THE FLUID EXCHANGE

FLUID WITHIN A BODY is encased by a membrane. Although the membrane may appear to be solid, it is in most cases semi-permeable and elastic. The membrane serves to regulate the passage of materials in and out of the form. Certain fluids are allowed to pass through, entering or exiting through various methods, such as absorption or perspiration. Membranes sometimes function mechanically, like screens, allowing passage solely based on the shape of the particle. This is a form of passive filtration because it is governed in large part by the balance of materials on either side. Other times, membranes play more active roles, deciding what is allowed in or out based on complex processes governed by more abstract laws[1]. However, the decision of what fluids are allowed to stay and which ones must be expelled always depends on whether or not the fluid serves to sustain the organism, if not to improve it, then to at least to maintain homeostasis[2]. The membrane always tries to work in favor of keeping the organism fit because it co-exists with the contents.

Some membranes are impermeable. The fluids they contain may never leave a body. These fluids can be cycled indefinitely within multi-organed systems, and often, these fluid is transformed by the interactions between organs. There are also a small number of impermeable singular organs. These isolated fluids are contained in their own specific organ, either stored indefinitely, waiting to be needed, because they are specific to the function of that singular organ or they are isolated because they are dangerous to the body. Simple forms contain fewer fluids. The simplest bodies govern only one fluid. Complex organisms that contain an greater number of fluids usually have a set of subsystems to govern the exchange of fluids between different parts of themselves.

When a membrane fails and fluids are allowed to flow in an unmediated fashion, it is devastating to any organism. Membranes play such a critical role in the body's function, that if it breaks, the body loses it's defining features. Through use over time, membranes can become fatigued, thinning, disintegrating, and loosing their ability to control fluids. A membrane can also fail if it is physically punctured by an outside force and it is unable to repair itself. A punctured body is a body in crisis. Even with a seemingly insignificant puncture, the body runs the risk of being permeated by a volatile fluid. A dangerous substance can enter the fluid stream through a small cut or abrasion. That liquid's infiltration can alter the system's balance and go unnoticed if the membrane repairs itself. A body can leak rapidly or or slowly weep a large volume of vital fluid over time. If a membrane is unable to regenerate itself, a small cut is susceptible to getting out of control. A slow leak is just as bad as a fast one. They both end in the same result, the death of the organism.

The flexibility of an organ is advantageous to its survival in most circumstances, but it can also lead to its own destruction. Because they are compressible or expandable to a certain point, damage occurs when the volume of an organ is increased or decreased to the point of explosion or crushed by an extreme alteration in the density of its atmospheric or ambient fluid[3]. The shape of the body is in part determined by the balance of pressure and materials on the inside and outside of this membrane. The pressure that is exerted on the outer membrane can affect the internal pressure of the organism, changing its fluids' density and volume[4]. The relationship between the two determines the rate of flow between the inside and outside.

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The volume and density of fluid contained in an organ is also effected by the internal and external temperature of the body. The membrane's surface tension and permeability also enters into the equation.

The exchange of bodily fluids between forms can occur by various methods. The intake of fluids generally causes the body to swell unless a similar rate of excretion occurs simultaneously. Some physical processes depend on the direct exchange of fluids from other bodies. When the contents of one body is passed directly through an opening rather than through a membrane, from one organism to another in a reciprocal fashion, physical equilibrium of pressure is generally achieved. Some bodies require a constant replenishment of resources, relying on a fresh source from the outside. There are some ongoing processes of exchange, such as breathing and digestion, and the rate of exchange balance between sides is never constant. Under duress, some bodies are adapted to recycle their dependency temporarily, but the potency of the required fluid is reduced with each cycle until its life giving power runs out. The exchange of bodily fluids in the form of consumption as food occurs with certain organisms. There are usually hierarchies between organism that consume other species's fluids such as amniotic fluid as eggs, breast milk, or blood. There are some instances of mutual consumption at a similar rate.

One key role of fluid exchange is in the reproductive and regenerative processes. They are part of a biological function, but also play emotional roles as part of communication because the exchange of certain fluids are dependent on the formation of intimate relationships between forms[5]. Fluids can be exchanged indirectly between bodies though intermediate substances such as water, and by absorption from surfaces. Because fluids are a key indicator of health, they can also be physically extracted for analysis by medical practice.

The membrane is sometimes unacknowledged because it forms a small fraction of the organism's volume compared to its content. Although it forms the visible surface of the form, it is sometimes seen as secondary to the substance it contains. This is obviously untrue, because it constantly an active, integral and crucial component in the support of the system. It is engaged in a reciprocal relationship based on mutual need with the fluids inside. It does not consume, but regulates the consumption between organisms and their environment. Using available resources, it determines the form and content of the body as much as the volume of the physical substance it contains.

[1] **Vitalism**, as defined by the Merriam-Webster dictionary, is a doctrine that the functions of a living organism are due to a vital principle distinct from biochemical reactions a doctrine that the processes of life are not explicable by the laws of physics and chemistry alone and that life is in some part self-determining.

[2] **Milieu intérieur or interior milieu**, from the French, milieu intérieur (the environment within), is a phrase coined by Claude Bernard to refer to the extra-cellular fluid environment, and its physiological capacity to ensure protective stability for the tissues and organs of multicellular living organisms.

[3] **Barotrauma** is physical damage to body tissues caused by a difference in pressure between an air space inside or beside the body and the surrounding fluid.

[4] **Boyle's Law** describes the inversely proportional relationship between the absolute pressure and volume of a gas, if the temperature is kept constant within a closed system.The law was named after chemist and physicist Robert Boyle, who published the original law in 1662.

The law itself can be stated as follows: For a fixed amount of an ideal gas kept at a fixed temperature, P [pressure] and V [volume] are inversely proportional (while one doubles, the other halves).

[5] **Emotional tearing** is a poorly understood behavior that is considered uniquely human. In mice, tears serve as a chemosignal. We therefore hypothesized that human tears may similarly serve a chemosignaling function. We found that merely sniffing negative-emotion–related odorless tears obtained from women donors induced reductions in sexual appeal attributed by men to pictures of women's faces. Moreover, after sniffing such tears, men experienced reduced self-rated sexual arousal, reduced physiological measures of arousal, and reduced levels of testosterone. Finally, functional magnetic resonance imaging revealed that sniffing women's tears selectively reduced activity in brain substrates of sexual arousal in men.

Shani Gelstein, Yaara Yeshurun, Liron Rozenkrantz, Sagit Shushan, Idan Frumin, Yehudah Roth and Noam Sobel, *Human Tears Contain a Chemosignal*, Published Online January 6 2011, Science 14 January 2011: Vol. 331 no. 6014 pp. 226-230