

## NONINVASIVE DETECTION OF CYTOPLASMIC STREAMING: PECULIARITIES OF PLANT AND ANIMAL CELLS

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The cytoplasmic streaming is a directed transport of molecules and organelles within the cytoplasm of plant or animal cell. It is based on the functioning of molecular motors (dynein, kinesin, myosin). This streaming aids in the delivery of nutrients, metabolites, and genetic information to all parts of the cell where they needed. Methods of light, fluorescence and confocal microscopy require special preparation of the object of investigation. Generally, these methods are limited to the specific single-cell and thin (monolayer or few layers of cells) objects such as isolated cells, leaf of the waterweed, root hairs of plants. Compared to them the nuclear magnetic resonance (NMR) technique provides a unique method to measure translational displacement of molecules of interest locally on the level of the cell compartment within the living organism [1]. Thus, a noninvasive detection and real-time monitoring of cytoplasmic streaming becomes possible [2].

The comparison of experimental data (NMR-diffusometry) with results of simulations (random walk) is presented. It is shown that the accuracy of measurement of velocity is dependent on the mechanism of transfer of certain molecule. Two main situations can be met: 1) the molecule or organelle of interest attached to the molecular motor; 2) water molecules and solvents are involved in the streaming of cytoplasm produced by the functioning of molecular motors. In the second case, the difference of geometry and structure of plant and animal cell leads to the different approaches to velocity measurements in each case. The influence of experimental conditions and diffusion exchange of molecules between cell compartments on the measured velocity of streaming is discussed.

### References

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2. *Sibgatullin T.A., Vergeldt F.J., Anisimov A.V., Van As H.* Translational dynamics of water in the cytoplasm of parenchymal cells of *Malus domestica* fruit: a pulsed NMR approach // *Doklady Biological Sciences* **Vol. 411**, 2006, Pp. 488–490.