

CHARACTERISTICS OF BLOOD VESSELS IN THE ANTERIOR PART OF THE EYE IN ALBINO RATS

N. V. Bekauri, N. M. Kirgizova,
L. I. Kolosova, and E. V. Lutsenko

UDC 599.323.4-141.3:591.484.6

Vascular loops arising from blood vessels on the inner border of the iris, floating freely in the anterior chamber of the eye, and a network of blood vessels in the cornea are present in albino rats.

The absence of pigment in the iris and the high degree of translucency of the cornea in albino rats makes the arrangement of the blood vessels in the anterior part of the eye and the blood flow in them clearly visible.

EXPERIMENTAL METHOD AND RESULTS

Biomicroscopy of the eye [3] in unanesthetized rats presents considerable difficulties, but with the aid of this method, using a binocular microscope or magnifying glass (magnification $20-30 \times 0.75$ or 20×2) an interesting feature distinguishing the eye of the albino rat could be clearly observed. This is the presence of vascular loops arising from the inner border of the iris and floating freely in the anterior chamber of the eye.

In bio-ophthalmoscopy on 30 intact rats from 5 different litters, these vessels were found in 22 eyes (in both eyes of 6 rats).

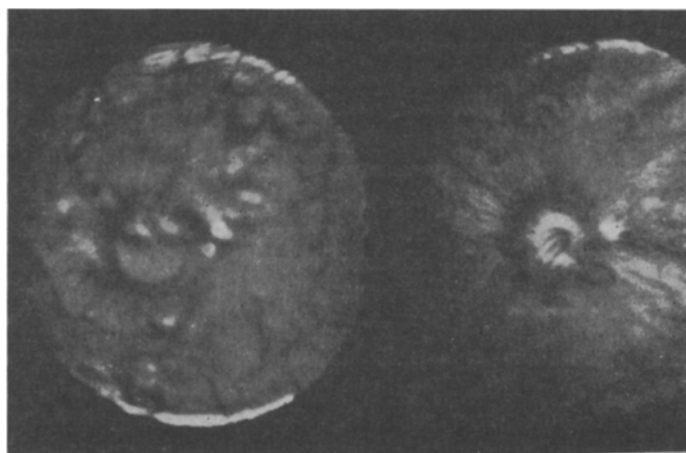


Fig. 1. Vascular loops of the iris located in front of the pupil in the anterior chamber of the eye of an unanesthetized albino rat (photographed in reflected light; $14.3 \times$).

L. P. Pavlov Institute of Physiology, Academy of Sciences of the USSR, Leningrad. (Presented by Academician V. N. Chernigovskii.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 71, No. 2, pp. 104-106, February, 1971. Original article submitted May 28, 1970.

© 1971 Consultants Bureau, a division of Plenum Publishing Corporation, 227 West 17th Street, New York, N. Y. 10011. All rights reserved. This article cannot be reproduced for any purpose whatsoever without permission of the publisher. A copy of this article is available from the publisher for \$15.00.

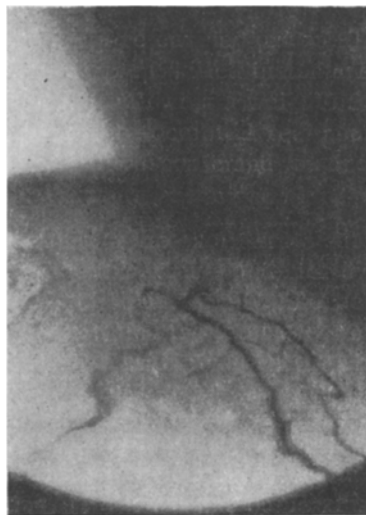


Fig. 2. Corneal vessels of an unanesthetized albino rat: dark vessels are superficial veins; pale vessels are deeper arteries (photographed in transmitted light; 40 × 2).

The shape and size of these loops vary from a winding border of blood vessels running along the edge of the sphincter of the iris, which are wider than its radial vessels, to a vascular coil or loop, or several loops located in front of the pupil (Fig. 1).

During prolonged illumination the vessels forming these loops may dilate and almost completely cover the sharply contracting pupil. After instillation of atropine solution (0.1 %) they contract and constrict, intersecting the region of the dilated pupil. Still further dilatation of the pupil is observed following intracranial division of the sensory nerve (trigeminal) of the eye. Whereas in rabbits, sensory denervation of the eye causes sharp contraction of the pupil and dilatation of the blood vessels of the iris, in albino rats all its vessels are sharply constricted while the pupil dilates. The vascular loops located in the region of the pupil become indistinguishable everywhere. This takes place also through structural changes in the epithelium of the cornea developing during the first few seconds after the operation. These vessels, like the very narrow (under normal conditions) pupil of albino rats, can be regarded as helping to protect the inner membranes of the eye against excessive illumination.

Another feature distinguishing the blood vessels of the anterior part of the albino rat eye is the development of a wide-looped plexus of vessels frequently observed in the cornea. It was found, to a varied degree (Fig. 2), in 26 eyes in 30 rats (in both eyes of 9 rats). No connection was observed between the presence of vessels in the cornea and vascular loops from the iris in the anterior chamber of the eye. In an excited animal, or with the deepening of anesthesia, the corneal vessels would constrict, and it then became more difficult to examine them under the microscope with the magnifications used.

Histological investigation showed that these vessels are subepithelial in position.

It is now established that the cornea [1, 2, 5] is normally without blood vessels. Blood vessels penetrate into it only during inflammation resulting from injury, infection, disturbance of the sensory innervation, or a state of avitaminosis of the animal [6]. Under these circumstances the cornea loses much of its translucency and gloss, for the invasion of blood vessels is accompanied by the development of connective tissue in the cornea [4]. Avitaminosis in rats is manifested by many other features (blepharoconjunctivitis, cataract, baldness, necrosis and trophic ulcers of the skin and mucous membranes, pareses), not present in rats receiving a balanced diet. No clouding of the cornea likewise was observed in such animals.

These distinctive features of the blood vessels of the eye in albino rats can be attributed to hypovitaminosis, not reflected in the state of the other tissues, and explained by the particularly high sensitivity of the corneal tissues of these animals. Development of the vessels in the cornea, and also of vascular loops of the iris located in the anterior chamber of the eye, immediately in front of the pupil, may also play the role of an additional protective mechanism, protecting the inner membranes of the eye of these phenotypically crepuscular animals from excessive (for them) illumination.

LITERATURE CITED

1. V. N. Arkhangel'skii (Editor), Textbook of Eye Diseases in Several Volumes [in Russian], Vol. 1, Book 1-2, Moscow (1962).
2. A. P. Lyubomudrov and L. M. Lychkovskii, in: Morphological Adaptations in Ontogenesis [in Russian], Kiev (1967), p. 77.
3. N. B. Shul'pina, Biomicroscopy of the Eye [in Russian], Moscow (1966).
4. T. Axenfeld, Lehrbuch und Atlas der Augenheilkunde, Jena (1958).
5. S. Lerman, Basic Ophthalmology, New York (1966).
6. A. Pirie and R. van Heyningen, The Biochemistry of the Eye [Russian translation], Moscow (1968).