Viruses and peroxisomes: uncovering novel targets for host-directed antiviral therapy

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Peroxisomes are subcellular organelles that play a central role in human health, by catalyzing a range of unique metabolic functions.

During viral infections, specific host cell organelles, such as peroxisomes, are exploited by both the virus (pro-viral) and the cellular immune system (antiviral), becoming central players in the intricate virus-host interplay.

In cooperation with mitochondria, peroxisomes contribute to the establishment of the antiviral immune response: specific cytosolic receptors recognise viral RNA and interact with the peroxisomal and mitochondrial protein MAVS, which oligomerizes and activates a downstream signalling cascade leading to the production of antiviral effectors (Figure 1).

Different viruses have been shown to interfere with peroxisomal functions to evade the antiviral response and/or promote infection (Figure 1). The group led by Daniela Ribeiro from the Institute of Biomedicine (iBiMED) has significantly contributed to demonstrate the importance of this organelle in the context of several viral infections and, in collaboration with an international network of experts, has recently published two major high-impact and highly respected review manuscripts (PMIDs: 35951481 and 34696946), discussing the recent advances in the study of the diverse roles of peroxisomes during viral infections, from animal to plant viruses, and from basic to translational perspectives. Her team has furthermore recently discovered the mechanistical reasoning for the kinetical differences observed between peroxisomal and mitochondrial antiviral signalling, as well as the relevance of peroxisome dynamics and interaction with the endoplasmic reticulum for the establishment of an efficient antiviral response (Figure 2). The advancements in this emerging area will certainly contribute to the discovery of novel peroxisome-related targets for the development of innovative broad-spectrum host-directed antiviral therapeutics.

FIGURE 1
Schematic representation of the Antiviral and Pro-viral interplay between peroxisomes and different viruses, throughout their life-cycle.

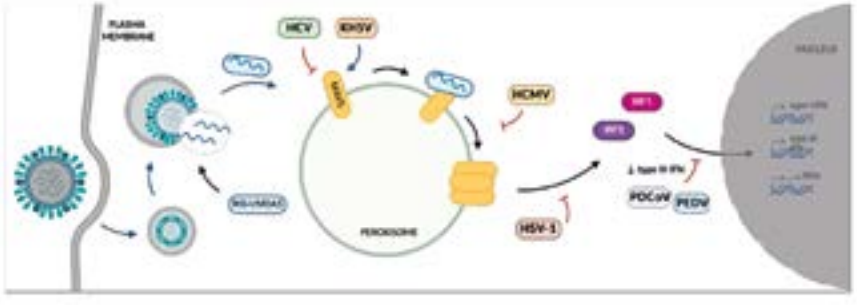

FIGURE 2
Schematic representation of the mechanisms by which peroxisomes (kinetics of MAVS oligomerization, morphology and interaction with the ER) influence the antiviral response.