Publications

Membranes et fonctions cellulaires

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Wouter H Roos, Otger Campàs, Fabien Montel, Günther Woehlke, Joachim P Spatz, Patricia Bassereau, Giovanni Cappello (2008 Nov 26)

Dynamic kinesin-1 clustering on microtubules due to mutually attractive interactions.


Résumé

Molecular motors Often Collectively work inside the cell. While the properties of individual motors-have-been Extensively Studied over the last decade, much less is it how Known motors coordinate Their Action When working in ensembles. The motor behavior in collective terms Where They touch each other, as in intracellular transport May Strongly depends on Their mutual interactions. In Particular, mutual interactions May result in motor clustering without the need of additional proteins. Here we study the interactions entre kinesin-1 molecules by Analysing Their attachment / detachment kinetics on microtubules in the lack of motor motion. Our in vitro experiments show That kinesins-1 REMAIN skirt attached to the microtubule in the presence of Neighbouring motors, resulting and in the training of motor clusters. Numerical simulations of the motor attachment / detachment dynamics show que la presence of attractive interactions entre motors quantitatively accounts for the experimental observations. From the comparison of the numerical results and the experimental data we estimate the interaction energy entre kinesin-1 molecules to be 1.6 +/- 0.5K (B) T. The existence of attractive interactions entre kinesin-1 Provides a new insight into the coordination mechanism entre motor proteins and May be crucial to Understand the large scale traffic in cells.

Jean-Baptiste Manneville, Jean-François Casella, Ernesto Ambroggio, Pierre Gounon, Julien Bertherat, Patricia Bassereau, Jean Cartaud, Bruno Antonny, Bruno Goud (2008 Nov 1)

COPI coat assembly occurs on liquid-disordered domains and the associated membrane deformations are limited by membrane tension.

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Résumé

Cytoplasmic coat proteins are required for cargo and selection of budding tubulovesicular transportation intermediates That shuttle entre intracellular compartments. To better Understand the physical parameters governing coat assembly and coat-induced membrane deformation, we-have reconstituted the Arf1-dependent assembly of the COPI coat on giant unilamellar vesicles by using fluorescently Labeled Arf1 and coatamer. Membrane recruitment of Arf1-GTP OCCURS Exclusively on disordered lipid domains and Does not Induce optically visible deformation membrane. In the presence of GTP-Arf1, coatamer self-assembled into weakly curved coats is under high voltage membranes, while it induces extensive membrane deformation membrane at low voltage. These deformations APPEAR to-
have a different composition from the membrane parental. Because they are protected from transition phase. These findings suggest que la COPI coat is adapté to liquid disordered membrane domains where it could promote lipid sorting and that its mechanical effects can be tuned by membrane voltage.

Pierre Sens, Ludger Johannes, Patricia Bassereau (2008 Jun 10)

**Biophysical approaches to protein-induced membrane deformations in trafficking.**


**Résumé**

Membrane membrane traffic requires deformation to generate vesicles and tubules. Strong evidence suggests that assembly of curvature-active proteins can drive such membrane shape changes. Well-documented pathways often involve protein scaffolds, in particular coats (clathrin gold COP). However, membrane curvature shoulds, in principle, be influenced by any protein binding membrane was asymmetrically; wide exchange membrane morphological could result from their aggregation. In the case of Shiga toxin or viral matrix proteins, tubules and buds appear to result from the cargo-driven formation of protein-lipid nanodomains, showing collective behavior that protein is crucial in the process. We argue here that a combination of in vitro experiments on giant unilamellar vesicles and theoretical modeling based on statistical physics is ideally suited to tackle collective thesis effects.

M Lamblet, B Delord, L Johannes, D van Effenterre, P Bassereau (2008 May 16)

**Key role of receptor density in colloid/cell specific interaction: a quantitative biomimetic study on giant vesicles.**


**Résumé**

This paper presents an experimental study of the adsorption of colloids on model membranes mediated by specific ligand-receptor interactions. The colloids consist of lipid multilamellar liposomes (spherulites) functionalized with the B-subunit of Shiga Toxin (STxB), while the lipid membranes are Unilamellar Giant Vesicles (GUV) containing STxB lipid receptor, globotriaosylceramide (Gb 3). Through confocal microscopy and flow cytometry, we show the specificity of the adsorption. Moreover, we show that flow cytometry can be used to efficiently quantify the kinetics of colloid adsorption is GUVs with very good statistics. By varying the bulk colloid concentration and receptor density in the membrane, we point out the existence of an optimum density for Gb3 adsorption. We propose that this optimum corresponds to a transition between reversible colloid adsorption at low density Gb3 and irreversible adsorption, and likely spherulite fusion, at high density. We compare our results to STxB-colloids both adhering on living cells and to free STxB proteins interacting with GUVs containing Gb3. This biomimetic system could be used for a quantitative assessment of the
early stage of virus infection or drug delivery.