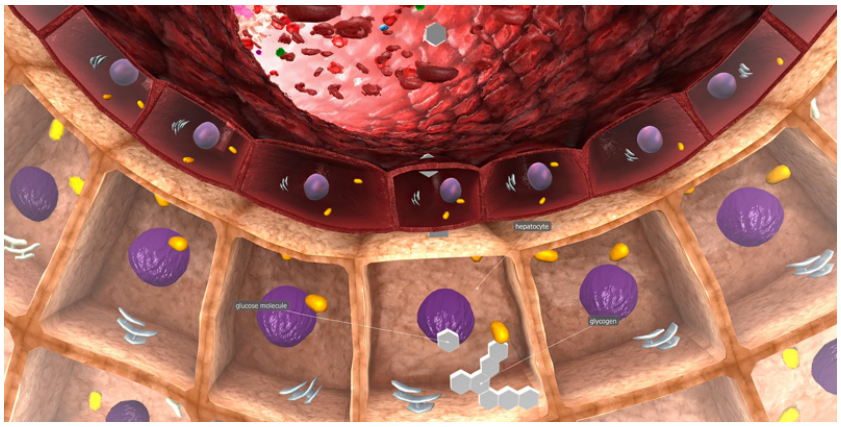
Liver and its cells (hepatocytes)



Molecular balance to maintain good liver function

The liver is made up of cells, the hepatocytes, which are 80 percent of its total mass. These cells are veritable factories for the formation and transformation of molecules, whose mitochondria work by producing metabolites and energy, supplying, among other things, high amounts of albumin, coagulation factors and other proteins that are found in the circulation. Liver products also include bile salts, which come from cholesterol metabolism.

A look at cell activity [1]

Another role played admirably by hepatocytes is **detoxification**, which is the transformation through a veritable enzymatic arsenal (collectively called P450 enzymes) of toxic molecules that arrive from throughout the

body through the venous (portal vein) bloodstream. This valuable work allows toxic products to be converted into products that can no longer do harm and can be eliminated from the body through excretion pathways. This transformation also takes place to eliminate drugs.

In this continuous "metabolic" work, the liver may become fatigued, but it is important to note that this tissue has higher **regenerative capacity** than other tissues, i.e., it is able to fully regenerate cell mass and function after being affected by different types of problems. It can be said that under normal conditions and without alteration of the natural balance, the liver has a "slow" turnover, between cells that have reached the end of their life and cells that divide to generate new cells (only 1-2% of all cells divide). The time can be estimated in months with an average life span of 180 days.

If it is subjected to a series of events of an infectious, traumatic, or even metabolic or vascular nature, the liver can accelerate the formation of new cells; for example, interestingly, after resection of part of this organ, it is able to rebuild its initial mass. This expresses the enormous potential for liver regeneration, which does not have to be altered and can respond naturally by repairing damage.

Liver fatigue and impact on metabolism

The liver, in its fundamental role as a "molecule factory," can also go into **fatigue** with issues that impact overall **metabolism**. In this case, the most predominant origin of liver problems lies in dysregulation of fat metabolism.

When it comes to lipids, it is clear that further investigation with cell membrane lipidomic analysis can allow us to pinpoint exactly where the **balance of hepatic functioning** is broken, giving substantial help in framing the liver condition and also suggesting rebalancing strategies.

Table 2.1 Percentages of fatty acids and families present in various human tissues

Fatty acids	Adipose tissue (%rel)	RBC (%rel)	Liver (%rel)	Retina (%rel)	Brain (%rel)
18:2, omega-6, LIN	10.5	9.3	17.5	1.4	0.6
20:4 , omega-6, AA	0.3	15.2	7.7	9.6	7.7
20:3, omega-6, DGLA	0.2	1.5	1.6	nd	1.2
20:5, omega-3, EPA	Traces	0.7	0.4	0.1	Traces
22:6, omega-3, DHA	0.3	3.2	3.4	19.7	7.2
SFA	27.2	43.1	42.0	48.2	45.9
MUFA	59.7	23.0	23.8	14.2	29.7
PUFA	13.1	33.3	32.0	37.2	23.4
Omega-3/omega-6	0.17	0.21	0.17	1.32	0.46

Recall that membrane lipidomic analysis is performed on the mature red blood cell (average life span 120 days), a cell representative of tissues throughout the body, but in particular a faithful mirror of the composition of the hepatocyte, to which it is virtually equal as a distribution of saturated, monounsaturated and polyunsaturated fats (tab from [2] work in bibliography).

Liver cell growth and replication underlie the resolution of most liver damage; it is important to understand how to succeed in maintaining the regenerative potential of this organ over time by supporting the formation of a **balanced lipid pool, a prerequisite for the formation of fully functioning cell membranes.**

Bibliography:

[1] Stanger, B. Z. *Annu. Rev. Physiol.* 2015, 77:179–200

[2] Ferreri, C.; Chatgilialoglu, C. *Membrane Lipidomics for Personalised Health*, page 39, Wiley, 2015

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