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Laboratory of Signal Transduction

Plasma membrane signalosomes

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Research topics

Recent studies in our laboratory are mainly focused on comprehension of the role of selected plasma membrane components in initial stages of mast cell activation. We have analysed the function of several proteins, including transmembrane adaptor proteins NTAL, LAT, and PAG and phospholipid scramblase I (PLSCRI). We found that in mast cells activated by aggregation of the high-affinity IgE receptor or Thy-1 glycoprotein, tyrosine phosphorylation of PLSCRI is dramatically increased. This had no effect on topography of PLSCRI or membrane symmetry as determined by externalization of phosphatidylserine (PS). During these studies we have found, unexpectedly, that inhibition of phosphatases by pervanadate induces exocytosis in the absence of PS externalization. Our data indicate that changes in topography of PLSCRI and its tyrosine phosphorylation, PS externalization, and exocytosis are independent phenomena that could be distinguished by employing specific conditions of activation. Furthermore, we have produced new monoclonal antibody specific for cell membrane molecule CD9 and found new additives enhancing the performance of polymerase chain reaction.

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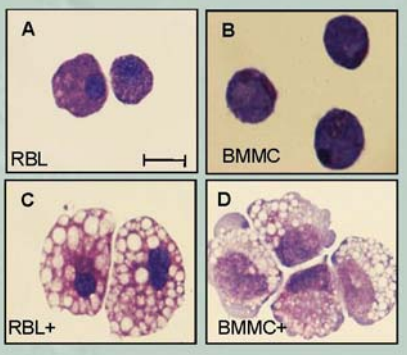
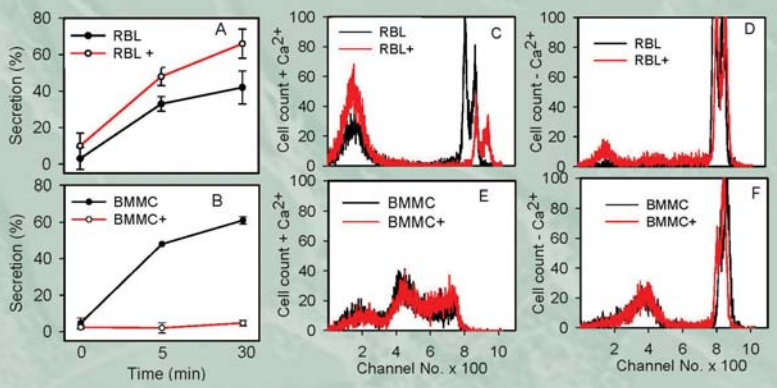
Telemetry. Implanted probes are used to measure body temperature continuously in the course of allergy reaction.

Selected recent papers

1. Dráberová L, Shaik GM, Volná P, Heneberg P, Tůmová M, Lebduška P, Korb J, Dráber P. Regulation of Ca^{2+} signaling in mast cells by tyrosine-phosphorylated and unphosphorylated non-T cell activation linker. **J Immunol.** 2007;179:5169-5180.
2. Smrž D, Dráberová L, Dráber P. Non-apoptotic phosphatidylserine externalization induced by engagement of glycosylphosphatidylinositol-anchored proteins. **J Biol Chem.** 2007;282:10487-10497.
3. Dráber P, Dráberová L, Heneberg P, Šmid F, Farghali H, Dráber P. Preformed STAT3 transducer complexes in human HepG2 cells and rat hepatocytes. **Cell Signal.** 2007;19:2400-2412.
4. Smrž D, Lebduška P, Dráberová L, Korb J, Dráber P. Engagement of phospholipid scramblase 1 in activated cells: implication for phosphatidylserine externalization and exocytosis. **J Biol Chem.** 2008;283:10904-10918.
5. Shaik GM, Dráberová L, Dráber P, Boubelik M, Dráber P. Tetraalkylammonium derivatives as real-time PCR enhancers and stabilizers of the qPCR mixtures containing SYBR Green I. **Nucleic Acids Res.** 2008;36:e93-e103.



Formation of vacuoles in vacuolin-1-treated mast cells. Rat basophilic leukaemia (RBL) cells (A,C) or bone marrow-derived mast cells (BMMCs, B,D) were treated with vehicle (A,B) or vacuolin-1 (C,D; +) and 3 h later the cells were stained with Giemsa-Romanowski stain. Bar, 10 μm. Interestingly, treatment with vacuolin-1 enhanced exocytosis and resealing of damaged membranes in RBL cells, but inhibited these processes in BMMCs (see data on the right).



Correlation between exocytosis and membrane repair in vacuolin-1-treated mast cells. Antigen-mediated exocytosis after treatment with vacuolin-1 was enhanced in RBL cells (A) but inhibited in BMMCs (B). Vacuolin-1 also had a different effect on repair of the plasma membrane damaged by streptolysin O. In the presence of Ca^{2+}, vacuolin-1 enhanced membrane repair in RBL cells (C), but inhibited it in BMMCs (E). In the absence of Ca^{2+} the repair was poor in both cell types (D, F).