Toy endocytosis

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We present a theoretical analysis for ligand-induced endocytosis. We consider a flat membrane that separates the inner and outer fluids, the outer fluid contains particles that can be absorbed on the membrane and aggregate to form domains and the inner fluid does not, domains with sufficiently large size depart from the membrane and enter the inner fluid by vesicle fission. Assuming domain growth to be an irreversible diffusion-limited process, our study reveals that in the steady state: (i) At reasonable absorption rate j_{on}, desorption rate j_{off} and n^*, number of particles in a vesicle, domains grow independently. (ii) When j_{off} is sufficiently large, j_{on} and n^* are sufficiently small, particles leave the membrane many times before finally joining domains and number of vesicles produced per unit time scales as $(j_{on}/j_{off})^2$. (iii) When j_{on} is sufficiently large, most particles absorbed on the membrane join domains before leaving the membrane and number of vesicles produced per unit time is proportional to number of particles absorbed on the membrane per unit time.

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