Content release of large secretory vesicles by the actomyosin network

Benny Shilo*, Tal Rousso and Eyal D. Schejter

Department of Molecular Genetics, Weizmann Institute of Science

* Corresponding author: benny.shilo@weizmann.ac.il

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Abstract

Some exocrine systems require exertion of active forces to mediate secretory vesicle content release at late stages of exocytosis. A universal feature of such systems is formation of an actin coat around each vesicle, which is thought to facilitate the force necessary to complete the process of vesicle secretion. This type of secretion is correlated with large-sized vesicles (several microns in diameter) in a variety of systems, yet not much is known about the factors and regulatory pathways that mediate the dynamic assembly of their actin structure. By setting up a live imaging system for cultured *Drosophila* salivary glands, we follow the dynamics of actin coat formation around "glue"-filled vesicles, and vesicle content release. This system accommodates two major advantages, exceptional imaging qualities owing to its unique size and architecture, and the ability to apply refined genetic manipulations at the level of a whole organism.

We show that the Formin family protein Diaphanous (Dia) is critical for the generation of the actin coat structure, and is recruited onto the vesicle surface following its fusion with the plasma membrane. "Squeezing" of the actin-coated vesicle and content release require Myosin-II, which is recruited onto the fusing vesicle as a result of a signaling cascade involving Rho1 and Rok. Myo-II revealed a unique organization that coincides with sites of contraction along the vesicle, and sheds light on the forces that are applied on the vesicle to facilitate efficient content release.