

## **A new method for identification of molecular motor role in endocytosis**

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Endocytosis is a vital process participating in nutrient uptake, signaling and disease resistance [1]. One of the main components of endocytic system is molecular motor system, which performs endosome transport, as well as transport of motors themselves. Molecular motor defects may cause diseases of nervous system, kidney diseases, and chronic infection of respiratory tract [2]. Our study focuses on the role of molecular motors in endocytosis.

Although systematic survey of gene contribution in endocytosis has been already conducted [1], there is still lack of systematic knowledge of motor-dependent dynamic properties of endocytosis, such as cargo transport speed, endosome properties (diameter, rab5 intensity, etc.) evolution during endosome maturation. Such knowledge requires design of new methods allowing analysis.

Problem with identification of molecular motor participation in endosome transport is that one type of motors may replace functions of another one, thus motor knockdown produce imperceptible changes in cargo translocation.

We propose a new method of identification of motor role in the process. The method is based on quantification of endosome motility in HeLa cells in control and under certain motor knockdown. We describe each endosome in every time point by the following parameters: diameter, mean rab5 intensity, speed, plus-end directed speed, minus-end directed speed and distance to nucleus. Then each parameter distribution is described by fitting with common statistical distribution, choice of the distribution is based on Bayesian information criterion. We also describe each pair of parameters by fitting parameter

dependency with analytical function. Piecewise linear functions with up to two nodes and exponential function are used, choice of the exact type is based on error estimated using cross validation. Parameters of distributions and coefficients of functions serve as numerical characteristics of a cell. These characteristics may be compared to control using Mann-Whitney criterion, revealing whether motor participates in endocytosis or not. Comparison of mean of characteristic values sheds light on the role of a motor.

As a next step, we are going to handle and analyze data for a large number of motors and estimate characteristic robustness using correlation coefficients of characteristic vectors of two independent computations.

1. C. Collinet et al. (2010) Systems survey of endocytosis by multiparametric image analysis, *Nature*, **464**:243–249.
2. N. Hirokawa and R. Takemura (2003) Biochemical and molecular characterization of diseases linked to motor proteins, *TRENDS in Biochemical Sciences*, **28**:558–565