

Review

Immunology's first priority dispute—An account of the 17th-century Rudbeck–Bartholin feud

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Abstract

Modern immunology has been notably free of public disputes over credit for major discoveries in this discipline. But the early recognition of the lymphatic system witnessed two examples of heated priority feuds. The first in the 17th-century concerned the greater anatomical organization of the system, while the second in the 18th-century concerned its function. This essay reviews the earlier of the two disputes, in which a Swedish medical student (Ole Rudbeck) charged a respected Danish Professor (T. Bartholin) with plagiarism and antedating his observations. Thus ethical issues in immunology predate modern times. How this discipline reached this point in its history is another focus of this essay and also an excuse to review briefly the anatomy of the lymphatic system. The influence of nationalistic pride on priority disputes is also discussed.

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1. Introduction

The impressive progress of immunology over the past 60 years has been generally free of major priority disputes of the public sort which beset other sciences starting in the 16th-century. Sociologists and historians reviewing this subject (Kuhn, Merton, Brannigan, Hellman, etc.) have included in their studies no immunological controversies worthy of analysis [1–4]. But two instances of contested priority did enliven the early history of basic immunology. The first dispute, dating from the 17th-century, concerned mainly the anatomy of the lymphatic system and pitted Ole Rudbeck (a Swede) against Thomas Bartholin (a Dane). These anatomists, from neighboring countries long at war with each other, are the chief protagonists of this essay. The second dispute, from the 18th-century, centered on the function of the lymphatic system and will be treated in another paper. The Rudbeck–Bartholin controversy

involved basic details of lymphatic anatomy which perhaps have been forgotten by many readers but need to be recalled for the ensuing discussion and which are summarized in the following section.

2. An overview of the lymphatic system

The lymphatic system is a widely distributed, largely invisible, intricate maze of vessels which drains extracellular fluid from all organs and tissues with the exception of the brain, the meninges, the eyeballs, tendons, and a few other structures. The system is essential in animals having a closed cardiovascular system under high pressure, because the arterial pressure ($100\text{ mm} \pm \text{Hg}$) fills interstitial spaces with a transcapillary transudate from blood, i.e., plasma, which must be steadily removed to prevent local edema [5]. Some of the plasma fluid and small molecules are reabsorbed through capillary walls back into the circulation, while unabsorbed fluid and macro-molecules (such as long chain fatty acids and lipoproteins) are returned in the lymph fluid to the blood stream via the lymphatic system.

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Lymph enters the plexus of microscopic vessels, collects into first order vessels and vessels of increasing size, and ultimately drains into two conspicuous collecting vessels—a long one and a short one. The main, longer trunk of return is the thoracic duct (see A, below), which lies anterior to the vertebrae and runs parallel with the aorta from ca. L-2 to C-2 (Fig. 1). The thoracic duct empties lymph into the blood stream at the junction of the left subclavian vein with the left internal jugular vein. Another, shorter collecting trunk is the right lymphatic duct (see B, below), which lies parallel to the right of the C-2 vertebrae, is ca. 1.25 cm long, and empties its lymph into the right subclavian vein.

(A) The thoracic duct begins at the level of L-2 in the abdomen as a dilatation, the *cysterna chyli* (initially termed the *receptaculum chyli*), into which three smaller trunks flow. Two trunks are the left and right lumbar trunks, which drain lymph mainly from the lower limbs, the pelvic viscera, the

