into this organ.

The present investigation was undertaken to consider the presence, if any, of lymphatic channels within the connective tissue framework of rat epididymis. The tissues were taken through for histology and examined with light and electron microscopes. Contrary to anticipation, there are abundant lymphatic channels within the epididymal tissue. In the discussion a hypothesis is raised that the epididymis may not be an immunologically privileged site or that if any privilege, the explanation will not be related to absence of terminal lymphatics in this area. Further work in progress seeks to clarify this hypothesis.

### Introduction

A search through literature reveals lack of any previous attempt to implant foreign tissue in the epididymis. Immunologically privileged sites protect histoincompatible tissue grafts from acute rejection. Such naturally occurring sites include the anterior chamber of the eye and the cheek pouch of the Syrian hamster. These are characterized by the absence or sparsity of lymphatic capillaries which prevent early access of graft transplantation antigens to the host's lymphoid tissue (reviewed by *Barker and Billingham 1977*).

This paper presents results of a study designed to investigate the existence of lymphatic capil-

laries within the connective tissue of rat epididymis. It is hoped that any information so obtained may be applied in the consideration of epididymis as a privileged site.

### Materials and Methods

Adult male rats of three different strains: 10 DA (Dark Agouti) 10 LE (Lewis) and 10 AS (Albino-Swiss) were used in these experiments. Each animal was killed by ether overdosage, then immediately perfused with 2% buffered glutaraldehyde via a catheter introduced into the thoracic aorta. The blood was washed out via a hole made into the right chamber of the heart. Both epididymides were therefore rapidly fixed and subsequently processed through the routine methods for light and electron microscopy.

### Results

The connective tissue of all the rat epididymides studied have abundant lymph capillaries. These joined to form sinusoids that are embedded among the arterioles and venules. The lymph spaces are distinguished from blood vessels by their wider lumen, thinner wall and completely irregular profile. Besides, these lymph vessels contained amorphous precipitate of fixed lymph protein with occasional small lymphocytes (Fig. 1).

Ultrastructural studies revealed that the wall of the lymphatic space is lined by continuous endothelium typically attenuated over the major aspects of its diameter except in the nu-



**Fig. 1** Section through the epididymis illustrating the duct (D) and the connective tissue. bv = blood vessels and that on the right side contains two red cells. LYM = Lymphatic sinusoid with thin wall and relatively wide lumen that contains precipitated lymph proteins (P). The lymphatic wall has irregular profile



**Fig. 2** Electron photomicrograph showing the very thin wall of lymphatic sinusoid within the connective tissue framework of rat epididymis. The endothelium is attenuated over the major aspects of its diameter (E) except in the nuclear area (n). L = lumen of the lymphatic space

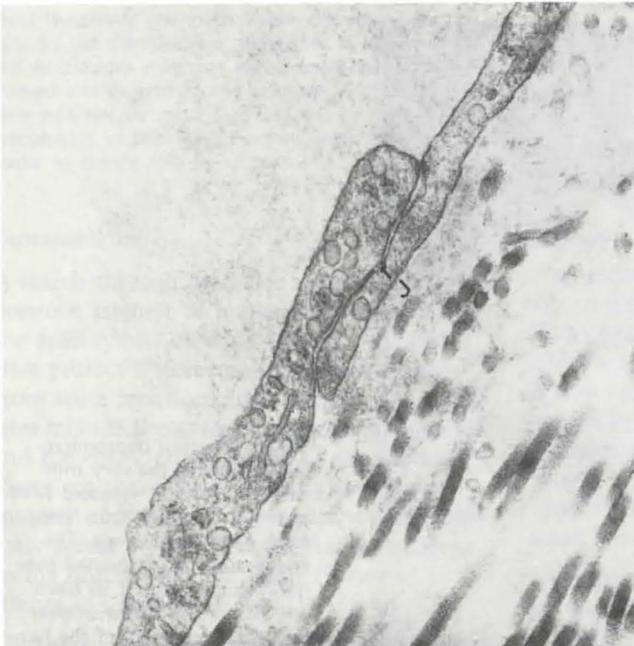
clear area (Fig. 2). As functional evidence of the ability of lymphatic wall to remove substances from the interstitial tissue, the cytoplasm of the lining endothelial cells has abundant micropinocytotic vesicles (Fig. 3). Part of the membrane of each endothelial cell extensively overlapped the cytoplasmic membrane of the adjacent endothelial cell (Fig. 4). All these features illustrate and agree with the conventional ultrastructural criteria of lymphatic capillaries as outlined by *Yoffey and Courtye* (1970).

#### Discussion

The present work demonstrates the presence of abundant lymphatic channels within the connective tissue of epididymis. Before the advent of improved tissue fixation by vascular perfusion it was thought that immunological privilege of the testis is connected with a lymphatic state (*Patrick et al.* 1972). Then *Fawcett* and co-workers (1973) clearly demonstrated that tissue disruption with loss of architectural organization was responsible for the earlier controversy on this tissue. They described lymphatic sinusoids within the testes of fifteen mammalian species. It may be



**Fig. 3** The attenuated cytoplasm (c) of lymphatic endothelial cell containing many micro-pinocytotic vesicles (v). L = lumen of the lymphatic space with coagulated protein materials. CT = Connective tissue with collagen fibres



**Fig. 4** The membrane of one lymphatic endothelial cell forming an extensive overlapping with the cytoplasmic membrane of the other adjacent lymphatic endothelial cell. (See arrow J.)

thought that the presence of abundant lymphatics within the interstitial tissue of the testis should extend directly to the adjacent epididymis. But there are functional, embryological and histo-morphological differences between the testis and the adjacent epididymis that make the two sites worthy of separate considerations. After the classical work of *Fawcett* and his team, why the rodent testis is immunologically privileged remains unclear and tissue transplantation workers still continued to describe extended survival of intratesticular foreign tissue (*Ferguson and Scothorne* 1977; *Dib-Kuri et al.* 1975; *Whitmore and Gittes* 1975). These reports suggest the need to focus attention on epididymal lymphatics. *Naji and Barker* (1976) thought that the privileged status of rodent testis may be related to anomalous testicular lymphatic although they provided no evidence to support this hypothesis.

The present studies demonstrate rich lymphatic sinusoids within the connective tissue framework of rat epididymis. When considered in terms of the concept of immunological privilege the observation would seem to suggest one of two things, viz: either that the epididymis is not immunologically privileged or that if any privilege, the premise would not be related to the alymphatic explanation commonly adduced for such sites as the an-

terior chamber of the eye or Syrian hamster cheek pouch. The present findings will provide background information for future transplantation studies in the epididymis.

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