Functionalized surfaces with tailored wettability determine Influenza A infectivity

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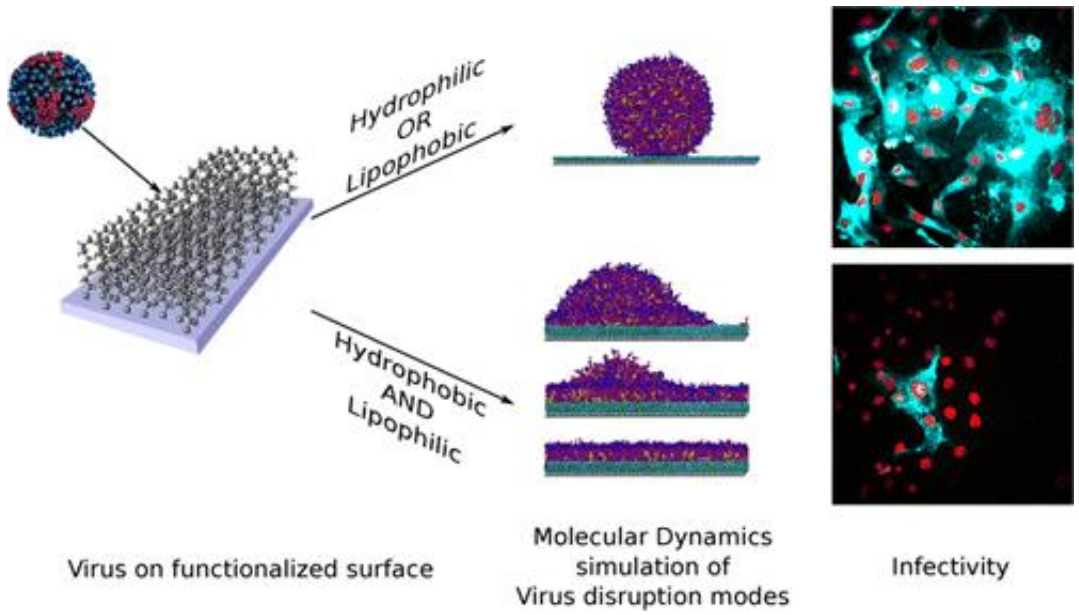

Effects of functionalized surfaces on viral particles Credit: ICFO

Disease can be spread through contact with materials contaminated with infectious microorganism, making control of transmission an interesting objective of surface research. In order to develop "active surfaces" that can reduce or eliminate this contamination, a detailed understanding of the molecular mechanisms of interactions between the surfaces and the microorganisms is crucial.

ICFO researchers in the groups led by ICREA Professor at ICFO

Valerio Pruneri and Prof. Melike Lakadamyali, in collaboration with Dr. Prantik Mazumder at Corning Incorporated and researchers at the Universitat de Barcelona led by Professors Ramon Reigada and Francesc Sagués, present a study of the external membrane of Influenza A virus envelope, recently published in *Applied Materials and Interfaces*, which sheds light on the mechanisms by which substrates with different wettability can interact with the lipid envelope of bacteria and viruses. Their findings pave the way for the design of new and more effective antimicrobial surfaces.

First author of this paper, Dr. Ilaria Mannelli, a member of the Optoelecetonics research group at ICFO led by Prof. Pruneri, explains, "The external envelope of Influenza A virus consists of a phospholipid bilayer with embedded proteins, in which the external part is hydrophilic allowing a good dispersion of the viral particles in aqueous solutions. However, the inner part of the envelope is made of the hydrophobic and oleophilic tails of lipids. Because of this, when a solution of viruses is deposited onto a functionalized surface that is simultaneously hydrophobic and oleophilic, the inner part of the viral envelope strongly interacts with the substrate molecules moving from the viral envelope to the surface. As a consequence, the integrity of the external membrane of Influenza A virus envelope is affected and the infectivity of the virus solution is reduced."

ICFO researchers in collaboration with Corning, Inc, tailored the wetting characteristics of glass surfaces by functionalizing them with coating made of alkyl- and fluoro-silanes as well as by nanostructuring. Furthermore, using a number of experimental and computational methods including real-time fluorescence microscopy carried out at ICFO and molecular dynamics simulations carried out by researchers at UB, researchers were able to study the effects of these functionalized surfaces on the infectivity of Influenza A viruses and introduce design criteria for new surfaces with specific properties that can deactivate

Influenza A viruses with high efficiency.

These results give new insights into the role of the wetting properties of functionalized surfaces on their effect on enveloped viruses coming into contact with them. These insights constitute the basis for guiding the design and development of new surfaces with higher antiviral activity that can be important for applications in public and/or sensitive environments such as in hospitals.

Provided by ICFO