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XXVIII. *An Account of the Lymphatic System in Amphibious Animals. By Mr. William Hewson, Lecturer in Anatomy: In a Letter to William Hunter, M. D. F.R.S. and by him communicated to the Society.*

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Read Nov. 9,
1769.

A GREEABLE to the promise which I made, in a postscript to the paper on the lymphatic system in birds, which the Royal Society did me the honour of publishing in their last volume, I now take the liberty of begging of you to present to the learned Society an account of the same system in a turtle. I should likewise have added a figure of that animal, had not these vessels agreed in so many particulars with those in birds, that I flattered myself the description would be intelligible without it.

This system in a turtle, like that in birds, consists of the lacteals and lymphatics, and their common trunks, or the thoracic ducts. It agrees likewise with that in birds, in not having any visible lymphatic glands either on the mesentery or near the thoracic ducts; but
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differs from that in birds, in not having any glands upon the larger lymphatics of the neck; at least I am inclined to believe so, from not having seen any in the dissection of one animal of this species in which I looked for them. It likewise differs from that in birds in another circumstance, to be taken notice of hereafter. Whether it agrees with the same system in birds, in the transparency and want of colour in the chyle, I cannot take upon me to determine, as I did not see any of that fluid in this subject (*a*).

The following description I took from the animal, after I had injected the larger branches of this system with a coloured wax, and the smaller with quicksilver. To avoid my being misunderstood, when I speak of the situation of the different parts, I shall mention, once for all, that the description was taken from the subject as it lay upon its back; those parts being called highest which were nearest the head, those lowest which were nearest the tail, those posterior which were nearest the back, and those anterior nearest the belly (*b*).

The lacteals accompany the blood-vessels upon the mesentery, running by their sides, and communicate frequently across those vessels. Near the root of the mesentery they anastomose, so as to form a net-work, from which several large branches go into some considerable lymphatics lying on the left side of the spine.

(*a*) In a crocodile, which I lately saw by the favour of Mr. John Hunter, the chyle was white.

(*b*) The animal, from which I took this description, was large, measuring from the lower to the upper part of the shell two feet seven inches, and two feet two inches from side to side.

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These last can be traced downwards almost to the *anus*, and belong to the parts situated below the mesentery, and particularly to the kidneys. At the root of the mesentery, on the left side of the spine, the lymphatics of the spleen join the lacteals, and immediately above this union a sort of *plexus*, or network, is formed, which lies upon the right *aorta* (for there are two *aortæ* in this animal). From this *plexus* a large branch arises, which passes behind the right *aorta* to the left side, and gets before the left *aorta*, where it assists in forming a very large *receptaculum*, which lies upon that artery. From this *receptaculum* arise the thoracic ducts. From its right side goes one trunk, which is joined by that large branch which came from the *plexus* to the left side of the right *aorta*, and then passes over the spine. This trunk is the thoracic duct of the right side; for, having got to the right side of the spine, it runs upwards on the inside of the right *aorta*, towards the right subclavian vein. And when it has advanced a little above the lungs, or within three or four inches of the subclavian vein, it divides into branches, which, near the same place, are joined by a large branch that comes up on the outside of the *aorta*. From this part upwards those vessels divide and sub-divide, and are afterwards joined by the lymphatics of the neck, which likewise divide into branches before they join those from below; so that between the thoracic duct and the lymphatics of the same side of the neck a very intricate net-work is formed. From this network a branch goes into the angle made by the jugular vein and the lower part or trunk of the subclavian: this branch, therefore, lies on the inside of the jugular,

jugular, whilst another gets to the outside of that vein, and seems to open into it a little above the angle between that vein and the subclavian. I say seems to open, for the injection has not succeeded at this part so as to enable me to determine whether the last-mentioned branch really did enter or not. Into the above-mentioned *receptaculum*, the lymphatics of the stomach and *duodenum* likewise enter. Those of the *duodenum* run by the side of the *pancreas*, and probably receive its lymphatics, and a part of those of the liver. The lymphatics of the stomach and *duodenum* have very numerous *anastomoses*, and form a beautiful net-work on the artery which they accompany. From this *receptaculum* likewise, besides the trunk already mentioned, which goes to the right side, arise two other trunks pretty equal in size; one of which runs upon the left side, and the other upon the right side of the left *aorta*, till they come within two or three inches of the left subclavian vein; where they join behind the *aorta*, and form a number of branches, which are afterwards joined by the lymphatics of the left side of the neck: so that here a net-work, or *plexus*, is formed, as upon the right side. From this *plexus* a branch issues, which opens into the angle between the jugular and the lower part or trunk of the subclavian vein. In these net-works, formed by the lymphatics near their terminations in the veins, this system in the turtle likewise differs remarkably from that in birds.

So much for the general description of the lymphatic system in this animal, I shall next add what I have observed as to the more minute distribution of its lacteals. In the first place, it may be observed, that

what knowledge we have of the minute distribution of those vessels in quadrupeds has been acquired from examining them when filled with their natural fluid, the chyle; for the valves with which those vessels abound prevent our injecting their smaller branches; as we do those of the arteries and veins of the intestines. But in this animal, I have been so fortunate as to force the valves, and to inject the lacteals from their trunks to their branches, so as to fill them all around with quicksilver, in several parts of the intestine. In these experiments I observed, that the quicksilver was often stopped by the valves, where the lacteals run upon the mesentery, or where they are just leaving the intestine; but when those valves were forced, and the quicksilver had once got upon the surface of the gut, it generally ran forward without seeming to meet with any obstacle. The lacteals anastomose upon the intestines, so that the quicksilver, which has got upon them by one vessel, in general, returns by another, at some distance. The larger lacteals, which run upon the intestines, accompany the blood-vessels; but the smaller lacteals neither accompany those vessels, nor pass in the same direction, but run longitudinally upon the gut, and dip down through the muscular coat into the cellular or nervous, as it has been called, which in this animal is very thin in comparison to what it is in the human subject. So far I have traced those vessels to my satisfaction; but what becomes of them after they have got to the cellular coat is not so easy to determine: in five or six different experiments which I have made, the mercury passed from the lacteals into the cells between the muscular coat and the internal,

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and spread from cell to cell, very uniformly, over a great part of the intestine, although but little force had been used, and although there was nothing like extravasation in any other part of the intestine. Upon inverting the intestine after thus filling its lacteals, the mercury, on being pressed, was, in many parts, driven into small vessels upon the internal coat, or villous, as it is called. From this it would seem, that this cellular net-work was a part of the lymphatic system in this animal. It might indeed be supposed to be mere extravasation, but that it is rather a part of the lymphatic system appears probable from the following considerations. First, from the regularity in the size of the cells. Secondly, from the little force used in the experiment, and from there being nothing like this appearance in the cellular membrane between the peritoneal and muscular coats where extravasations were as likely to happen. Thirdly, from my having been able, after inverting the intestine, to press the quicksilver from the cells into the very small vessels upon the internal coat; but I must confess these facts would not be sufficient to determine whether these cells were, or were not a part of the system, did not the analogy of the same part in fish clearly prove it. For in the cod, instead of the cellular net-work, as in the turtle, there is a network of vessels (of which a description shall be given hereafter) so that I have now no doubt but that those cells are parts of the lymphatic system, and that the small absorbent vessels of the internal coat pour their fluid into this net-work, from which it is conveyed by the larger lacteals.