Analytical and Bioanalytical Chemistry (2020) 412:8225–8227
https://doi.org/10.1007/s00216-020-03007-7

EDITORIAL

European analytical column number 48

Slavica Ražić[1] · Marcela A. Segundo[2]

Published online: 22 October 2020

The European Analytical Column is the voice of the Division of Analytical Chemistry (DAC) as a professional network of chemical societies and their members working in all fields of analytical sciences within the European Chemical Society (EuChemS). Promotion of analytical chemistry as an interdisciplinary field and support to members' activities are two of its main goals. This year, we will focus on the role of analytical sciences in fighting COVID-19. We hope you feel inspired!

DAC-EuChemS activities

One of the main activities of DAC-EuChemS is the promotion and organization of the Euroanalysis conference. Every two years, one of the participating scientific chemical societies hosts Euroanalysis, with active involvement from local scientists in organization. Last year, the Turkish Chemical Society organized Euroanalysis XX in Istanbul (http://euroanalysis2019.com/) from 1 to 5 September with two chairs, Prof. Dr. Sibel A. Özkan (Ankara University) and Prof. Dr. Mehmet Mahramanlioğlu (Istanbul University). It was a successful event, with more than 600 participants gathered in the campus of Istanbul University. Euroanalysis XXI is scheduled for August 2021 (http://www.euroanalysis2021.nl/), chaired by Prof. Dr. Lutgarde Buydens (Radboud University), and it will take place in the beautiful city of Nijmegen, Netherlands, under the auspices of the Analytical Chemistry Section of the Royal Dutch Chemical Society and COAST, the Dutch Community of Innovation for Analytical Science and Technology.

Other ongoing activities of DAC-EuChemS are performed within study groups. These include Bioanalytics, Chemometrics, Education, Electroanalytical Chemistry, History, Nanoanalytics, Quality Assurance, and the recently upgraded task force on Sample Preparation. Please check the DAC-EuChemS website for their reports (https://www.euchems.eu/divisions/analytical-chemistry/), and feel free to contact any of the heads of the study groups for more information or to participate in their activities.

Collaboration with other professional networks within EuChemS is also sought. In particular, DAC-EuChemS and the Division of Chemistry and the Environment (DCE-EuChemS) have exchanged invited lectures and organized special thematic sessions at their last conferences. Finally, one of DAC-EuChemS's objectives is to support its delegates for the organization of local events open to the international community through dissemination of the event within the professional network. The steering committee of DAC-EuChemS is happy to receive input for additional activities. Feel free to contact one of the following people: Slavica Ražić, University of Belgrade, Serbia (Chair); Marcela Segundo, University of Porto, Portugal (Secretary); Jiří Barek, Charles University, Czech Republic (Treasurer); Charlotta Turner, Lund University, Sweden; Sibel A. Özkan, Ankara University, Turkey; Lutgarde Buydens, Radboud University, Netherlands; and Martin Vogel, University of Münster, Germany.

✉ Slavica Ražić
slavica.razic@pharmacy.bg.ac.rs

Marcela A. Segundo
msegundo@ff.up.pt

[1] Department of Analytical Chemistry, Faculty of Pharmacy, University of Belgrade, Vojvode Stepe 450, Belgrade 11222, Serbia

[2] Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, R Jorge Viterbo Ferreira, 228, 4050-313 Porto, Portugal

Role of analytical chemistry in the context of the COVID-19 pandemic

It is undeniable that the emergence of coronavirus disease 2019 (COVID-19) in recent months has changed the way our society behaves, affecting daily life across all age groups and posing a threat to life of at-risk groups. The scientific community and its players became a focus of attention, with many people placing hope of a return to our previous lifestyle on immunization of the population through vaccines. There is a flood of articles on the COVID-19 crisis, with multiangle and particular approaches. With an urgent need to gain valuable information on as-yet unknowns, the peer-review process was skipped in a vast number of cases and the judgement of quality and trueness was left to the public. Analytical chemists, as part of the scientific community, have been seeking a solid ground of reliable methods, procedures, and devices and their validation. The aim of this column is not to provide a list of references with details on analytical methods and devices, because this is a very dynamic field. In fact, more than 1000 papers and reports of different kinds had already been published by the end of March [1]. The objective of this analytical column is rather to express awareness of DAC-EuChemS[1] members regarding burning demands in connection with analytical issues related to the diagnostics of COVID-19, highlighting the social and economic impact of analysis in this context. As an example, more than three million tests for COVID-19 have been performed daily worldwide (based on data reported on August 172,020, 7-day smoothed) [2]. Considering an estimated cost of 100 dollars per test, this represents an estimated expense of 300 million dollars per day for governments/private institutions and/or individuals (and a marketing opportunity for companies producing these tests).

