# A method for analysing a breath sample for screening, diagnosis or monitoring of SARS-CoV-2 carriage or infection (COVID-19) on humans


## Summary

In one aspect, provided herein is a method for analysis, the method comprising:

- obtaining a sample comprising elements coming from breath exhaled from a person (112);
- exposing the sample to a spectrometer;
- determining at least one value of a signal intensity and/or concentration of ions defined by its mass-to-charge ratio (m/z) given by the spectrometer in at least one range,

the or each range being defined by a median value and limits of the range;

- applying at least one test to the value,

the range(s) and the test being configured for identifying that:

- a person carries or is infected by SARS-CoV-2, with or without clinical symptoms,
- a person does not carry or is not infected by SARS-CoV-2,
- a person suffers from COVID-19, and/or
- a person does not suffer from COVID-19; and
- communicating a message according to a result of the test.

In another aspect, provided herein is a device (120) for the diagnosis, screening or monitoring of SARS-CoV-2 and/or COVID-19,

the device comprising:

- means for determining at least one value of a signal intensity and/or concentration of ions defined by its mass-to-charge ratio (m/z) given by the spectrometer in at least one range,

the or each range being defined by a median value and limits of the range;

- means for applying at least one test to the value,

the range(s) and the test being configured for identifying that:

- a person carries and/or is infected with SARS-CoV-2,
- a person does not carry and/or is not infected with SARS-CoV-2,
- a person suffers from COVID-19, and/or
- a person does not suffer from COVID-19.

In another aspect, provided herein is a program comprising code instructions configured for controlling an execution of a method as described herein or for controlling a device (120; 220) as described herein.

In yet another aspect, provided herein is a process for providing a program according to the preceding claim on a communication network in view of downloading the program.

The invention relates to the SARS-CoV-2 virus carriage or infection (COVID-19) and to tests for screening, diagnosis or monitoring thereof.

The prior art includes the following documents which are referred to in this specification:

1. COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). https://coronavirus.jhu.edu/map.html (accessed September 28th, 2020.

2. Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. JAMA 2020.

3. Beigel JH, Tomashek KM, Dodd LE, et al. Remdesivir for the Treatment of Covid-19 - Preliminary Report. N Engl J Med 2020.

4. Recovery_Collaborative_Group, Horby P, Lim WS, et al. Dexamethasone in Hospitalized Patients with Covid-19 - Preliminary Report. N Engl J Med 2020.

5. Lucas C, Wong P, Klein J, et al. Longitudinal analyses reveal immunological misfiring in severe COVID-19. Nature 2020.

6. Hadjadj J, Yatim N, Barnabei L, et al. Impaired type I interferon activity and inflammatory responses in severe COVID-19 patients. Science 2020.

7. Kuri-Cervantes L, Pampena MB, Meng W, et al. Comprehensive mapping of immune perturbations associated with severe COVID-19. Sci Immunol 2020; 5(49).

8. Shen B, Yi X, Sun Y, et al. Proteomic and Metabolomic Characterization of COVID-19 Patient Sera. Cell 2020; 182(1): 59-72 e15.

9. Kataoka H, Saito K, Kato H, Masuda K. Noninvasive analysis of volatile biomarkers in human emanations for health and early disease diagnosis. Bioanalysis 2013; 5(11): 1443-59.

10. Rattray NJ, Hamrang Z, Trivedi DK, Goodacre R, Fowler SJ. Taking your breath away: metabolomics breathes life in to personalized medicine. Trends Biotechnol 2014; 32(10): 538-48.

11. Amann A, de Lacy Costello B, Miekisch W, et al. The human volatilome: volatile organic compounds (VOCs) in exhaled breath, skin emanations, urine, feces and saliva. J Breath Res 2014; 8(3): 034001.