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Nomenclature of

The Lymph Apparatus

L. I. Saar, Dr. med. vet.
R. Getty, D.V.M., M.S., Ph.D.*

A review of the textbooks of anatomy of domestic animals and of man\textsuperscript{10}, \textsuperscript{16}, \textsuperscript{19}, \textsuperscript{24}, \textsuperscript{26}, \textsuperscript{34}, \textsuperscript{35}, \textsuperscript{46}, \textsuperscript{22} and meat inspection handbooks \textsuperscript{21}, \textsuperscript{24}, \textsuperscript{25}, \textsuperscript{39}, \textsuperscript{42}, \textsuperscript{45}, \textsuperscript{3} and various other publications \textsuperscript{1-3}, \textsuperscript{5-8}, \textsuperscript{12-14}, \textsuperscript{17}, \textsuperscript{18}, \textsuperscript{27-30}, \textsuperscript{33}, \textsuperscript{37}, \textsuperscript{38}, \textsuperscript{40}, \textsuperscript{42}, \textsuperscript{44}, indicate that a variety of terms are used for describing the lymph system.

Terms “Lymphatic System” and “Lymph System”

According to Nomina Anatomica (2nd edition), revised by the International Anatomical Nomenclature Committee (I. A. N. C.), 1961, “the systema lymphaticum includes the vasa lymphatica, nodi lymphatici (lymphonodi), folliculi lymphatici, and the lien. The tonsils are described under ‘fauces’ and the thymus is included in ‘glandula’ sine ductibus et paraganglia”.

In Gray (1959), however, the thymus and also the tonsils are included in the “Lymphatic System” which is composed of the lymphatic vessels, the lymph nodes and certain lymphatic organs (solitary and aggregated lymphatic nodules), the spleen and the lymphoid (adenoid) tissue. In Bloom-Fawcett (1962) the “lymphatic system” is said to be composed of lymphatic vessels and organs. The authors define the lymphatic tissue under blood cell formation and destruction, with the spleen and the thymus being discussed in separate chapters. The tonsils are described under associated structures of the oral cavity (Isthmus fauces). Ham (1947) describes the “lymphatic division of the circulatory system”, as including the lymphatic capillaries, vessels and ducts. The lymphatic capillaries and somewhat larger vessels are summarized as “lymphatics”. The lymph nodes, the nodules of the lymphatic tissue, the tonsils, the Peyer’s patches and other similar structures, the hemal nodes, the spleen and also the thymus are described under “different types of lymphatic tissues”. Grau, in Krölling-Grau, 1960, described “lymph vascular system” to include the lymph capillaries, lymph vessels, lymph ducts and the lymph nodes with which they are connected. The “hemopoietic apparatus” was classified according to cell types formed, and “myeloic system”, where mainly erythrocytes and granulocytes are formed (bone marrow) and the “lymphatic system” as areas of the blood forming apparatus where mainly the lymphocytes are produced. Grau (1960) divided the “hemopoietic apparatus” into three parts. The first included the blood forming tissues closely related to the tissue fluid (ground substance). It includes the diffuse lymphoreticular tissue, the organ-like lymphoreticular islets, the lymphonodi solitarii, the lymphonodi aggregati, Peyer’s patches, the tonsils and the thymus. The second part included only the lymph nodes, which were closely related

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Issue, No. 1, 1962
to the lymph; and the third part described the blood forming tissues closely related to the blood itself, i.e., the spleen, hemal nodes, and the bone marrow.

Bargmann (1959) avoided using terms like “lymph vascular system, lymphatic system, and lymph system”. The term “lymphatic apparatus” was used in a more functional sense to describe lymphatic tissue structures. In Bargmann (1959), the circulatory system and the hemopoietic tissues and organs are discussed from a broader aspect. Bargmann calls it, “the circulatory and the defense system” (Das Kreislauf und Abwehrsystem), and states that it is made up of the blood vessels, heart, lymph vessels and the mesenchymal defense apparatus. The latter is composed of the reticulo-endothelial system, found in organs associated with the blood and lymph circulation (bone marrow, lymph nodes, spleen, etc.) and supported by lymphoepithelial system (tonsils, thymus).

