PhD Research Proposal Form
China Scholarship Council (CSC) - ENS Group

FIELD: Life sciences

Thesis subject title: **THE HUMAN INTERFERON-INDUCED TRANSMEMBRANE PROTEINS (IFITMS) AS DIRECT AND INDIRECT REGULATORS OF SEVERAL CLASSES OF VIRUSES**

Name of the French doctoral school : Integrative cellular and molecular biology (BMIC)
Name of the Research team : Laboratory of Primate Lentiviruses Lyon (LP2L)
Website : https://ciri.ens-lyon.fr/teams/lp21

Name of the Supervisor : Andrea CIMARELLI
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Lab Language : English

Research Proposal Abstract :
The Interferon-induced transmembrane proteins (IFITMs) belong to a family of cellular proteins that protect the cell against the infection by numerous viruses ranging from the human immunodeficiency type 1 virus (HIV-1) to Ebola virus or SARS-CoV2. IFITMs block the fusion between viral and cellular membranes thus preventing the virus from accessing the cell. However, the exact mechanism through which IFITMs act remain unclear and both a direct effect of IFITMs on membranes through physical insertion, or an indirect effect on their lipid composition has been hypothesized. Using a series of complementary approaches in cell biology, virology as well as immunology, this PhD proposal aims at understanding the mechanism of action of these broad family of innate defense factors and thus at paving the way for the development of novel antiviral treatments that mimic IFITMs and that are thus effective against several different viruses. The candidate will be directly tutored by the head of the lab and will be formed to the latest techniques in cell imaging, virus tracing and more generally in virology.

References : 1. Zhong et al. A novel domain within the CIL regulates egress of IFITM3 from the Golgi and prevents its deleterious accumulation in this apparatus. *bioRxiv*, 2021. **2.** Marziali and Cimarelli. Membrane interference against HIV-1 by intrinsic antiviral factors: the case of IFITMs. *Cells,* 2021. **3.** Marziali et al. Functional heterogeneity of mammalian IFITM proteins against HIV-1. *Journal of Virology,* 2021. **4.** Wu et al. The interferon stimulated gene 20 protein (ISG20) is an innate defense antiviral factor that discriminates self versus non-self translation. *PLoS Pathog* 2019. **5.** Tartour et al. Interference with the production of infectious viral particles and bimodal inhibition of replication are broadly conserved antiviral properties of IFITMs *PLoS Pathog* 2017.

Type of PhD :
1.Full PhD

- Joint PhD/cotutelle (leading to a double diploma) : NO
- Regular PhD (leading to a single French diploma) : YES

2. Visiting PhD (for students enrolled at a Chinese institution who will be invited to a French institution to carry out a mobility period) : NO