Lymph and functional integrity – prologue

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**Abstract**

The lymphatic fluid is the fluid part of the interstitium, also called tissue fluid. In evolutionary terms, it is the further development of the ‘coelom fluid’, the ‘primal ocean’; not just water, as the translation of the word ‘lymph’ says. Together with the extracellular matrix, lymph forms the entire physiological cosmos of the tissue cell.

**Prologue**

Knowledge is multidimensional. Being "conscious" enables "consistent thinking". As Claude Bernard says in his "introduction to the study of experimental medicine" in 1865, knowledge and awareness of the functionality and the reason for the individual elements arise after the knowledge of the individual elements. The human body is the symphony of its individual functional units. If this symphony is out of sync, functional disorders occur, diseases can arise, and the aging process can be accelerated in the long term.
The complexity of the human organism is based on the availability of energy and the ability to make physical and chemical changes. As a chemotroph, humans have to gain their energy by oxidizing molecules with a high energy content, which are synthesized by the phototroph with the help of the sun. In biosphere there is a unidirectional flow of energy: from the sun to the phototroph and from this to the chemotroph and ultimately released as heat in the environment. The flow of energy is determined by the laws of thermodynamics. The chronobiological condition of the organism is a strong predisposing factor in this setting. This means that long-term storage of energy in living organisms is naturally not intended. Structures in the human body that serve to store energy should therefore not be understood as a bioenergetic storage but as a buffer. In order to understand and interpret the effect (e.g. task) of biological substances in the organism ‘human’, it is important to note the following: Organic substances are potential biochemical energy (bioenergetic synonym: energy equivalents) and, due to their structure, information carriers. Depending on the functional considerations, the biological material is to be functionally evaluated and assessed: within the energy system “human” as an energy source, within the logistic organization of the organism “human” as an information carrier.

In order to be able to differentiate systems of the organism and to represent interactions, it is helpful to take a look at the evolution of biological systems (phylogenetics). Life on earth developed in the form of unicellular organisms in a large 'primeval sea'. The composition of the primordial sea included a stable environment of nutrients and waste products. The waste products were diluted infinitely. ‘Multicellularity’ (Metabionta) developed to gain mobility and activity. So that every cell remained in contact with the “primordial sea”, the number of germ layers developed the ‘Eucoelomat’ with initially the ‘Coelom Fluid’, a moving, constantly regenerating, liquid pallidum that is not directly connected to the environment. With the increasing development of mesodermal structures (muscles, endothelium, fascia), the vascular systems emerged due to the increasing autonomy of the perfusion system against environmental influences. These multicellular cells were freed from the physical conditions of direct, uncontrolled diffusion, which existed in the state of pure coelomic fluid, and could, with a muscularily regulated vascular system and musculoskeletal system, become more complex and therefore independent of their physique and range of motion. This created the conditions for the transition to life on land; shape the body regardless of the constant presence of water in the environment. Finally, this phylogenetic
development divides the extracellular fluid into two compartments: the interstitial fluid, corresponding to the original ‘coeloma fluid’, and the blood plasma, which circulates alongside cells in the bloodstream and functionally separates the environment and interstitium in favor of the autonomy of the organism. The blood circulation can be adapted to the needs of the organism with autonomous behavior in its environment (e.g. regulation of blood pressure and ‘topophysiographic shift’ of blood volume by means of vessel regulation).

The lymphatic fluid is the fluid part of the interstitium, also called tissue fluid. In evolutionary terms, it is the further development of the ‘coelom fluid’, the ‘primal ocean’; not just water, as the translation of the word ‘lymph’ says. Together with the extracellular matrix, lymph forms the entire physiological cosmos of the tissue cell. The composition of this extracellular fluid is precisely regulated and offers the adjacent cells of the body the constant environment necessary for its survival. As it can only be diluted to a limited extent as part of the inter-cell space, it is only able to offer the cell everything that the cell needs and to remove everything that the cell avoids if it is continuously exchanged as part of the microperfusion.

The fundamental influence of this system on the organism can be illustrated bioenergetically if you observe that lymph influences all fundamental variables of a biophysical system: volume, pressure and temperature. In addition to thermodynamics, nutrition and removal of superfluous metabolites, protection and regeneration are essential tasks for maintaining cell function. Lymph has a fundamental influence on water and electrolyte balance, energy balance, metabolism and the immune system.

Biochemical composition and physical conditions within certain limits are essential for an undisturbed function of the cells. This condition is called homeostasis. If there is a change in the composition of the lymph and / or microperfusion, this has a fundamental influence on thermodynamics, water and electrolyte balance, metabolism and the immune system and thus on the tissue cell.

The organism and each of its cells receive energy by keeping many reactants and their products in steady-state concentrations; exergonic (energy-releasing) towards equilibrium without ever reaching it. This means that long-term storage of energy in living organisms is naturally not intended. Structures in the human body that serve to store energy should
therefore not be understood as a bioenergy, but as a buffer. Functional integrity of perfusion, immunology, endocrinology and neurology, as well as the organ systems of the organism controlled thereby, is only given if the absorbed energy is finally released (‘derived’). If this flow balance is disturbed, the functional integrity is jeopardized, a disease in which at least locally all the systems mentioned are involved threatens. If a local system and / or the organism tends towards a ‘closed system’, this means that its thermodynamic resistance increases ("it will not get rid of its heat"). This principle is very evident in the energy metabolism of humans: Those who absorb energy and cannot release it in the same way (movement, heat release) stores it, e.g. develops fat deposits (lipogenesis). If there is no anatomical storage option, the energy is kinetically transferred. This is shown by increased perfusion or immunological activity (autoimmune activity).

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Funding.  
no funding

Compliance with ethical guidelines  
Conflict of interest.  
F. Lüders states that there is no conflict of interest.

This post does not include any of the authors studies carried out on humans or animals.