In equally well known histology and anatomy text-and handbooks, as well as in those books which are especially concerned with the lymph flow, the terms lymphatic system, lymphatic apparatus, lymphatics, lymph (or lymphatic) vessel, lymph (or lymphatic) node are used very differently. The “lymphatic system” may include the lymph vessels and a variable number of lymphatic tissue structures and organs; or it may include the lymph vessels and the lymph nodes only. Furthermore, the term “lymphatic system” may refer to a subdivision of the hemopoietic system. The term “lymphatic apparatus” in general refers to the organization and function of the lymphatic system, but it is also used in a “nonspecific” functional sense for the lymphatic tissue (Bargmann, 1959).

The term “lymphatics” has different meanings. In a broader sense it is applied as a synonym for the “lymphatic system” (Chauveau, 1902 and Delamere, 1913) or it may describe the lymph capillaries, vessels, and ducts; thus, representing an “accessory system” to the blood vascular system (Trautmann-Fiebiger, English ed. 1957); or on a more strict basis it is limited to lymph vessels connecting the lymph capillaries with the lymphatic trunks (Trautmann-Fiebiger, English edition 1957). In Ham (1957) the “lymphatics” includes the lymphatic capillaries and those somewhat larger lymph vessels. Kraus (1957) suggested one refer to the lymph capillaries from the standpoint of morphology and physiology as “lymph alveoli” or “lymph receptors”.

Disagreement and inconsistency exists also in terms such as: lymph (or lymphatic) capillary, lymph (or lymphatic) vessel, lymph (or lymphatic) duct. Some authors prefer terms “lymph vessels”; others “lymphatic vessels”. In some publications, (Yoffey-Courtice, 1956; Rusznyak et al. English ed. 1960) both terms, lymph and lymphatic vessel are used as synonyms. In most of the publications the term “lymph node” is consistantly used while occasionally the “lymphatic node” is preferred. (The Nomina Anatomica, second edition, 1961, adheres to “lymphatic node”.)

The word lymphatic means “pertaining to” or “related to” the lymph, but when it is used in combination with the word “system”, it opens a field of discussion on the degree of relations existing between the tissue structures and the lymph fluid. Thus, e.g., the “bone marrow” which mainly produces erythrocytes and granulocytes (myeloid system) is also involved to a lesser degree in lymphopoiesis, (Grau, in Krölling-Grau, 1960) and may be included then in a sense in the “lymphatic system”. Furthermore, the terms, like the “loose lymphatic tissue”, consisting predominantly of stroma (Bloom, 1962) and also the “diffuse lymphoreticular tissue” (Grau, 1960) indicating relation to the lymph fluid, illustrate the difficulties present in defining the morphological extent of the “lymphatic system”. In 1962, Csaba, et al. stated that: “As regard to the question whether one is justified to speak of a uniform lymphatic system, observations have led to the conclusion that for all the morphological similarities between the organs examined (lymphatic organs, thymus, spleen, lymph nodes, etc.) and in spite of functional overlap-
ping, there is no such thing as a uniform lymphatic system since all the organs are essentially different from one another.”

It may be concluded, therefore, that the need exists to define the terms used. The word “lymph” will be used in a smaller manner like the blood, the lymph vessels, and blood vessels. Thus, the lymph will be regarded as fluid which is present in the lymph capillaries, lymph vessels, lymph ducts, lymph trunks, and in the sinuses of the lymph nodes. The lymph vessels and the lymph nodes which are engaged in conveying the lymph will constitute the “lymph system”. The term “lymph vascular system” will include the lymph capillaries, lymph vessels, lymph ducts, lymph trunks and their contents, the lymph, but no lymph nodes. The word “lymphatic” will indicate a certain, but not exclusive relationship to the lymph and will be applied to lymphatic tissue (structures) which are situated outside the lymph vascular system, i.e., separated from the lymph by the lymph capillary wall.

