Towards ultrasensitive detection of SARS-Cov-2 within 48 after infection by means of a high throughput optoplasmonic technology

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Early detection of SARS-Cov-2 infection is the best way to prevent spread of the disease. However, as we are observing, any shortage of laboratory diagnostic capacity at national or local level will hamper epidemic response. Nucleic acid amplification tests (NAAT) have become the gold-standard for detecting low-concentrations of the virus in blood. However, these methods are technically demanding and cost-prohibitive in developing countries. Immunoassays are more affordable and can be more easily adapted for point-of-care diagnosis. However, the sensitivity so far of these methods has been too low. We here report the development of a sandwich immunoassay based on novel optoplasmonic transduction[1-3] for detecting the SARS-Cov-2 nucleocapsid N-protein and the spike S-protein from a nasal swabbing material. The limit of detection of the immunoassay is below 10^{-15} g/mL that is equivalent to few virions in 10 mL of plasma. This is 5 orders of magnitude better than last generation of approved immunoassays and 2 orders of magnitude better than NAT methods. This LoD reduces the undetectable phase after infection to just 24-48h. The technology meets potential to be produced *en masse* at low cost and capability for miniaturization to be used at point-of-care. Final remark: a linear decrease in the detection time implies exponential decrease in the pandemic dissemination.

REFERENCES

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