Main services

I. Measurement of antigen specific T-cell response

After vaccination, a major issue in vaccine efficacy studies is the quantitative measurement of the humoral immune response, i.e. T-cell immunity in addition to antibody production. T cells are capable of killing virus-infected cells and develop a long-term T cell memory that leads to the accumulation of reactive clones in the event of a subsequent viral infection. In immunosuppressed, i.e. immune-compromised patients (elderly, cancer patients, autoimmune patients) this is a particularly important parameter to monitor.

Our approach:

Our group developed a flow cytometric method to measure SARS-CoV-2 specific T cell activity in the context of the COVID-19 pandemic. We isolate white blood cells from blood samples isolated from patients and measure reactive CD4+ helper and CD8+ cytotoxic T cells at the single cell level after ex vivo restimulation with viral recombinant peptides. The method can also be used to measure other antiviral T cell immunity.

Target group:

Pharmaceutical companies, biotech companies, retail customers who want to see the development of T-cell immunity specific to a particular virus after administration of a vaccine, clinical centres where immunocompromised patients are vaccinated.

Our related publications:

https://www.frontiersin.org/articles/10.3389/fimmu.2022.846248/full

https://www.mdpi.com/1422-0067/23/19/11411

https://www.frontiersin.org/articles/10.3389/fmed.2023.1176168/full

II. Measurement of plant genome poliploidity

A fundamental parameter in plant breeding is the monitoring of DNA stocks, the so-called polyploidy test. This characteristic changes dynamically during plant breeding and provides information on the chromosome set.

Our proposed approach:

Our group can use flow cytometry to determine plant chromosome composition by using a DNA staining agent.

Target group:

Research institutes, universities, plant breeding companies, seed companies

Our related publications:

https://link.springer.com/protocol/10.1007/978-1-61779-182-6_15

https://plantmethods.biomedcentral.com/articles/10.1186/1746-4811-6-5

III. Cytotoxic assessment of drug- candidate molecules

For candidate antitumour agents, it is questionable whether they exert cytostatic and/or cytotoxic effects. A further question for bioactive antitumour agents is whether they have an apoptotic or necrotic effect, and whether, in the case of an apoptotic effect, programmed cell death occurs in mammary cancer cells via an extrinsic or intrinsic pathway.

Our approach:

Our group has optimized methods using flow cytometry with single cell resolution, where we are able to determine whether the drug candidate molecule under test has a cytostatic and/or cytotoxic effect following in vitro or ex vivo treatment. We use a specific DNA staining solution and protocol to determine the cell cycle phases after treatment. Further, AnnexinV/propidium iodide will be used to determine the number of early apoptotic, late apoptotic and necrotic cells after treatment. And using the JC-1 redox sensitive reagent, we can detect changes in mitochondrial membrane potential at the single cell level.

Target group:

Pharmaceutical companies, biotechnology companies, pharmaceutical universities, research groups

Our related publications:

https://onlinelibrary.wiley.com/doi/full/10.1002/ddr.22006

https://www.mdpi.com/1420-3049/23/11/2845

https://www.mdpi.com/1422-0067/18/10/2105

IV. Multiplex measurement of cytokine/chemokine concentrations

Quantification of cytokines, chemokines, hormones is often not possible from a limited amount of biological samples (CSF, newborn blood, tears).

Our approach:

Our group is unique in Eastern Hungary in having the Luminex MAGPIX technology, which allows multiplex quantification of 50 proteins (cytokines, chemokines, hormones) in one reaction

from 20 microliters of biological samples. With one reagent set, the concentration of 50 proteins to be measured can be determined from 80 biological samples in 96-well plates, generating 4000 data points (pg/ml).

A similar technique, Legendplex, is also available from our group, where 13 proteins can be quantified in one reaction well of a 96-well microtitre plate by flow cytometry.

Target group:

Pharmaceutical companies, biotech companies, university or HUN-REN research groups

Our related publications:

https://link.springer.com/article/10.1186/s13293-022-00414-6

https://www.mdpi.com/1422-0067/22/8/4198

https://www.hindawi.com/journals/mi/2021/5523582/

https://www.nature.com/articles/s41366-024-01584-6

V. Multiplex immunophenotyping

The plasticity, dynamic changes and polarization of cells in the immune system are very important parameters that may underlie a therapeutic response, drug resistance. Multiparametric immunophenotyping and isolation of specific immune cell subclasses would greatly facilitate a better understanding of diseases resulting from dysregulation of the immune system, such as cancer or chronic autoimmune diseases.

Our approach:

Our group is dedicated to the study of immune homeostasis disorders, and we have developed specialised technologies available only in Hungary. The Helios single-cell mass cytometer, with which 44 proteins can be analysed at the single-cell level, is a highlight. With the CyTEK Aurora spectral sorter, 48 proteins can be analysed at the single cell level and 6 different populations can be isolated from a biological sample. Our group has also established a carcinoma panel to investigate the single-cell response (sensitive versus resistant tumour cells) of antitumour agents.

Target group:

Pharmaceutical companies, biotech companies, university or HUN-REN research groups

Our related publications:

https://www.mdpi.com/1422-0067/21/1/170

https://www.mdpi.com/2073-4409/8/9/1093

https://www.sciencedirect.com/science/article/pii/S1672022921000553

https://www.mdpi.com/1422-0067/21/14/5135

https://www.mdpi.com/2072-6694/14/1/144

https://www.frontiersin.org/articles/10.3389/fimmu.2023.1243233/full

https://www.frontiersin.org/journals/immunology/articles/10.3389/fimmu.2023.1297577/full

https://www.frontiersin.org/journals/immunology/articles/10.3389/fimmu.2024.1376933/full

https://www.frontiersin.org/journals/immunology/articles/10.3389/fimmu.2024.1380481/full

https://www.cell.com/iscience/fulltext/S2589-0042(24)01104-0