Rapid single-molecule detection of SARS-CoV-2 with a bioelectronic sensor

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Read the paper:

Guo, K., Wustoni, S., Koklu, A. et al. Rapid single-molecule detection of COVID-19 and MERS antigens via nanobody-functionalized organic electrochemical transistors.
Nature Biomedical Engineering **5**, 666ff (2021)

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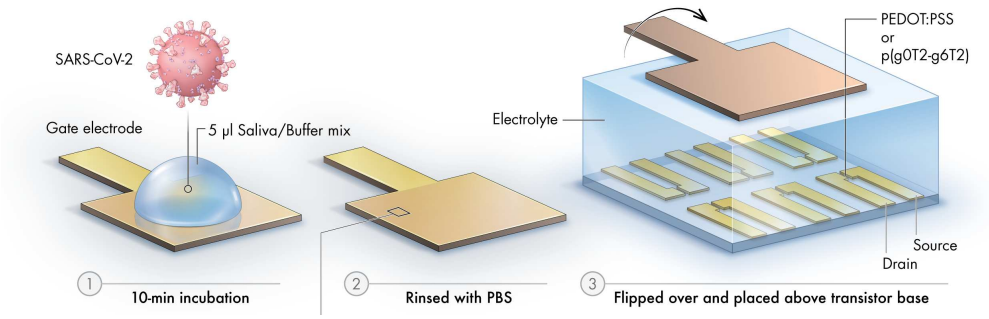
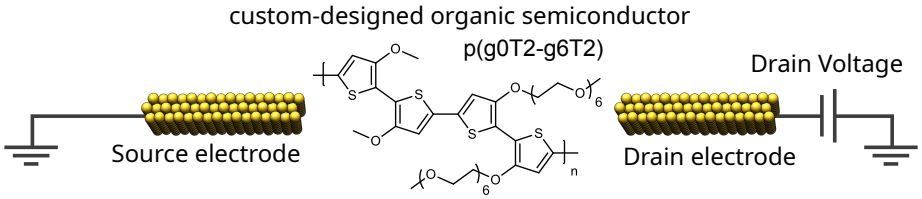
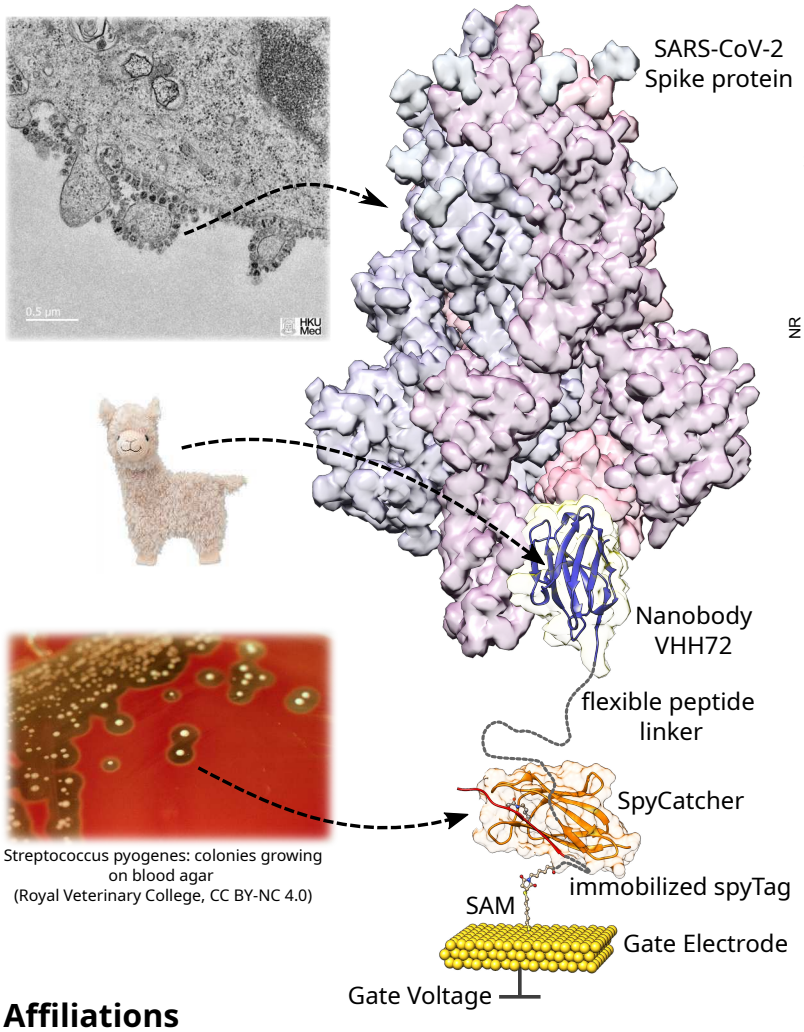
Sensor Usage



