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SOME CHARACTERISTICS OF THE VASCULAR NETWORK IN THE MUCOSA OF THE OLFACTORY REGION IN PIGS

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Studies were performed on corrosive, cleared and histological preparations. The characteristics of surface and deep vein networks in the mucosa of the olfactory region are shown. Also shown are the characteristics of the capillary network and artery-vein anastomoses in the mucosa of the same region.

Key words: vein network, capillary network, artery-vein anastomoses, mucosa, olfactory region, pig.

INTRODUCTION

The elementary functions of the nasal cavity and its mucosa and, in particular, the functions of heating, moistening, filtration and olfaction /Dukes, 1970; Hinchcliffe and Harrison, 1976; Negus, 1958; Popović, 1965, 1987, 1988/ have become a subject of great interest in recent years, especially with respect to aerial pollution resulting from dust, gases and various radioactive materials. All of this disrupts the ecological balance and increases the importance of the protection of different ecological-systems. This results in unprecedented interest in the functioning of systems of natural defence and detection, which includes the elementary functions of respiration and olfaction. These functions of the nasal cavity are in direct connection with the morphological characteristics of both the skeleton / Ellenberger et al., 1943; Loeffler, 1958; Hillman, 1971; Popović, 1964, 1988; Romer, 1966/ and the mucosa itself, and especially vascularization / Dawes et al., 1953; Heinze, 1960; Horst, 1960; Popović, 1965, 1987, 1993/.

MATERIAL AND METHODS

A total of 15 heads from pigs of different, breeds, aged from 1.5 months to 2 years were examined using the method of injecting the blood vessels with gelatin, Berlin blue, corrosive preparations, cleared and histological preparations. Revertex-T latex was used for making corrosive preparations. The mucosa was cleared in glycerine. Histological preparations were stained with haematoxylin and azocarmine.

RESULTS AND DISCUSSION

Veins in the nasal cavity mucosa /Dawes et al., 1953; Heinze, 1960; Horst. 1960; Popović, 1965, 1987/ and particularly the veins in the mucosa which lines the ethmoid bone and represents the mucosa of the olfactory region in pigs, form surface and deep vein networks (Figure 2;4). This is especially visible in corrosive and histological preparations. The surfance vein networks of the ethmoid bone

Figure 1. Transversal section of the nasal cavity in the pig in the middle of M3. Veins and arteries are filled with latex, coloured with black tusche ink.
1 - "swell body"; Se - septum nasi; Sf - sinus frontalis; Vo - vomer.

mucosa are made up of many veins of small calibre. They form a fragile and dense network of small loops of irregular shape (Figure 2). Contrary to these, the vein networks which lie in the deepest layer of the mucosa form veins of larger calibre (Figure 4). This network is much less developed than the surface one. Both vein networks are linked by numerous anastomoses. It should also be pointed out that

Figure 2. Venous network iin the mucous membrane of the caudal part of the nasal conches and ethmoturbinalia of the nasal cavity in the pig. Corrosive preparation (latex).
1 - v. sphaenopalatina; Cnd - concha nasi dorsalis; Cnm - concha nasi media; Cnv - concha nasi ventralis; Et - ethmoturbinalia.

Figure 3. Deep venous plexus and arterio-venous anastomosis of the mucous membrane laminae mediane in the pig. Corrosive preparation (latex).
A - artery; AV - arterio-venous anastomosis; V - veins.

vein networks in this region are much less developed than in the other areas of the nasal cavity (Dawes et al., 1953; Popović, 1965). This especially pertains to veins of the largest calibre. Vein networks are not of the same density everywhere (Figure 1). The thickest vein networks, the so-called "swell body", are located in the caudal extension of the dorsal nasal passage situated in a separate funnel-like depression (Figure 1). These thickened vein networks become thinner in the caudal region but they can be followed almost up to the lamina cribrosa. They actually represent the caudal extension of the "swell body" of the dorsal nasal passage (Popović, 1965, 1987).

