CoViD-19: Inflammation and Molecular Imaging

Advanced Molecular Imaging Systems and Their Potential Role in Diagnosis and Treatment of the Infection and Inflammation in the CoViD-19

20-23 May 2021

organized by

ISTITUTO SUPERIORE DI SANITÀ (ISS)
National Centre for Innovative Technologies in Public Health

ISTITUTO NAZIONALE DI FISICA NUCLEARE (INFN)

in collaboration with

INTERNATIONAL RESEARCH GROUP IN IMMUNO-SCINTIGRAPHY AND THERAPY (IRIST)

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Relevance

Inflammation is one of the responses of the immune system to defend and repair tissues and therefore it is a mechanism that acts to confront dangerous situations, from pathogenic microbes to traumatic events. It is not just a limited local phenomenon, as recent research has shown the existence of a significant inflammatory systemic component even in pathologies where it was considered absent or irrelevant: cardiovascular diseases, atherosclerosis and stroke, neurodegenerative diseases, tumors and infectious diseases, caused by viruses and bacteria.

Based on the evidence so far, researchers argue that CoViD-19 should be considered as an inflammatory disease, as the severity of the inflammation is often associated with a disregulation of the inflammatory immune response, that goes in overdrive. In fact, it is becoming clear that, in particular for some of the vulnerable patient groups, it is the response of their immune system – inflammation – that explains why they get so sick and die. Specifically, we are seeing that the risks associated with diabetes, obesity, cardiac disease, lung disease, and in general age and sex are all related to the immune system not functioning properly when confronted by the virus. Understanding inflammation is therefore very important for survival and curing from CoViD-19 while it is an extremely complex phenomenon.

Aim

The event intends to involve, as already done in the past, international specialists from different disciplines (radiologists and nuclear doctors, physicists, engineers, biologists, virologists, ...) to discuss the role of inflammation in CoViD-19 and the strategies and technologies to be use in the battle against it. Among the

molecular imaging modalities that can play a very important and ultimately even a central role is the Nuclear Medicine imaging (PET, SPECT). In fact, the nuclear medicine modalities allow the *in-vivo* detection of different physiologic and pathologic on-going phenomena and offer noninvasive tools to detect early pathophysiological changes before anatomical changes occur, and to guide treatment.
However, standard nuclear medicine techniques have limitations in terms of sensitivity and specificity (due to nonspecific standard imaging agents such as FDG). New advanced dynamic multi-organ (systemic) imaging technologies that are already available in the research arena and are constantly being improved, could translate into increased sensitivity of early detection and differentiation, in staging etc, and avoiding the long-term side effects of inflammation. In addition, novel radiopharmaceutical probes have the possibility to improve specificity of the targeted disease processes (either viral or bacterial infection, and the associated inflammation).
We believe that this is the time and we see utmost urgency to have these research advances to be transferred to the clinical research field and then to expedite its translation to clinical practice.
Topics to be addressed in the workshop include: role of imaging modalities in early diagnosis, staging and follow-up, long-term side effects of inflammation, technological advancements in dynamic total-body / multi-organ imaging, cost and dissemination of new molecular imaging technologies.

Structure
Lectures, questions and answers, round table final discussion.

PROGRAMME

Thursday, May 20th

15.00 Welcome (Organizer and representatives of the host institutions)
INFN - ISS

15.20 *COVID-19 in 2021: Lesson Learned and Remaining Challenges (registered video courtesy of Accademia Nazionale dei Lincei and Ospedale Bambino Gesù)*
A. Fauci

15.40 *Origin and evolution of SARS-CoV-2*
E. Vicenzi

16.00 *Vaccines and monoclonals to regain our freedom*
R. Rappuoli

16.20 Discussion-1

16.35 *COVID-19: A System disease*
A. Gori

16.55 *Immunology*
M. Rescigno

17.15 *Mathematics and data science of COVID-19*
G. Parisi

17.35 Discussion-2

17.50 *Multimodal X-ray Imaging with Darkfield Contrast: Improved COVID-19 Detection with Chest X-rays*
F. Pfeiffer

18.10 *Medium effects of COVID-19 on multi-system health focusing on the potential role of inflammation*
B. Raman

18.30 *Rapid diagnosis of patients with COVID-19 by Artificial Intelligence*
Y. Yang

18.50 Discussion-3

Friday, May 21st

15.00 *Understanding the radiation risks associated with molecular imaging*
M. K. O'Connor

15.20 *Role of 2-[18F]FDG as a Radiopharmaceutical for PET/CT in patients with COVID-19*
A. Chiti

15.40 *What molecular imaging of cancer patients can teach us about COVID-19*
S. Del Vecchio

16.00 Discussion-1

16.15 *18F-FDG brain PET hypometabolism in post-SARS-CoV-2 infection: substrate for persistent/delayed disorders?*
E. Guedi

16.35 *The role for dynamic imaging*
I. Buvat

16.55 Discussion-2

17.10 *The case for the Total Body PET imaging of CD8+ T Cells for researching COVID-19*
T. Jones

17.30 *Imaging Immune phenomena*
M. Pomper

17.50 *Potential Role of Conventional and Total Body PET Imaging in Assessing Systemic Complications of COVID Infection*
A. Alavi

18.10 Discussion-3

18.25 *The potential role of AI in NM imaging*
D. Visvikis

18.45 *The potential of the EuPRAXIA photon beams for CoViD-19 research*
F. Stellato

