Understanding the replication mechanisms of emerging RNA viruses at atomic resolution

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Emerging RNA viruses represent an increasing threat for global human and animal health due to vector species redistribution triggered by climate change, human behavior and changes on the use of the land. RNA viruses, by using a single strand RNA genome, face several challenges for infecting the host cells and have developed an amazing vast and diverse number of strategies to conceal their genomes from host immune surveillance during genome replication. Here we will address two examples: the RNA viruses with negative polarity of Bunyavirus (e.g. La Crosse virus) and RNA viruses of positive polarity of Alphavirus (e.g. Chikungunya virus). Bunyavirus have developed ribonucleoprotein assemblies that hide the RNA genomes and replication intermediates from the cell surveillance while Alphavirus have developed membrane associated replication complexes that generate viral organelles to conceal their genomes. The structural characterization of these replication machineries, ruled by conserved RNA dependent RNA polymerases, is providing an accurate understanding of the different mechanisms developed for facing the same biological problem of evading the cell surveillance for the replication of infectious RNAs. We will have a glance on how the rapid evolution of structural biology by new high resolution cryo-electron microscopy techniques is impacting our understanding of viral infection and how we can now address biological questions that few years ago were unattainable.