Latex-corrosive preparations of vein networks, especially in the area of the "swell body", show veins with partial loop-like narrowed parts between which there are marked expansions of characteristic shape (Figure 2;3). A similar picture was observed also in corrosive preparations of mucosa veins in other parts of the nasal cavity, but much more so (Dawes et al., 1953; Popović, 1965). However, histological preparations also showed so-called "thick-walled" veins in the area of the "swell body" (Figure 4) (Dawes et al., 1953; Popović, 1965). Both these

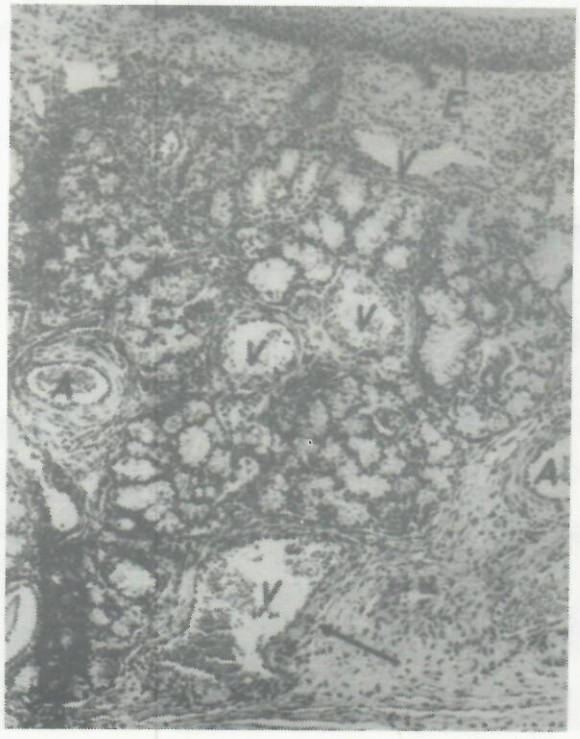

Figure 4. Transversal section of the mucous membrane of the lamina mediana in the pig in the "swell body" region. 80x.
A - artery; E - epithelium; V - vein; The arrow shows the thick -walled vein.

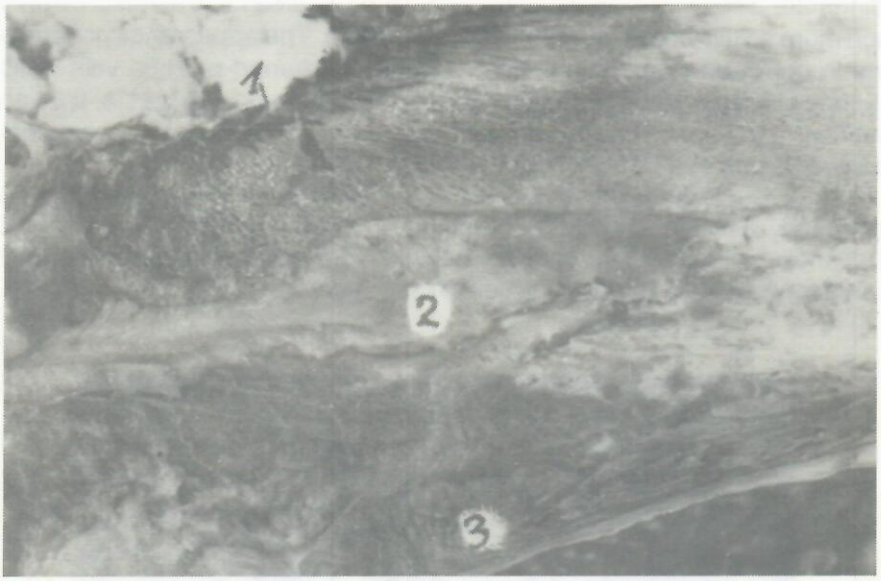

Figure 5. Sagittal section of the caudal portion of the nasal cavity in the pig. Removed lamina mediana and septum nasi. Blood vessels of the periosteum and perichondrium. As viewed from the medial side. 1 - lamina cribrosa; 2 - vomer; 3 - os palatinum