We have designed a bioelectronic sensor that can rapidly detect a wide variety of protein targets in unprocessed biological samples with single-molecule sensitivity. The sensor combines custom-designed semiconductor materials and custom-designed fusion proteins into a highly amplifying transistor architecture. The modular protein design allows for the easy reprogramming of the sensor by a simple exchange of nanobodies. A spyCatcher / spyTag bioassembly strategy covalently couples nanobodies at ultra-high density and under perfect orientation control which, in turn, enables the capture of target molecules at attomolar concentration.

Sensor Construction

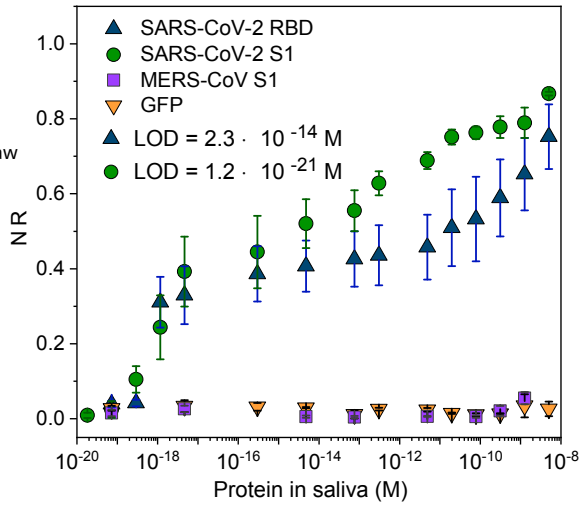




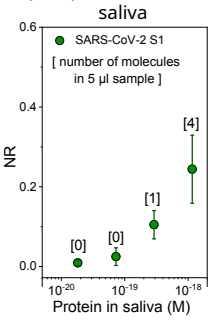
Streptococcus pyogenes: colonies growing on blood agar
(Royal Veterinary College, CC BY-NC 4.0)

Examples of Sensor Performance

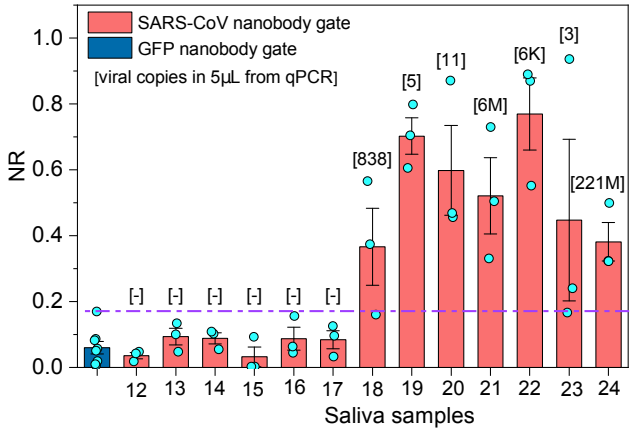
Response to SARS-CoV-2 or MERS Spike and RBD proteins mixed into saliva



Detection of single Spike proteins from raw saliva



Detection of SARS-CoV-2 in saliva samples of Covid-19 negative and positive patients



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