Short Communication

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Disse and his Space

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Abstract

This article aims to review the work of the German anatomist Joseph Disse (1852-1912), specifically with regard to the contents of his „Ueber die Lymphbahnen der Säugethierleber". In this he described a thin space, until that moment not referred, located between the hepatocyte and the sinusoidal membrane (sinusoids).

Keywords: Perisinusoidal Spaces; Liver Anatomy; Liver Nodes; 19th Century German Histologists; 19th Century German Anatomists.

Together with the parenchyma, stroma of the conjunctive tissue and sinusoids, the *perisinusoidal spaces (PS)* are one of the structural components of the liver [1]. They are located between the basal spaces of hepatocytes and the sinusoidal endothelium. It is an area where blood and hepatic cells are exchanged. This space is named after the man who discovered it: Joseph Hugo Vincenz Disse (1852–1912), a German anatomist and histologist (Figure 1). J.Disse was born on 25 December 1852 in Brakel-an-der-Weser (North Rhine-Westphalia) where his father, Andreas Disse, was Königlicher Kreisphysikus (district physician) of the District of Höxter [2].

J. Disse studied medicine at the Universities of Würzburg, Göttingen, München and Erlangen. On 7 March 1875 he earned his medical doctorate from the University of Erlangen for his dissertation "Beiträge zur Anatomie des menschlichen Kehlkopfes" *(Contributions to the Anatomy of the Human Larynx*). Later, he specialized in Anatomy at the University of Strasbourg. He remained in Strasbourg for four years (1876-1880) and worked as assistant to the anatomist Heinrich von Waldeyer-Hartz (1836-1921). Waldeyer-Hartz is known in medicine for being the first to introduce the name "chromosome" and for consolidating the neuron theory of organization of the nervous system. He is also remembered in three macroanatomical structures of the human body which were named after him as: Waldeyer's tonsillar ring (the lymphoid tissue ring of the naso- and oropharynx), Waldeyer's glands (of the eyelids) and Waldeyer's sheath (the sheath that encircles the terminal ureter) [3].

From 1880 to 1888, J. Disse taught gross anatomy, histology, embryology and anatomical pathology at the University of Tokyo. On his return to Germany and after a short period in Berlin he accepted (1889) a position as "Privatdozent" at the Anatomical Institute of the Georg-August-University in Göttingen, where he became professor in the same year under Friedrich Sigmund Merkel (1845-1919), who in 1875 provided the first full description of Tastzellen (touch cells) which occur in the skin of all vertebrates. In February 1894 he became an "außerordentlicher Professor", while retaining his prosector position. Three months later, he accepted a call to the Anatomical Institute in Halle but resigned because of the lack of equipment and problems in his collaboration with his colleagues. From 1895 to November 1911 he was a professor at the University of Marburg, first as a prosector, later as an "außerordentlicher Professor" and since 1907 "Honorarprofessor" of anatomy and director of the university's anatomical institute. Near the end of his career he retired to Bavaria where he died from tubercular meningitis in Oberstdorf on 9 July 1912 [4].