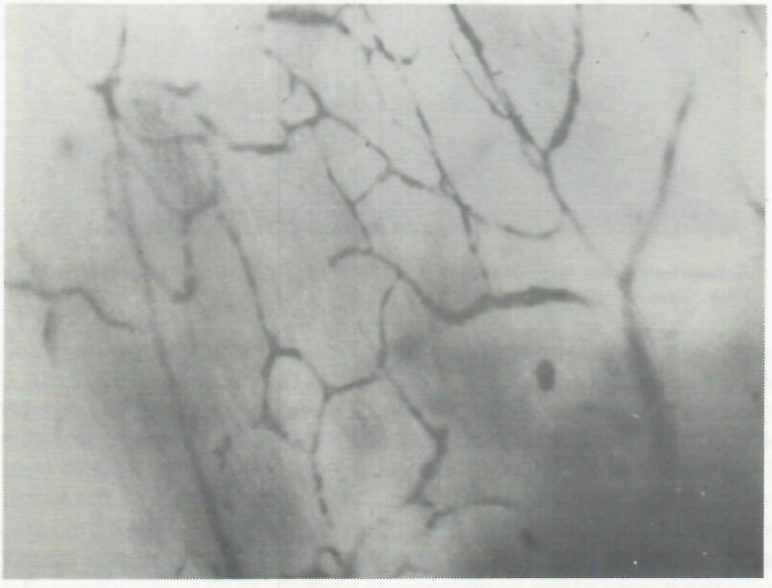

Figure 6. Periostal capillary network of the mucosa of the lamina mediana. Injected with berlin blue. Cleared preparation. 80 x.

findings are also evident in mucosal veins in other areas of the nasal cavity but much more so (Dawes et. al., 1953; Popović, 1965). The appearance of narrowed parts in corrosive preparations and muscular thickened parts in vein walls in histological preparations probably indicate the same occurrence i. e. they are a reflection of the sphincter- like action of veins in these parts of the nasal cavity mucosa /Dawes et al., 1953; Popović, 1965).

The artery-vein capillary network of the periost and perichondrium is relatively poorly developed and the loops are of irregular shape (Figure 5;6). The subepithelial and glandular capillary networks are richer and are characterized by an especially characteristic appearance (Figure 7).

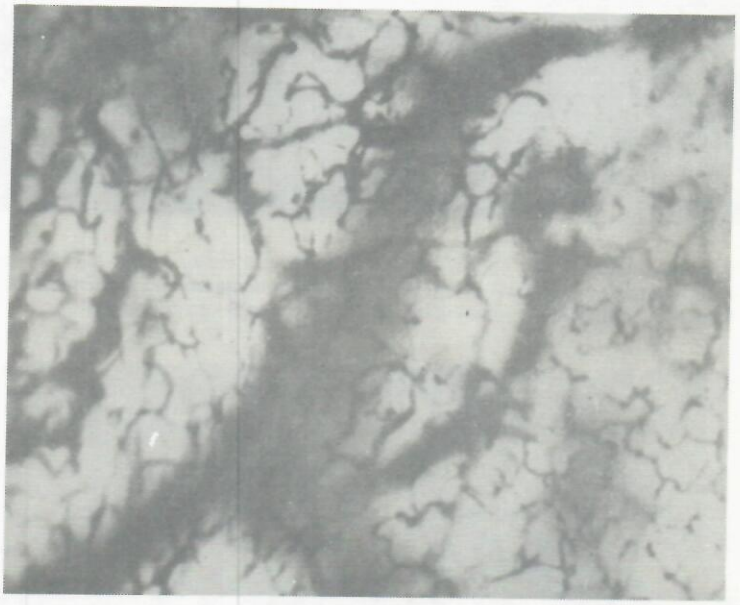

Figure 7. Subepithelial capillary network of the mucosa of the lamina mediana. Injected with Berlin blue. Cleared preparation. 80 x.