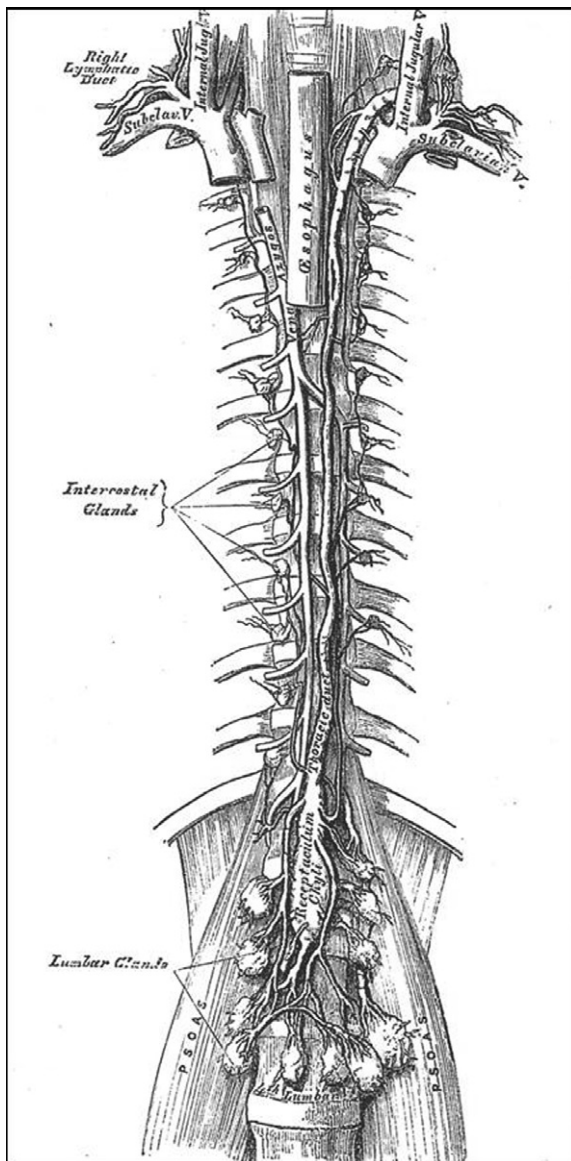


Fig. 1. The thoracic and right lymphatic ducts. From Gray's Anatomy, 1859, p. 427.

kidneys and adrenal glands, and much of the abdominal wall. The third trunk is the intestinal trunk, which receives lymph mainly from the stomach, the intestines, the pancreas, and much of the liver. Elsewhere along the thoracic duct innumerable other smaller lymphatic vessels enter.

(B) The right lymphatic duct drains the right side of the head, neck, and thorax plus the right arm, right lung, right side of the heart, and the convex surface of the liver.

Along their course, lymphatic vessels appear beaded as they pass through small lymph nodes and, where the uni- or bicuspid valves are present [6]. Lymph nodes are designated by their location—axillary, inguinal, gastric, etc. Of particular relevance to this essay is the largest group of nodes—the 140 or so mesenteric nodes aligned in several rows within the layers of the mesentery. In the 17th-century, lymph nodes were commonly termed conglobate glands by anatomists who assumed then that they had only a secretory function.

Lymph draining the small intestine may be clear and watery like that coming from other areas, or it may be cloudy and yellow if containing fat from the intestinal contents. In the latter instance the lymph is called chyle and the lymph vessels conducting it are called lacteals. They enter the *cysterna chyli* (= *receptaculum chyli*), which is the beginning (the lower end) of the thoracic duct. When filled with turbid chyle, the vessels are conspicuous; when containing clear lymph, they are generally invisible to the naked eye but can be revealed by injection techniques. See ¹ for the Latin etymology of some common terms in this field¹.

Lymphatic drainage is absent in immunologically privileged sites in the body, e.g., the brain, cornea, etc. Other sites devoid of lymphatics include orbital fat, the internal ear, cartilage, and subcutaneous fat and epidermis [7]. The literature has been confusing about lymphatic drainage in the epidermis and spleen. According to Yoffey and Courtice, “no lymphatic vessels have been described in the epidermis” but the skin contains “a superficial plexus in the corium and another plexus lying in the deeper part of the corium or in the adjacent subcutaneous tissue,” both plexuses being without valves [6]. Older anatomy texts give various interpretations of lymphatic drainage in the spleen. Yoffey and Courtice state that lymphatic vessels are absent in the stroma (red pulp) of the spleen but that they are present in the capsule and the thickest trabeculae and have been described in the white pulp [6].

3. The early history of lymphatic anatomy from Hippocrates to Pecquet

The parts of the lymphatic system described earliest were lymph nodes, for they often form visible bulges

¹ Etymology of some Latin-derived terms found in this essay:

chyle: from *chylus* = juice;

conglobate: from *conglobo* = to gather into a ball, or a rounded mass;

lacteals: from *lacteus* = milky;

lymph: from *lympha* = clear water.

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