LENS members tackling COVID-19

Budapest Neutron Centre (BNC)

https://www.bnc.hu/?q=covid-19-update2

The beamline proposal deadline for the 2020 autumn cycles has been postponed until 15 May. However, rapid access proposals are still being accepted, where priority access will be given to projects related to the fight against the CoVid-19 pandemic. Email communication of the users with the BNC user office and with the instrument staff is encouraged via addresses available on the facility web at https://www.bnc.hu. The reactor is presently scheduled to restart on 11 May. Priority measurements will be performed as the actual state regulations allow the staff, users and reactor to be back in operation.

European Spallation Source (ESS)

https://europeanspallationsource.se/article/2020/03/27/ess-demax-lab-prioritise-proposals-covid-19-related-research

The European Spallation Source Deuteration and Macromolecular Crystallisation Support Lab, DEMAX, is already functioning on a small scale and we can provide expertise, advice, and limited materials to support research to address the critical need to understand and shut down the coronavirus disease, COVID-19. ESS will prioritise requests for the production of deuterated proteins, DNA, and some types of small molecules such as detergents and lipids that are all potentially useful for neutron scattering studies of viral components. As an enveloped virus, the membrane of COVID-19 is composed of lipid membranes derived from the host cell. DEMAX can make deuterated eukaryotic lipids derived from yeast that could be used to study viral-host cell interactions and maybe even viral assembly interactions with proteins. ESS will also actively engage with external subject matter experts to support their efforts in collaborative projects. In addition, as experienced scientists in small angle scattering, chemistry, structural biology, reflectometry, and crystallography we can also assist with structural modeling and data analysis.

Strategies on how to contribute to COVID-19 research fit well into the already defined LENS WG3 PA 'role of cell membranes in health and disease'. This PA involves partners from ESS (coordinator), ILL, FZJ, STFC, MLZ and PSI, and liaises with relevant external subject matter experts in the field.

Forschungszentrum Jülich/Jülich Centre for Neutron Science (FZJ/JCNS)

https://www.fz-juelich.de/SharedDocs/Pressemitteilungen/UK/EN/2020/2020-03-23-corona-fzj-en.html

In order to contribute to the research on the corona virus SARS-CoV-2, JCNS has decided to offer its instruments via a special proposal round with privileged access, giving them priority over all other applications for beam time. To this respect, regular proposal rounds (next Deadline March 27, 2020) would imply too long waiting time to access the JCNS instruments, and therefore all interested scientists are kindly invited to submit their experiment proposal to the JCNS User Office per email (useroffice@mlz-garching.de) without any pre-defined template and without any deadline. Submitted proposals will be assessed as soon as possible to ensure access to the instrument during the next reactor cycle planned between May 5 and June 3, 2020.

Institut Laue-Langevin (ILL)

https://www.ill.eu/news-press-events/news/general-news/coronavirus-covid-19/

At the ILL, we plan to run 2 more cycles in 2020 which will constitute a significant opportunity to perform early research related to Covid-19 on many of our neutron scattering instruments. In addition to the instruments, we have deuteration facilities and share biology and soft matter facilities with our partner institutes on the EPN campus - the ESRF, EMBL and IBS. For rapid access to beam time, Director's Discretionary Time (for full experiments) and Easy Access (for short measurements) should be used.
We also expect the research community to work on Covid-19 on a longer timescale. We encourage you to think about the role of neutrons and discuss longer-term projects with scientists at ILL. These projects may require PhD students which the ILL can support through its PhD programme (next call autumn 2020) and the InnovaXN programme, running with the ESRF, for which the second call for projects involving industry partners will be opened shortly, with a view to selecting 20 more projects by July 2020.

ISIS Neutron & Muon Source (ISIS)

https://www.isis.stfc.ac.uk/Pages/Coronavirus-(Covid-19)-and-the-ISIS-Neutron-&-Muon-Source.aspx

Corona virus functions through a viral to membrane receptor route in which the protein “spikes” on the surface of the virus interact with a specific protein receptor (angiotensin converting enzyme 2, ACE2) on the mammalian cell membrane surface. This interaction promotes the fusing of the virus with the plasma membrane and the subsequent transfer of the viral genetic material into the host cell where it hijacks the cellular machinery ultimately producing more viral particles.
At the ISIS pulsed neutron and muon source we have a series of techniques and model biological membrane systems which enable both structural and dynamical studies on complex biological architectures. Macromolecular interactions as well as the relative distribution and changes in components during a biochemical event can be examined in realistic environments such as mammalian cellular membrane surfaces. Unique insight into the virus (sars-cov-2) and the resultant disease (covid-19) can be provided by neutron scattering techniques and would include measurements such as:

- Through neutron reflectometry and small angle neutron scattering, the overall details of viral–membrane binding could be resolved and the effect of pharmaceutical compounds on disrupting this interaction examined.
- Using Small angle neutron scattering, the structure of the virus could be examined and the relative distribution of macromolecular components within that structure, both before and after the interaction of antiviral drugs, resolved. This could be complemented by dynamical studies on the effects of the drugs on the virus components using quasi-elastic neutron scattering.
- Verifying the absolute molecular level details of precision assay and sensor systems for viral detection could be examined using neutron reflectometry to aid in the development of these field deployable diagnostics.

Building on detailed atomic structural information from the research community, and working across the Harwell campus, the application of neutron techniques is capable of providing unique insights, particularly in relation to the fundamental understanding and benchmarking of the diagnosis and therapeutics development stages. The ISIS source has rapid and flexible access mechanisms in operation routinely which will enable to these research tools and capabilities to be available for the international research effort upon the earliest resumption of operations.