Essentially, commercially available methods are based on two approaches: (i) detection of genetic material (or proteins) from SARS-CoV-2 in respiratory-tract specimens, or (ii) the detection of antibodies against the virus in blood samples. The detection of viral RNA is the only accepted diagnostics to confirm active infection [3]. The samples have to be representative respiratory specimens collected during the early and acute phases of infection. However, negative RT-PCR results from throat swabs may occur in the later infection phase, when the virus has migrated into the lung. Antigen tests have some potential for the first approach and could give information on infection status, because several proteins on the surface of the coronavirus are able to cause an immunological reaction. However, according to the recent scientific literature, antigen tests are still less reliable than RNA tests. Testing for antibodies in blood samples is mainly performed in studies concerning previous contact with the virus (the presence of immunoglobulin G) [4]. Analytical scientists are important here, as they understand what is determined/detected in each type of assay and they can assess and explain the limitations of each approach (limits of detection and quantification, existence of false positive or false negative results).

Another important aspect of implementing testing is the turnaround time. Obtaining a fast response after being tested is essential to implement efficient outbreak management, with the isolation of individuals who test positive and quarantining of their contacts, thus minimizing spread of the disease. Currently, this is the only way to break the chains of transmission.

How can analytical scientists contribute?

Analytical scientists can make a major contribution here, by developing and evaluating innovative and cost-effective approaches to reduce analysis time. This is a highly dynamic area of great importance and attractive for analytical chemists. It is now more widely understood and accepted that scientists are very important players and act on the frontline together with medical experts. The gap between them is narrower than ever before. As a matter of fact, clinical diagnostics, epidemiology, and virology profiles are very important in the decision-making process. On the other hand, fundamental analytical science issues, such as scientific data evaluation and the balanced presentation of results, are of enormous importance. More than ever, the estimation and inclusion of uncertainties have become an unavoidable part of all scientific approaches for decision-making. In the present scenario, analytical chemists have to do their best to facilitate communication with other disciplines, specialists, and experts. In addition to the aforementioned, there is a gray area between the roles of scientists and legislators. Nevertheless, the voice of the first party should be listened to and taken into account in policy-making processes, since there is no black-or-white scenario in many cases.

In general, it is important to have sound scientific evidence on the reliability and comparability of most COVID-19 tests, as soon as possible. Joint studies and sharing data will contribute to the pooling of efforts for developing the protocols for test validation and standardization. In line with that, it is mandatory to have the corresponding control samples and reference materials for both the manufacturers carrying out product performance evaluations and for the laboratories validating that performance. Verified, well-characterized reference (control) materials that mimic real patient samples, as well as reference test methods, will allow a giant step forward in COVID-19 testing and will contribute reliable test data for the successful fight against this pandemic. For example, a

[1] DAC-EuChemS is composed of delegates, observers, and guests interested in analytical sciences in general, as appointed by the respective societies and organizations.

positive control material for SARS-CoV-2 RNA testing by PCR was developed by the European Commission's Joint Research Centre in April and has already been sent to reference laboratories in 42 countries around the world [5]. EURM-019 is a quality-control material, not a certified reference material, so further quality-assurance measures are needed.

How will DAC-EuChemS contribute?

In the present scenario, the creation of a task force focused on the analytical aspects of COVID-19 is an idea with three objectives in mind:

- to support the provision of information about COVID-19 testing and its analytical challenges for university lecturers on analytical chemistry;
- to disseminate knowledge and best practices for the characterization of methods developed for COVID-19 detection;
- to promote the role of analytical sciences in the COVID-19 pandemic.

We would like to invite all those interested in this topic to contact us and contribute to this project!

Acknowledgments Inputs and comments from Hendrik Emons were highly appreciated.

References

1. European Commission, Current performance of COVID-19 test methods and devices and proposed performance criteria - Working document of Commission services, https://ec.europa.eu/docsroom/documents/40805, accessed on 14/09/2020.
2. Daily COVID-19 tests, Our World in Data, University of Oxford and Global Change Data Lab, https://ourworldindata.org/grapher/daily-covid-19-tests-smoothed-7-day, accessed on 24/08/2020.
3. Lippi G, Simundic AM, Plebani M. Potential preanalytical and analytical vulnerabilities in the laboratory diagnosis of coronavirus disease 2019 (COVID-19). Clin Chem Lab Med. 2020;58(7):1070–6. https://doi.org/10.1515/cclm-2020-0285.
4. Li ZT, Yi YX, Luo XM, Xiong N, Liu Y, Li SQ, Sun RL, Wang YQ, Hu BC, Chen W, Zhang YC, Wang J, Huang BF, Lin Y, Yang JS, Cai WS, Wang XF, Cheng J, Chen ZQ, Sun KJ, Pan WM, Zhan ZF, Chen LY, Ye F. Development and clinical application of a rapid IgM-IgG combined antibody test for SARS-CoV-2 infection diagnosis. J Med Virol In press. https://doi.org/10.1002/jmv.25727.
5. EURM-019 single stranded RNA (ssRNA) fragments of SARS-CoV-2, available at https://crm.jrc.ec.europa.eu/p/EURM-019 (accessed on 05/10/2020).