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Fighting viral infections with engulfing nano-shells

European research consortium VIROFIGHT to advance novel treatment against viruses such as SARS-CoV-2, HIV, influenza, and Hepatitis

Instead of targeting virus-specific proteins or enzymes by small molecules as done by current antivirals, researchers of the EU-funded VIROFIGHT project will develop nano-shells that are supposed to engulf and neutralize entire viruses. This novel approach has the potential to help fight multiple viruses such as SARS-CoV-2, HIV, influenza, and Hepatitis B with one and the same method.

Viral infections affect millions of people every year and cause tremendous human suffering and costs to society. For approximately 70% of all WHO listed viruses, no treatment is available and the antiviral drugs that do exist must be applied very early after infection to be effective. The current COVID-19 pandemic is only one such example. The VIROFIGHT consortium proposes a new approach to fight viral infections, to address the lack of broadly applicable antiviral treatments, and to create means for combating emerging pathogens.

Figure 1: Nano-shells engulf and neutralize viruses mediated by multivalent virus-binding aptamers or antibodies. ©Hendrik Dietz, Technical University Munich

„Our mission is to develop and test prototypes of nano-shells that have the principal capacity to neutralize any given virus by engulfing them", says project coordinator Prof. Hendrik Dietz (Technical University of Munich). "We think this may lead to neutralization of the pathogen by occlusion. Different kinds of viruses could be fought using the same platform."

The biocompatible nano-shells developed by the researchers combine DNA origami, protein design and in-vitro evolution. Their interior will be coated with a layer of virus-specific molecules to exploit avidity effects for strong and specific virus binding. These binding effects will be tested at laboratory scale on a variety of viruses. To achieve this technological target, the interdisciplinary project integrates experts on supramolecular chemistry molecular nanoengineering, and virology.

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Project Partners:
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ARTTIC S.A.S. (France)
National Institute of Chemistry (Slovenia)
University of Regensburg (Germany)
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