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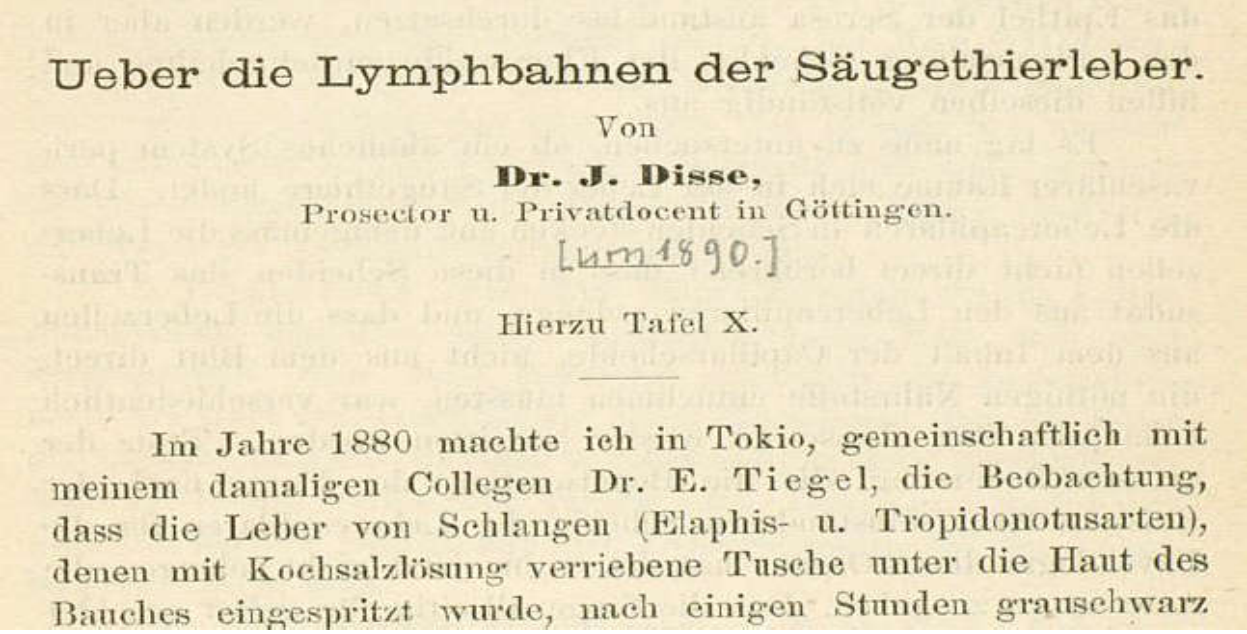
J. Disse was an experimental pathologist of unusually wide scope often with an emphasis on functional or evolutionary and was a renowned embryologist and histologist at the time. Among his publications are those about the development of the nerve nerve (olfactor nerve) and the olfactory region (olfactory region). He completed impressive works on anatomical microscopy, specifically on lizards and small mammals, by subcutaneously injecting them with a saline and diluted dye solution. Disse's interest in the lymphatics of the liver was kindled by a casual observation he and his coworker Tiegel made in snakes and lizards that had been injected with india ink. A few hours after subcutaneous administration of the ink, the reptile's liver was seen to turn dark gray. Disse discovered this to be caused by the dense accumulation of dye granules in fine spaces situated between the sinusoids and the hepatocyte plates. Free granules never appeared in the blood but occasionally were seen engulfed by white cells. Disse concluded from these observations that the lobular sinusoids are encased in a fibrous sheath separating their lumen from a perisinusoidal cylindrical space bordered peripherally by the hepatocyte plates [2]. Results reported in your paper „Ueber die Lymphbahnen der Säugethierleber" (*Regarding the Lymphatic Tracts of the Mammalian Liver*) published in 1890 in *Archiv für mikroskopische Anatomie (*vol 36:203-224) (Figure 2). This original contribution of the hepatic structure was quickly recognized by the pathologists of his time with his eponym. However, some authors, such as Hans Eppinger, pointed out that it was not related to the lymphatic system and others such as Wilhem Pfuhl called it pericapillar lymphatic sheath [5].

Table 1 lists Disse's publications [6]. In addition, Disse delivered a number of larger papers in the „ Ergebnisse der Anatomie und Entwicklungs geschichte" (*Results of Anatomy and Development History*) [7].

