CorDial-S Newsletter-II

Update on the achievements in the past 6 months

November 2021

A very active consortium, sparkling creativity and innovation and pushing the boundaries of technology to serve unmet medical needs.

CorDial-S is proceeding towards the conclusion of the first 12 months out of the 16-total months of the project. We have therefore reached more than half of the project and we are at the turning point where we begin to transform all the work carried out thus far into tangible results.

Thanks to the interdisciplinary and multisectoral consortium members of CorDial-S, during the first 12 months the foundation for a solid scientific and technological background is leading currently to the first minimal viable product and its use in a clinical trial study at CHU Lille to differentiate patients as COVID-19 negative or positive. Moreover, work has started on a further improvement of this product via the integration of a sensing cartridge, making the diagnostic device complying with the standards for CE mark. The technical files are under development with Affinité Instruments, Biosensing Diagnostics and the help of Colmeris MedTech.

Indeed, one of the key points we are proud of is the engagement of the Canadian company Affinité Instruments, into our project on the instrumental side as well as Biosensing Diagnostics on the biomedical aspects. The synergy between these companies as well as with the Irish based magnetic nanoparticle company Magnostics is pushing the CorDial-S diagnostic platform to an advanced level. Indeed, starting from September 2021 onwards, the CorDial-S Consortium has been enriched with the entry of an additional beneficiary - Affinité Instruments - who have brought new vistas to the network, ensuring an even more successful collaboration and a wider commercial-oriented interaction. We warmly thank them for joining our Consortium, and are confident that together we will provide leading expertise to meet the ambitious project goals. In addition, we are very grateful for Biosensing Diagnostics to lead the

path forward in the product commercialisation, by building a solid start-up advisory board and an adapted business strategy for the future.

CorDial-S In NUMBERS	
NETWORK • 8 beneficiaries • 2.3 M EUR funds	**PUBLICATIONS** • 2 papers published and others under preparation • 1 patent under consideration • 1 provisional patent deposited • Clinical Trial is running under ClinicalTrials.gov ID: NCT04780334 Title: « Détection rapide, ultrasensible et multicanaux du Covid-19 » | Type: Category 3
MEETINGS • Meetings every month and lately every week to align on product design • Presentation of consortium at OncoLille	**INTERACTIONS** • 4 Newspaper articles • Cordial-S web page • 50 Newsletter subscription • Creation of a start-up Biosensing Diagnostics

CorDial-S and COVID-19: promising results

After almost two years since the start of the COVID-19 outbreak, research related work engaged at the local and European level is still ongoing. **CorDial-S,** one of the EU supported research and innovation action, with the aim to tackle the spread of coronavirus via a fast (20 min) and sensitive (100 viral particles/mL) diagnostic device, **is reaching its promises in a clinical trial study on 100 patients**. The excellent sensing capabilities of a portable diagnostic device based on surface plasmon resonance (SPR) transduction have been combined with a nanobody surface receptor, shown to have high binding strength to the spike 1 (S1) glycoprotein of the SARS-CoV-2 viral envelope. The SPR responses to cultured SARS-CoV-2 viral particles (clade 20A.EU2, EU variant) in PBS (0.1 M, pH 7.4) of increasing concentrations were determined. From these experiments, the main conclusion is that SPR signal changes can be correlated to the absolute number of viral RNA genomes by qRT-PCR, assuming that each genome is associated with a virion. According to our findings (**Figure 1**) a C_t = 40 correlates to 2×10^3 viral RNA genomes ml^{-1} with an infectivity cut-off at C_t = 32.5 correlating to 5.9×10^4 viral RNA genomes ml^{-1}.