19.05 Discussion-4

Saturday, May 22nd

15.00 *Advances in PET/CT imaging with Biograph Vision and Quadra*
M. Conti

15.20 *TOF-PET*
P. Lecoq

15.40 *Total body - PET imaging from the top of the head to the toes?*
T. Jones

16.00 Discussion-1

16.15 *Clinical applications of Total Body PET*
H. Shi

16.35 *Alternative applications of Total Body PET*
S. Vanderberghe

16.55 *PET/Compton Hybrid as the Imager of the next generation*
G. Llosa

17.15 Discussion-2

17.30 The point of view of a Regulatory Agency
M. Cavaleri

17.50 *Therapy for Early COVID-19 - A Critical Need*
A. C. Javan

18.10 *The role of nuclear medicine in therapy evaluation of infectious diseases*
M. Sollini

18.30 Discussion-3

18.45 *INFN and Catania University Anti Covid Lab for face mask characterization*
G. Cuttone

19.05 *Spike Proteins in MERS-CoV, SARS-CoV and SARS-CoV-2 Coronaviruses: Differences in Proteic Conformation*
A. D'Arco

19.25 Discussion-4

Sunday, May 23rd

15.00 *Accurate Image Quantification with Advanced Image Reconstruction*
H. Tsoumpas

15.20 *Automatic Lung Analysis for COVID-19 Patients*
F. Gao

15.40 *Artificial intelligence to reduce the radiation burden for PET/CT imaging of COVID patients*
K. Shi

16.00 *COVID-19 therapy optimization by AI- driven biomechanical simulations*
C. Voena

16.20 Discussion-2

16.35 *From fundamental physics research to medical applications: Ventilation System and PET* (TBC)
A. B. McDonald

16.55 *Lessons from the COVID-19 Pandemic - Unique Opportunities for Unifying, Revamping and Reshaping Epidemic Preparedness of (Europe's) Public Health Systems*
G. Ippolito

17.15 *The role of media in a pandemy*
M. Molinari

17.35 ROUND TABLE – Panel Discussion – Q/A

19.00 Closeout

CET time zone

SPEAKERS

Abass **Alavi** - University of Pennsylvania, Philadelphia, USA
Aseem **Anand** - EXINI, Lund, Sweden
Irène **Buvat** - Curie Institute, Orsay, France
Marco **Cavaleri**, European Medicines Agency (EMA), Amsterdam, The Netherlands
Arturo **Chiti** - Humanitas University, Milan, Italy
Maurizio **Conti** - Healthineers Molecular Imaging, Siemens, Germany
Giacomo **Cuttone** - Istituto Nazionale di Fisica Nucleare-Laboratori Nazionali del Sud (LNS), Catania, Italy
Annalisa **D'Arco** - Sapienza University of Rome; Istituto Nazionale di Fisica Nucleare, Rome, Italy
Silvana **Del Vecchio** - Federico II University, Naples, Italy
Andrea **Gori** - Policlinico of Milan, Italy
Fei **Gao** - Siemens Healthinners, Knoxville, Tennessee, USA
Eric **Guedi** - University of Marseille, France
Anthony S. **Fauci** - National Institute of Allergy and Infectious Diseases (NIAID-NIH), Bethesda, MD, USA
Giuseppe **Ippolito** - Spallanzani Institute, Rome, Italy
Arzhang Cyrus **Javan** - National Institute of Health, USA
Terry **Jones** - University of California, Davis, USA
Paul **Lecoq** - European Organization for Nuclear Research, CERN, Switzerland
Gabriela **Llosa** - University of Valencia, Spain
Arthur B. **McDonald** - Nobel Price Laureate, Canada
Maurizio **Molinari** - La Repubblica Newspaper, Rome, Italy
Michael K. **O'Connor** - Mayo Clinic, Rochester, MN, USA
Giorgio **Parisi** - Accademia dei Lincei, Italy
Franz **Pfeiffer** - Technical University Munich, Germany
Martin **Pomper** - Johns Hopkins University, Baltimore, USA
Betty **Raman** - Centre for Clinical Magnetic Resonance Research, Oxford, UK
Rino **Rappuoli** - GlaxoSmithKline (GSK) Vaccines; Monoclonal Antibody Discovery Lab, (TLS), Siena, Italy
Maria **Rescigno** - Humanitas University, Milan, Italy
Hongcheng **Shi** - Fudan University, Shanghai, China

Kuangyu **Shi** - University of Bern, Switzerland
Martina **Sollini** - Humanitas University, Milan, Italy
Francesco **Stellato** - Istituto Nazionale di Fisica Nucleare, Roma, Italy
Harry **Tsoumpas** - University of Leeds, UK
Stefaan **Vanderberghe** - Ghent University, Belgium
Elisa **Vicenzi** - IRCCS Ospedale San Raffaele, Milan, Italy
Dimitris **Visvikis** - University of Brest, France
Cecilia **Voena** - Istituto Nazionale di Fisica Nucleare, Rome, Italy
Yang **Yang** - Mount Sinai University, New York, USA

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Scientific Moderators

Each session will be chaired by a chairperson chosen among the International Advisory Committee and Local Organizing Committee members.

Technical Moderator

FABRIZIO URSINI - Istituto Nazionale di Fisica Nucleare (e-mail: fabrizio.ursini@lngs.infn.it)

GENERAL INFORMATION

Venue

The event will take place on Zoom Education online platform. Up to 500 registered participants are admitted to the interactive remote sessions; a streaming connection will be available to other attendees. Link to the online platform will be sent to the registered participants; streaming access information will be available on the conference indico web page: https://agenda.infn.it/event/covimi/.

Target audience

The event is mainly addressed to Health Service, University and Research personnel and PhD students in Medicine and Scientific disciplines (Biology, Physics, Biomedical Engineering ...).

Registration

Participation is free of charge.
Registration is available on the conference indico web site https://agenda.infn.it/event/covimi/.
All registered participants will receive the detailed and up-to-date information for attending the workshop.

For any further information, please contact the Organizing Staff