The term “lymphatic system” will be avoided by listing the lymphatic tissue structures without referring to the term “system”.

<table>
<thead>
<tr>
<th>Table No. 1</th>
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<tbody>
<tr>
<td><strong>LYMPH APPARATUS</strong></td>
</tr>
<tr>
<td><strong>A. Lymph System</strong></td>
</tr>
<tr>
<td>1) Lymph vascular system: Lymph (fluid)</td>
</tr>
<tr>
<td>Lymph capillaries</td>
</tr>
<tr>
<td>Lymph vessels</td>
</tr>
<tr>
<td>Lymph trunks</td>
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<tr>
<td>2) Lymph nodes*</td>
</tr>
<tr>
<td><strong>B. Lymphatic Tissue Structures</strong></td>
</tr>
<tr>
<td>(Lymphatic apparatus)</td>
</tr>
<tr>
<td>1) Lymphatic tissue (lymphoreticular tissue,</td>
</tr>
<tr>
<td>[Grau]; lymphocytic tissue, [Rebuck].)</td>
</tr>
<tr>
<td>2) Lymphatic tissue aggregations (“Organ-like</td>
</tr>
<tr>
<td>lymphoreticular islets”, [Grau]; “Taches</td>
</tr>
<tr>
<td>laiteuses, [Ranvier].)</td>
</tr>
<tr>
<td>3) Lymphatic nodules (lymphonoduli solitarii;</td>
</tr>
<tr>
<td>lymphonoduli aggregati.)</td>
</tr>
<tr>
<td>4) Spleen;</td>
</tr>
<tr>
<td>5) Thymus;</td>
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<tr>
<td>6) Tonsils;</td>
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<tr>
<td>7) Lymph nodes*</td>
</tr>
</tbody>
</table>

* See Text.

The lymph nodes have a somewhat intermediate position, see Table No. 1. They may be described as “lymphatic tissue structures” as they are composed of accumulations of lymphatic tissue; or as they convey lymph via their sinuses, and thus may be included in the “lymph system”.

The term, “lymph apparatus”, will include in a broad sense the descriptive and functional aspects of the “lymphatic tissue structures” and those of the “lymph system”. The expression “lymphatic apparatus” however, will include the descriptive and functional aspects of the “lymphatic tissue structures”. The term lymphatics will be applied in its plural form only and, in agreement with Ham (1957), limited to the lymph capillaries and the “somewhat” larger lymph vessels.

The “Lymph Node” versus “Lymph Gland”

At the Anatomical Congress at Basle (B.N.A., 1895), the term “lymphoglandula” was chosen after a vigorous debate about the term “gland or node”. The early writers seem to have adhered to the term “gland”. Malphigi (1691) and de Graaf (1765) believed that the “lymph glands” add substances of their secretion to the lymph. Sylvius and Wharton (1664) thought that these nodes modified the lymph. Heyfelder (1851) found that the white corpuscles were much more numerous in the efferent than in the afferent lymph vessels and Rindfleisch (1878); Newmann (1881); and Moses (1890); described a “hematopoietic function” of the lymph glands. Cruikshank (1786) and Hewson (1846), however, considered the lymph glands as being a plexus of lymph vessels.

In the middle of the 19th century with the advances made in differentiating tissue structures involved in the formation of lymphatic nodules and lymph nodes, new terms appeared as a result of the lymphatic tissue described. In 1863, Kölliker described the term “cytogenous tissue” which led to “cytogenous glands” and to “organa cytogenea” (Rauber-Kopsch, 1955). He (1860) described the “adenoid tissue” from which the adenoid glands are derived. Henle (1859) used the term “conglobate glandular substance”, and Waldeyer (cit. Hellmann,
1930) introduced the term "lymphoid tissue" (lymphoid nodules). In France the lymph nodes were named as "ganglions lymphatiques". This term was already applied by Chaussier and Adelon (1818) because of a macroscopic resemblance found between the nervous ganglia and the lymph nodes. Pierol (1900) stated that the term "gland" as used for compound nodules is inaccurately sanctioned by long usage. In 1912, Baum was firmly opposed to the term "lymphoglandula:" (B.N.A.) and advocated the use of "lymphonodus. In the past 50 years both terms, the "gland" and the "node" have been often used synonymously. In fact, the term "lymph gland" is still most frequently used in abattoirs. In 1928, Baum again repeated that, "the lymph nodes have no similarity with 'glands' in structure, function and development" and due to Baum's great influence on the morphology of the lymph system in European literature, the term "lymph gland" was more or less eliminated and replaced by "lymphonodus" (Jenaer Nomina Anatomica, 1935).