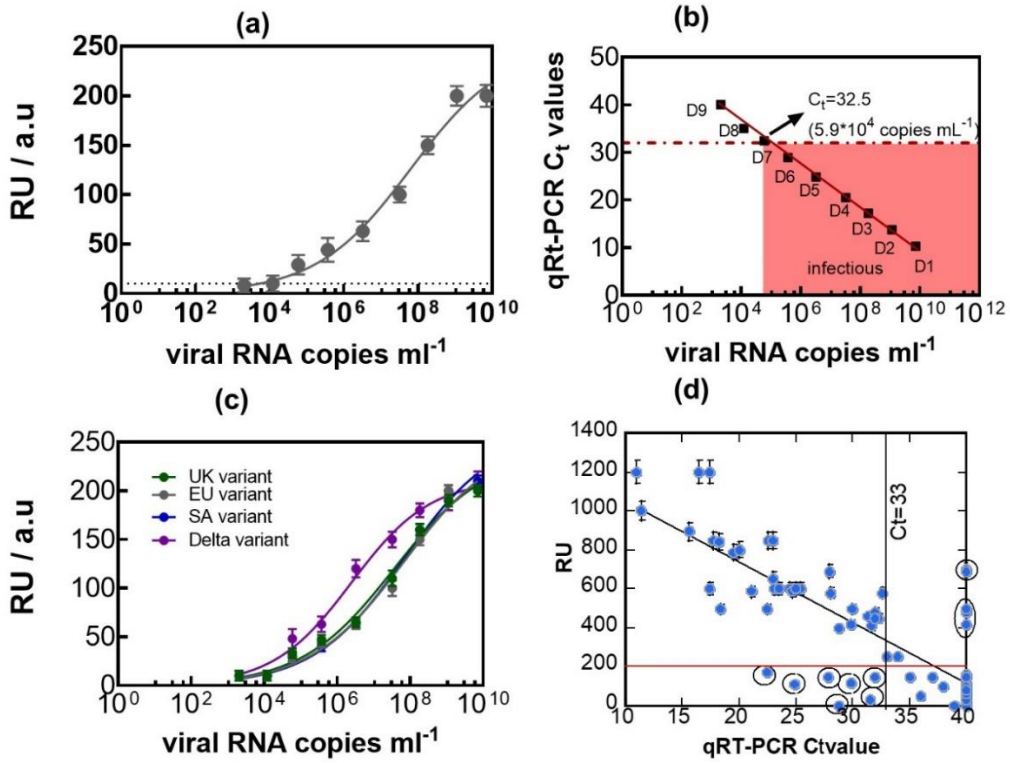

***Figure 1**: **Performance of CorDial-S sensor**. (a) Dose-dependent response curve towards SARS-CoV-2 clade 20A.EU2 (EU variant). Dotted line indicates theoretically determined limit of detection (LoD). (b) Correlation of qRT-PCR cycle threshold (C_t) values and viral RNA copies mL^{-1}. The dash-dotted line indicates the limit of viral infectivity. (c) Dose-dependent response curves towards SARS-CoV-2 clade 20A.EU2 (EU variant), 20I/501Y.V1 (British variant), 20H/501Y.V2 (South African variant) and B.1.617.2+AY.1+AY.2 (Delta variant). The results are expressed as the mean ± SEM of at least 3 independent samples for each group. (d) Correlation between qRT-PCR positive and negative nasopharyngeal samples and SPR data. Cut-off between positive and negative was set at 200 RU.*

The sensors characteristics are as follows:

CorDial-S CHARACTERISTICS

- Linear range: 5.9×10^4 to 1.9×10^8 viral copies ml^{-1}
- LoD corresponds to C_t = 33
- LoD = 10 pfu mL^{-1}
- LoD = 2.9×10^4 viral copies ml^{-1}
- Noise level: 10 RU
- 100% specificity to SARS-CoV-2
- 84% positive percentage agreement (PPA)| 92% negative percentage agreement (NPA)

The concept was validated on 112 nasopharynges samples until now (43 positive,69 negative) showing 84 % positive percentage agreement (PPA) and 92% negative

percentage agreement (NPA), as compared to qRT-PCR. 88 more nasopharynges samples as well as saliva samples will be tested in the next 6 weeks.

Moving on to the final project phase

With this result in hand we will now move to the final project phase to get the product onto the market via Biosensing Diagnostics. At the moment Consortium partners are still striving to improve the current concept in different ways and make the diagnostic as user friendly as possible for clinicians and laboratory technicians with the ultimate goal to improve the quality of life for patients requiring fast and reliable COVID-19 tests. On the digital front, the Consortium has implemented a training and validation methodology for machine learning-based COVID-19 diagnosis regardless of the data size or features. In this respect, the data to be obtained from the on-going clinical trial is expected to offer further insights into how the SPR data can be regarded also a rapid test for quantification of contagiousness.

Thanks to the proactive contribution and collaboration of all the members of the Cordial-S Consortium, the work continues to strengthen its solid partnership.

Courage to all of us for the last 4 months!

Sabine Szunerits, project leader of CorDial-S