

Abstracts June 9th

Prof. Jeremy Nicholson

BSc PhD CChem FRSC CBiol FRSB FRCPath FMedSci HonFRCP

Pro-Vice Chancellor for Health Sciences

Beyond the acute infection, a growing body of evidence supports the notion that COVID-19 may also evolve into a much more chronic syndrome (long COVID), and a significant number of patients hospitalized for COVID-19 infection report persistence of some symptom after a mean period from discharge of 50 days, with dyspnea and asthenia being the most common. We hypothesize and experimentally demonstrate that long COVID retains a characteristic metabolic fingerprint, that can be used for the diagnostic of the syndrome as well as in the validation of prognosis biomarkers.

Dr. Oscar Millet

Principal Investigator CIC bioGUNE

Coronavirus disease (COVID-19) is a systemic infection that exerts significant impact on the metabolism. Consistently, the metabolomic and lipidomic serum profiles, as obtained by NMR* spectroscopy RUO, have proven useful to discriminate acute patients from healthy subjects. Key discriminant metabolites include glycoprotein markers of inflammation, an increased kynurenine/tryptophan ratio as well as an abnormal lipoprotein, glucose, ketone bodies and an amino acid signature consistent with diabetes and coronary artery disease.

Abstracts July 7

Prof. Ulrich Günther

University of Lübeck, Professor of Metabolomics - Institute for Chemistry and Metabolomics

Coronavirus disease 2019 (COVID-19) is a viral infection affecting multiple organ systems of great significance for metabolic processes. Thus, there is increasing interest in metabolic and lipoprotein signatures of the disease and early analyses have demonstrated metabolic pattern typical for atherosclerotic and hepatic damage in COVID-19 patients. However, it remains unclear whether these are specific for COVID-19 or a general marker of critical illness. To answer this question, we have analyzed serum samples from COVID patients, from 18 SARS-CoV-2 antibody-positive individuals all with matched controls.

COVID-19 patients show a distinct metabolic serum profile, including changes typical for severe dyslipidemia and a deeply altered metabolic status compared to healthy controls. Specifically, VLDL parameters, IDL particles, large-sized LDL particles, and the ApoB100/ApoA1 ratio were significantly increased, whereas HDL fractions were decreased. Moreover, a similarly perturbed but distinct profile was apparent, even when compared to other ICU patients suffering from cardiogenic shock, highlighting the impact of COVID-19 especially on lipid metabolism and energy status. Anti-SARS-CoV-2 antibody-positive individuals without acute COVID-19 show a significantly perturbed metabolic profile

compared to age- and sex-matched healthy controls, but SARS-CoV-2 antibody-titers correlated significantly with metabolic parameters, including levels of glycine, ApoA2, and small-sized LDL and HDL subfractions. Our data suggest that NMR* metabolic profiles are suitable for COVID-19 patient stratification and post-treatment monitoring.

Dr. Christoph Trautwein

Werner Siemens Imaging Center, Department of Preclinical Imaging and Radiopharmacy, University Hospital, Eberhard Karls University Tübingen, Group Leader Metabolomics & Systems Medicine

The personalized face of COVID-19: how individual lifestyle could affect disease severity and NMR* spectroscopy hereby serve as diagnosis and monitoring tool (Dr. Christoph Trautwein)

The so called cytokine storm is a major complication and cause of death in acute COVID-19 disease. It is characterized by an overshooting immune response and seems to often affect obese and diabetic patients which show disturbed blood glucose homeostasis. In two projects we have used NMR spectroscopy to investigate peripheral blood mononuclear cells (PMBCs) and plasma/serum samples from different COVID-19 patients (acute, severe, convalescent) and healthy controls upon specific metabolite or lipoprotein changes. The obtained NMR* data was correlated with cytokine panels and clinical metadata for selected patients. Our results suggest, that NMR* spectroscopy can be a worthwhile tool for personalized disease characterization allowing refined diagnosis and monitoring strategies.

** Bruker NMR Instruments are for research Use Only. Not for Use in Clinical Diagnostic Procedures.*