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## RESEARCH AREA

Lipids actively influence the function of transmembrane proteins through direct binding or indirect effects mediated by alterations in biophysical parameters (fluidity, hydration, dipole potential) and lateral organization (lipid raft, ceramide platform microdomains) of biological membranes. Since these parameters are determined by the lipid composition of bilayers, it is reasonable to assume that they may change in diseases characterized by alterations in membrane lipid levels. Such conditions include metabolic (hypercholesterolemia), neurodegenerative (Alzheimer's disease, Parkinson's disease) and lysosomal storage disorders (Niemann-Pick type C, Gaucher's disease) as well. However, the biological roles of changes in biophysical parameters and lateral organization of membranes in the regulation of proteins and the pathomechanism of diseases are still largely unexplored. By means of the wide variety of fluorescence-based measurement techniques available at our department, we investigate the presence and roles of such alterations in the above-mentioned diseases, which can represent novel therapeutic targets, and, in addition, help to better understand these pathological conditions.

## TECHNIQUES AVAILABLE IN THE LAB

Basic cell biology, molecular biology and immunological techniques (cell culturing, transfection, immunofluorescence labeling, Western blot, ELISA, RNA interference), quantitative fluorescence methods (spectrofluorometry, flow cytometry and confocal laser scanning microscopy, digital image processing and analysis, fluorescence resonance energy transfer), as well as generation and application of cellular and animal models of various diseases will be used.

## SELECTED PUBLICATIONS

**Kovacs, T., Kurtan, K., Varga, Z., Nagy, P., Panyi, G., Zakany, F.** (2023) Veklury® (remdesivir) formulations inhibit initial membrane-coupled events of SARS-CoV-2 infection due to their sulfobutylether- $\beta$ -cyclodextrin content. **Br J Pharmacol** **180(16)**: 2064–2084.

**Kovacs, T., Nagy, P., Panyi, G., Szente, L., Varga, Z., Zakany, F.** (2022) Cyclodextrins: Only Pharmaceutical Excipients or Full-Fledged Drug Candidates? **Pharmaceutics** **14(12)**: 2559.

**Kovacs, T.,\* Zakany, F.,\* Nagy, P.** (2022) It Takes More than Two to Tango: Complex, Hierarchical, and Membrane-Modulated Interactions in the Regulation of Receptor Tyrosine Kinases. **Cancers (Basel)** **4**: 944.

**Kovacs, T., Sohajda, T., Szente, L., Nagy, P., Panyi, G., Varga, Z., Zakany, F.** (2021) Cyclodextrins Exert a Ligand-like Current Inhibitory Effect on the KV1.3 Ion Channel Independent of Membrane Cholesterol Extraction. **Front Mol Biosci** **8**: 735357.

Zakany, F., Szabo, M., Batta, G., Kárpáti, L., Mándity, IM., Fülöp, P., Varga, Z., Panyi, G., Nagy, P., **Kovacs, T.** (2021) An  $\omega$ -3, but Not an  $\omega$ -6 Polyunsaturated Fatty Acid Decreases Membrane Dipole Potential and Stimulates Endo-Lysosomal Escape of Penetratin. **Front Cell Dev Biol** **9**: 647300.