

Abstract Submitted
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Particle aggregation during receptor-mediated endocytosis

SHENG MAO, ANDREJ KOSMRLJ, Princeton University — Receptor-mediated endocytosis of particles is driven by large binding energy between ligands on particles and receptors on a membrane, which compensates for the membrane bending energy and for the cost due to the mixing entropy of receptors. While the receptor-mediated endocytosis of individual particle is well understood, much less is known about the joint entry of multiple particles. Here, we demonstrate that the endocytosis of multiple particles leads to a kinetically driven entropic attraction, which may cause the aggregation of particles observed in experiments. During the endocytosis particles absorb nearby receptors and thus produce regions, which are depleted of receptors. When such depleted regions start overlapping, the corresponding particles experience osmotic-like attractive entropic force. If the attractive force between particles is large enough to overcome the repulsive interaction due to membrane bending, then particles tend to aggregate provided that they are sufficiently close, such that they are not completely engulfed before they come in contact. We discuss the necessary conditions for the aggregation of cylindrical particles during receptor-mediated endocytosis and comment on the generalization to spherical particles.

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