Table 1: Manuscripts published by Joseph Hugo Vincenz Disse

1.	Beiträge zur Anatomie des menschlichen Kehlkopfes. Arch. f. mikr. Anat., Bd. 11, 1875.
2.	Die Entstehung des Blutes und der ersten Gefäße im Hühnerei. Arch, f. mikrosk. Anat., Bd. 16, 1879.
3.	Die Ausbildung der Nasenhöhle nach der Geburt. Arch. f. Anat. Und Phys., 1889.
4.	Beiträge zur Kenntnis der Spalträume des Menschen. Ebenda 1889.
5.	Über die Lymphbahnen der Säugetierleber. Arch. f. m. Anat., Bd. 36, 1890.
6.	Untersuchungen über die Lage der menschlichen Harnblase und ihre Veränderungen im Laufe des Wachstums. Anat. Hefte, Bd. 1, S. 1, 1891.
7.	Grundriß der Gewebelehre. Stuttgart, Enke, 1892.
8.	Über die Veränderungen der Epithelien in der Niere bei der Harnsekretion. Nachr. d. Ges. d. Wiss., Göttingen, 1892.
9.	Über die Spinalganglien der Amphibien. Verhdl. d. Anat. Gesellsch., VII. Versammlung.
10.	über Epithelknospen in der Regio olfaetoria. Nachr. d. Ges. d. Wiss.. Göttingen und Anat. Hefte, Nr. 17. ,
11.	Anatomie des Rachens. Heymanns Handbuch der Laryngologie, Wien 1899.
12.	Über die erste Entwicklung des Riechnerven. Sitzgsb. Ges. zur Beförd. der Naturw. in Marburg, 1896, s. a. Anat. Hefte, Nr. 28-30, 1897.
13.	Zur Anatomie der Niere. Sitzb. Ges. zur Bef. der Naturw., Marburg 1898 und 1900.
14.	Die Niere winterschlafender Tiere. Ebend. 1900.
15.	Zur Anatomie des menschlichen Harnleiters. Ebend. 1901.
16.	Wirbelsäule und Thorax. Handbuch der Anatomie, herausgegeben von K. v. Bardelkben, 1896.
17.	16a. Harnorgane. Handb. der Anat., herausgeg. von K. v. Bardelebex, 1902.
18.	Early development of the olfactory nerve. Journ. Anat. Phys., vol. 35, 1902.
19.	Über die Blutgefäße der menschlichen Magenschleimhaut. Sitzb. Ges. zur Bef. d. Naturw. in Marburg, 1903, s. a. Arch. f. m. Anat., Bd. 63, 1904.
20.	Untersuchungen über die Durchgängigkeit der jugendlichen Magen-Darmwand für Tuberkelbazillen. Berliner klinische Wochenschr., 1903.
21.	Über die Entwicklung des Kloakenhöckers bei Talpa europaea. Sitzgsb. der Ges. zur Bef. der Naturw., Marburg 1904, s. a. Anat. Hefte, Nr. 82, 1905.
22.	Über die Vergrößerung der Eikammer. Verhdl. der Deutschen Ges. Für Gynäkologie, Kiel 1905 (Leipzig 1906) — s. a. Stzgsb. d. Ges. zur Bef.d. Naturw., Marburg 1905 und Arch. f. mikr. Anat., Bd. 68, 1906.
23.	Weitere Mitteilungen über das Verhalten des Schleims im Magen von menschlichen Embryonen und von Neugeborenen. Beiträge zur Klinik der Tuberkulose, Bd. IV, 1905.
24.	Über die Bildung des Zahnbeins. Sitzungsber. d. Gesellsch. zur Bef. der Naturw., Marburg 1908.
25.	Über die Bildung des Knochengewebes. Ebend. 1908, s. a. Arch. f. mikr. Anat., Bd. 73, 1909.
26.	Wie entsteht die Grundsubstanz des Zahnbeins? Anat. Anz., Bd. 35, 1909.
27.	Über die Lymphbahnen der menschlichen Magenschleimhaut. Stzgsb. d. Ges. zur Bef. der Naturw., Marburg 1910.
28.	Über die Bildung der Grundsubstanz des Knochengewebes. Verhdlg. d. Anat. Gesellsch., Leipzig 1911. 25. Versammlung.



Ueber die Lymphbahnen der Säugethierleber.

Von

Dr. J. Disse,

Prosector u. Privatdocent in Göttingen.

[um 1890.]

Hierzu Tafel X.