Artery-vein anastomoses have been observed both in the mucosa of other areas of the nasal cavity (Popović, 1965) and in the mucosa of this area. They are also observed in the area of the "swell body" which represents an extension of the "swell body" of the dorsal nasal passage. Artery-vein anastomoses are most often of sigmoid shape (Figure 3), although completely straight and short artery-vein anastomoses have been observed. It is characteristic for the lumen that in the arterial part it corresponds to the luman of arteries and then the radius starts to increase and finally rapidly flows into one of the veins of greater lumen, so that in this area the lumen of the anastomoses corresponds to the lumen of the veins (Figure 3).

REFERENCES

1. *Dawes, J. D. K. and Prichard, M.M. L.* 1953. Studies of the vascular arrangements of the nose. *J. Anat. Brit. 87,* 311.
2. *Dukes, H. H.* 1970. The Physiology of the Domestic Animals. Eighth edition. *J. Swenson.*
3. *Ellenberger, W. und Baum, H.* 1943. Die vergleichende Anatomie der Haustiere, *18. Aufl. Berlin. Springer-Verlag.*
4. *Heinze, W.* 1960. Die Kopfvenen des Schweines unter besonderer Bercksihtigung der venösen Organversorgung. *Vet. med. Diss., Berlin.*
5. *Hillman, D. J.* 1971. Macroscopic anatomy of the nasal cavities and paranasal sinuses of the domestic pig (Sus scrofa domestica). *Ph. D. Thesis, Iowa State University Library, Ames.*
6. *Hirchcliffe, R. and Harrison, D.* 1976. Scientific Foundation of Otolaryngology. *William Heinemenn Medical Books Ltd. London.*
7. *Horst, B.,* 1960. Arterien und Venen am Kopf des Schweines. *Inaugural Dissertation, Hannover.*
8. *Loeffler, K.* 1959. Zur Topografie der Nasenhöhle und der Nasennebenhöhlen beim Schwein. *Dtsch. tierärztl. Wschr. 66,* 237-242, 270-273.
9. *Negus, V.* 1958. The comparative anatomy and physiology of the nose and paranasal sinuses. *S. Livingstone Ltd., Edinburgh, Williams and Co. Bal.*
10. *Popović, S.* 1964. Eine Darstellung der morphologischen Eigentmlichkeiten Nasengerüstes bei Haussäugetieren. *Anat. Anz. 114, S.* 379-388.
11. *Popović, S.* 1965. Anatomical and radiological investigations of the vascularization of the nasal mucous membrane in pigs. *Acta Veterinaria (Beograd), 17,* 447-458.
12. *Popović, S.* 1987. Some morphological features of the dorsal nasal passage and their functional importance. *Acta Veterinaria (Beograd), 37,* 335-342.
13. *Popović, S.* 1988. Influence of aerodynamic properties of the nasal cavity on the funciton of the olfactory sense in wild and domestic pigs. *Acta Veterinaria (Beograd),* 287-292.
14. *Popović, S.* 1993. Vascularization of the labyrinth mucosa in the ethmoid bone of pigs. *Acta Veterinaria (Beograd), 43,* 165-170.
15. *Romer, Sh.* 1966. Vergleichende Anatomie der Wirbeltiere, *Verlag, Paul Parey,* Hamburg.

NEKE ODLIKE VASKULARNE MREŽE SLUZOKOŽE MIRISNE REGIJE SVINJE

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SADRŽAJ

Ispitivanja su vršena na korozivnim, prosvetljenim i histološkim preparatima. Prikazane su odlike površnih i dubokih venskih mreža sluzokože koja prekriva sitastu kost a koja u najvećoj meri predstavlja i sluzokožu mirisne regije. Takođe su prikazane i odlike kapilarne mreže kao i arterijsko-venske anastomoze sluzokože iste regije.