An interview with Pr Carine VAN LINT

Director of Research F.R.S.-FNRS, Head of the Service of Molecular Virology at the Université libre de Bruxelles (ULB), Member of the International AIDS Society Scientific Working Group on HIV Cure

What expertise have you developed in the field of epigenetic mechanisms regulating gene expression of retroviruses, and what are your main discoveries in this area?

© Laboratory of Carine Van Lint

For more than 30 years I have been studying the transcriptional and epigenetic mechanisms regulating gene expression of the retroviruses HIV-1 (Human Immunodeficiency Virus type 1), HTLV-1 (Human T-lymphotropic Virus type 1) and BLV (Bovine Leukaemia Virus). In the context of HIV-1 and BLV, my laboratory has largely contributed to characterize and determine the role of chromatin structure in the molecular mechanisms regulating these viruses, in particular by studying nucleosome positioning, chromatin remodelling and epigenetic modifications (such as histone acetylation and methylation and DNA methylation).

We have highlighted the key role of certain cellular factors (such as CTIP2/Bcl11b, UHRF1 (R. Verdikt et al., 2022, eBiomedicine), AhR (D. Chatterjee et al., 2023, Cell

Reports) and CTCF (M. Bellefroid et al., 2022, Nucleic Acids Research)) in the transcriptional regulation of HIV-1 and BLV, respectively.

What therapeutic avenues are you currently exploring in the field of HIV?

The major problem in eradicating HIV-1 is the persistence of latent “cellular reservoirs” which express little or no virus but which can be reactivated by various cellular stimuli. These reservoirs explain the rebound in viremia observed in most patients after interruption of the combination antiretroviral therapy (cART). This rebound is due to the reservoir cells in which the virus hides from the host immune system and escapes the cART treatment, waiting for a sign of immune weakness before re-emerging.

The virus is in a state of latency in these reservoir cells, where its transcription is repressed by various mechanisms, including epigenetic modifications. On this basis, several international consortia, of which my laboratory is a member, have proposed “shock and kill” strategies aimed at deliberately reactivating the viruses contained in these reservoirs using latency reversing agents (LRAs) (A. Rodari et al., 2021, Annual Review of Virology). The aim of this reactivation is to eliminate the latent HIV reservoirs, while maintaining cART to prevent the spreading of the virus. This kind of strategy would allow the “kill” phase during which latently-infected cells would then die from viral cytopathic effects or host immune clearance.

We obtained fundamental results demonstrating the reactivation of HIV-1 by a sequential combination of two LRAs: a DNA methylation inhibitor and a histone deacetylase inhibitor, thereby targeting two important mechanisms of HIV-1 epigenetic repression. This discovery led to the launch of an international clinical trial which is currently underway in collaboration with Prof. Stéphane De Wit at the CHU Saint-Pierre in Brussels (ULB).

Another important therapeutic strategy being studied by various international researchers and our laboratory is the “block and lock” approach, which consists not in reactivating but in reinforcing the latent state of the viruses to avoid a rebound in viremia after stopping the anti-HIV treatment. These are the strategies being discussed by the International AIDS Society Scientific Working Group on HIV Cure, a group of internationally recognized experts chaired by the 2008 Medicine Nobel Prize Laureate Francoise Barré-Sinoussi, of which I am the only Belgian representative.

What do you see as the main challenges in controlling HIV replication in the long term?

The main challenge is to gain a better understanding of the molecular mechanisms involved in the persistence of the HIV-1 virus, so as to be able to develop effective new strategies aimed either at eliminating latent reservoirs or at reinforcing the latent state of the virus so that it is no longer able to ‘wake up’.

However, the molecular mechanisms involved in HIV-1 latency are multiple and heterogeneous, and it is therefore very complicated to target all the mechanisms involved in the different cellular reservoirs with a single agent. The current aim is therefore to reactivate highly reactivatable viruses and block the expression of viruses that are more difficult to reactivate, in the majority of cellular reservoirs, with the goal of achieving control of HIV infection by the host immune system in the absence of antiretroviral therapy.

https://smv.ulb.be

© Laboratory of Carine Van Lint

The “KT Jeang Retrovirology Prize 2025” awarded to Professor Carine Van Lint

The University of Brussels (ULB) and the Fund for Scientific Research (FNRS, Belgium) are proud to announce that Professor Carine Van Lint, FNRS Research Director and Head of the Service of Molecular Virology at ULB, has been awarded the prestigious “KT Jeang Retrovirology Prize 2025” for her outstanding work on the molecular mechanisms regulating gene expression of the HIV-1, HTLV-1 and BLV retroviruses. Established in 2005, the prize is awarded annually by the prize committee to a mid-career scientist who has made exceptional contributions to the field of retrovirology. Carine Van Lint is the first Belgian researcher to be awarded this prize.

She is author and co-author of more than 140 international publications in the field of retrovirology and molecular biology. After performing her PhD thesis at the US National Institutes of Health (NIH, Bethesda, USA) and a post-doctoral fellowship in New-York, she joined the Faculty of Sciences of the University of Brussels (ULB) as the Director of the Service of Molecular Virology. Internationally recognized for her work on the transcriptional and epigenetic regulation of retroviruses, Carine Van Lint has significantly advanced our understanding of human immunodeficiency virus type 1 (HIV-1) latency and reactivation from latency. Her pioneering studies revealed the crucial role of chromatin structure and histone modifications in controlling HIV-1 gene expression. These discoveries have paved the way for the therapeutic strategies known as the “shock and kill” approach, which aims to reactivate latent viral reservoirs in order to eliminate them.

Since founding her laboratory at ULB in 1999, Carine Van Lint has developed strong translational research collaborations with clinical partners in Belgium and internationally, contributing to the development and launch of innovative clinical trials. Her work has also led to major advances in the study of other retroviruses, including the oncogenic retroviruses HTLV-1 (Human T-cell Leukemia Virus type 1) and BLV (Bovine Leukemia Virus).

Carine Van Lint is a dedicated mentor who trained and supervised more than 60 young graduate and postdoctoral researchers. She actively serves on several international scientific committees. This award recognizes the scientific excellence and societal impact of an outstanding research career.

The scientific journal *Retrovirology* has published an article highlighting Professor Van Lint’s career, available here:
https://link.springer.com/article/10.1186/s12977-025-00673-2