HIV-1 pathology: when metabolism meets immunology

“*We are what we eat*"

To this day, the human immunodeficiency virus type 1 (HIV-1) infection is still a public health problem with more than 33 million affected people worldwide with a growing number of cases.

Immunology and metabolism have always been considered as distinct practices. However, recent advances in the understanding of immune functions associate these branches with complex networks. This field, called immuno-metabolism, is a new way to look at research and offers a wide ground for innovative studies. Indeed, the immuno-metabolism influences many aspects of our lives from nutriment transformation to the immune response, which requires large amount of energy. In this context it is no surprise that many scientists previously used this recent angle to tackle the difficulties encountered while dealing with cancer. With our review, we aim to do the same for HIV-1.

We compiled for the first time the different impacts of HIV-1 infection on the metabolism and how, in turn, these affect the immune system. Indeed, this new field offers a different way to look at HIV-1 pathology; the infection *per se* isn’t the only factor, or even the most crucial one, when it comes to disease progression. The inflammation, aging, and even current medications are all factors to consider. Those factors all lead to the deregulation of the metabolism and thus impact the immune system. The inflammation activates the immune system and when the former doesn’t stop, such as during HIV-1 infection, it leads to the exhaustion of the latter. Aging leads to oxidative stress which damages cells and worsens inflammation. The activation of the immune system increases metabolic needs and results in oxidative stress. We can see that all those factors are intertwined and that each exacerbates the others. Since both the metabolism and the immune system affect each other and that the HIV-1 infection deregulates both, this creates a deleterious cycle that only worsens with time. This is particularly relevant considering that current medications are allowing infected individuals to grow older than ever before.

This brings the following question: Can we find new ways of fighting HIV-1 by playing on the metabolism, with a particular diet or supplements for example?

It is largely admitted that current treatments cannot achieve HIV-1 cure. As such, we need to look towards complementary approaches and unconventional concepts. Immuno-metabolism represents a central element of HIV infection and understanding this might just give us the tools we were lacking to fight against this affliction.

Authors: Xavier Dagenais-Lussier, and Julien van Grevenynghe

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Current topics in HIV-1 pathogenesis: The emergence of deregulated immuno-metabolism in HIV-infected subjects.
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