The term "lymphonodus" has been criticized as being an incorrect Latin expression, and at the A.I.N.C. (International Anatomical Nomenclature Committee) held at Oxford in 1950, the Latin name "nodus lymphaticus" was preferred and the term "lymphonodus" kept as a synonym. This was also approved by the Sixth and Seventh International Congresses of Anatomists, held in Paris in 1955 and in New York in 1960.

The English term "lymph node" and its Latin equivalent "lymphonodus" sound similar and in both of the cases, they may be shortened as "Ln". (lymph node; lymphonodus) and "Lnn." (lymph nodes; lymphonodi). Furthermore, "lymphonodus" consists of one word only and it is also five letters shorter than the comparative "nodus lymphaticus". Using the term "nodus lymphaticus" consistently, the terms which are breathtakingly long already will appear even longer such as: "nodi lymphatici trachobronchiales inferiores", or "nodi lymphatici cervicales superficiales dorsales". Thus, for the reasons mentioned above, it would seem that the term "lymphonodus" (lymph node) should be preferred.

The "Lymph Node" versus "Lymph Nodes"

According to Baum (1926) difficulties are evident from the standpoint of comparative anatomy in applying the term "lymph node" in its singular and in the plural form "lymph nodes". In some species of animals there are, in certain regions, usually only one lymph node, while in other species several lymph nodes are present. The problem becomes more complicated when one takes into consideration inconsistently found lymph node groups which may appear as one or several lymph nodes; and also when differences are found on the right and the left side of the same animal. Thus, Baum (1926) suggested two new terms to choose from, "lympholocus" (place of lymph) and "lymphocentrum" (center of lymph) which may consist of one or several lymph nodes. Other suggestions were made by Süppel (1926) to call it "lymphocribrum" (lymph filter or lymph sieve) and by Schmaltz (1927) to describe the place lymph nodes are found as the "lympharium", similar to words used like aquarium and herbarium.

According to Zietschmann (1958) it is possible to avoid the latter terms by calling a conglomerate of small lymph nodes, as they are most commonly found in swine, simply as one "lymph node" (Ln.). This term also includes those cases in which one or more of these small lymph nodes are slightly apart from the main grouping. This would be also referred to as "one lymph node". However, when there are found to be two or more conglomerations of lymph nodes and they can be clearly distinguished from each other, then one can refer to "lymph nodes" (Lnn.). Certainly, it is not the most ideal way to solve the problem of terminology involved, but the solution given by Zietschmann seems to be for the authors as a practical compromise. The term "lymphocentrum" (Zietschmann, 1958) possibly may be used to describe several differently named groups of lymph nodes which form a large unit.
Grau (1961) is definitely in favor of calling the lymph node groups "lymphocentra" and according to Grau when this is achieved it will be possible to establish a common nomenclature for man and animals. In Ellenberger-Baum (1943) the term "lymphocentrum" (Lc.) was successfully applied by Grau to summarize the lymph node groups from the standpoint of comparing the horse, dog, cat, ox, sheep and swine. In 1961, Spira extended Grau's principles of the "lymphacentra" to man, primates, insectivora, chiroptera, lagomorpha, and rodentia. Spira proved that by general acceptance of the term "lymphocentrum" it is possible to eliminate many difficulties which comparative anatomy has faced in the past. Thus, the term "Lc. mandibulare" may include in various species of animals and man the Lnn. mandibulares, Lnn. mandibulares accessorii, Lnn. buccales, Ln. pterygoideus, Lnn. submentales, Lnn. paramandibulares and the Lnn. linguales.