Im Jahre 1880 machte ich in Tokio, gemeinschaftlich mit meinem damaligen Collegen Dr. E. Tiegel, die Beobachtung, dass die Leber von Schlangen (Elaphis- u. Tropidonotusarten), denen mit Kochsalzlösung verriebene Tusche unter die Haut des Bauches eingespritzt wurde, nach einigen Stunden grauschwarz

Fig. 1: Joseph Hugo Vincenz Disse (1852–1912)

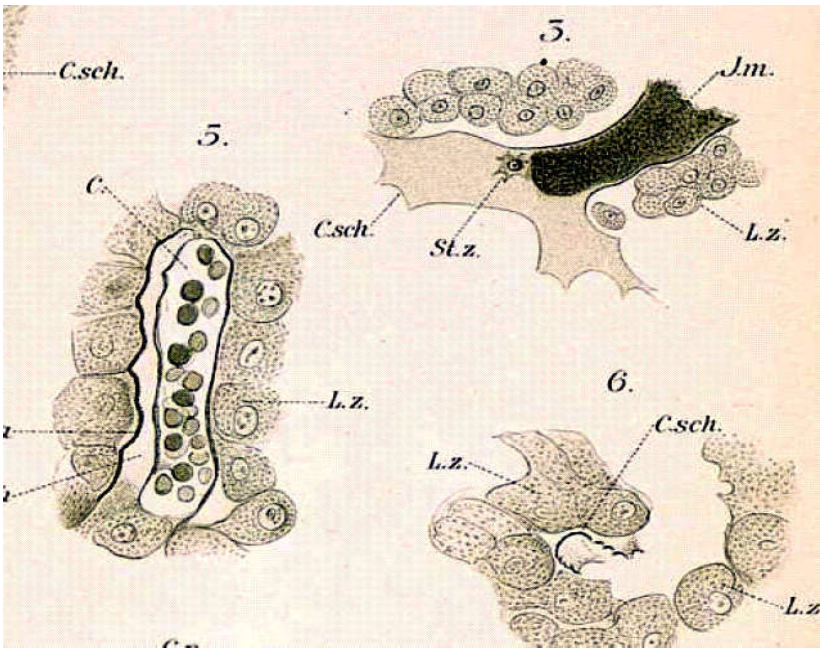


Fig. 2: Disse's paper, with a partial view of his figures, where reported its findings

The Perisinusoidal Space of *Disse, Today.*

The Hepatic Sinusoids (HS) are capillary spaces that receive blood from the branches of the portal vein and the hepatic artery at the periphery of lobules and deliver it to central veins. HS are lined with rectoendothelial cells (Kupffer cells, predominantly in the periportal area) and by a thin discontinuous endothelial that has a discontinuous basal lamina, which is lacking in many cases. HS would be kept open by a connective fibrillar network. From the surface of the hepatocytes, small irregular microvilli project to the PS. The microvilli extend, up to six times, the length of the available surface area for exchanging substances between the hepatocytes and plasma. Through the PS, proteins and lipoproteins in the hepatocytes are transported to the blood. All the hepatic secretions, except for the bile, follow this path.

Fenestration and discontinuity of the endothelium facilitates this transport. Sinusoidal endothelial cells form a fenestrated monolayer within the sinusoidal endothelium. This discontinuous structure allows contact between hepatocytes and lymphocytes.

The PS also contains hepatic stellate cells (HSC) also known as perisinusoidal cells or Ito cells (earlier lymphocytes or fat-storing cells which store fat or fat soluble vitamins (like vitamin A). HSC do not proliferate in the healthy liver. However, a variety of insults that cause inflammation can result in HSC transforming to myofibroblasts, resulting in collagen production, fibrosis, and cirrhosis [8,9].

Most of the lymph originates in the PS and circulates in the same direction as bile. The plasma that remains in the PS drains towards a small periportal gap: the space of Mall, between the stroma of the portal canal and the outermost hepatocytes of the hepatic lobule. These lymphatic branches open to the interlobular lymphatic ducts. The lymphatic vessels that form may be superficial or deep. Superficial lymph vessels move along the subperitoneal fibrous capsule and deep lymph vessels follow the portal branches or the hepatic veins. A large part of the superficial and deep lymph vessels drain into the hepatic pedicle lymph nodes. Other lymph vessels (superficial coming from the back portion, which accompanies the hepatic veins) pass from the bare area of the liver through the diaphragm to the phrenic nodes and posterior mediastinal lymph nodes, near the inferior vena cava. Some lymph vessels of the posterior portion of the liver follow the falciform ligament and reach the parasternal lymph nodes. The paraesophageal zone of the left lobe drains lymph into the left gastric node [10]. Around 80% of the hepatic lymph flows into thoracic duct [1].

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