Unfortunately the term "lymphocentrum" has not achieved the popularity it deserves. This is probably due to the reluctance on the part of some anatomists to apply the term "center" to so many diverse areas of the body; and also because the term is more commonly associated with a "mid-point", rather than to a "central area". In fact, some of the "lymph centers" described by Spira include a wide area of lymph node groups. Thus, the Lc. coeliacum includes in various species the Lnn. coeliaci; Lnn. lienales; Lnn. gastriici; Lnn. hepatici s. portarum; Lnn. pancreaticoduodenales and the Lnn. omentales. Some of the lymph centers, i.e., the Lc. inguinale profundum is limited to a relatively small area, representing the Lnn. inguinales profundi only.

According to Spira the Lc. cervicale profundum includes the Lnn. cervicales profundi craniales; Lnn. cervicales profundi medii and the Lnn. cervicales profundi caudales and thus this 'center' covers an area ranging approximately from the larynx down to the thoracic inlet. Furthermore, the following lymph nodes are also included as being associated ("Vorgeschaltet") to the "deep cervical lymph center": Ln. costocervicalis and the Ln. rhomboideus (in the ox and the sheep); and the Lnn. submentales; Lnn. nuchales; Lnn. retroauriculares; and the Lnn. occipitales (in man). Thus, the term lymphocentrum is apparently used in a sense of a "central area".

After weeks of discussions with associates in the anatomy department, and also consulting numerous dictionaries, none of the terms suggested such as "lymph group area", "lymph node groups", or just "lymph area" were found to improve essentially the term lymphocentrum" already used in publications. In fact, in Webster's Dictionary (1959) the term "center" is not exclusively used to designate a point equally distant from all points but rather, as Webster states, in biology to refer "to a group of cells having a common function." Thus, the term "lymphocentrum" will be applied with some reservations, but only as a necessity to have a term available for summarizing lymph node groups in a certain area, which form a larger functional unit.

Summary

A review of textbooks and various publications indicated disagreement and inconsistency in the terminology used in describing the lymph fluid and the lymphatic tissue structures. The terms "lymph" and "lymphatic" are discussed and a suggested classification of the terms has been given in Table No. 1. The term "lymph" is applied to fluid only, which is present in the "lymph vascular system" composed of lymph capillaries, lymph vessels, lymph trunks and the sinuses of the lymph nodes. The "lymph system" is engaged in conveying the lymph and it includes the "lymph vascular system", the lymph nodes and the lymph fluid itself.

The word "lymphatic" pertaining to lymph has been used in reference to tissue structures only, which are situated outside the lymph system, having a certain but not an exclusive relationship with the lymph fluid.

Because in the past, the lymph fluid was considered to be in "open communication" with the "tissue fluid", the term "lymphatic system" included lymph vascular system, lymph nodes, lymphatic tissue
structures and the “tissue fluid”. New findings, however, have made the “open communication” concept unacceptable and thus the term “lymphatic system” which described it, may be considered now as improper. Likewise, the possibility of applying the term “lymphatic system” to lymphatic tissue structures only, as a “system” related to the lymph fluid, appeared to the authors as being questionable because of the various interpretations of the morphological and functional extent of said “lymphatic system”.

It was suggested that the term “lymphatic system” be completely avoided by describing the lymphatic tissue structures without referring to the term “system”.

The term “lymphatic apparatus” will indicate the descriptive as well as the functional aspects of the lymphatic tissue structures while the term “lymph apparatus” includes both the “lymph system” and the “lymphatic tissue structures”. The term “lymphoid tissue” in its meaning “tissue resembling lymph” was substituted by the term “lymphatic tissue”. The term “lymph gland” was replaced by the term “lymph node”.

The term “lymphocentrum” (Baum, Grau) was discussed and accepted by the authors, as a necessity for comparative anatomy in order to have a term available for describing differently the name of a lymph node, nodes, or a group of lymph nodes, which in different species of animals perform the same general function.

### Selected References


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