A novel tropomyosin 4/β-actin filament population that regulates ER to Golgi trafficking.

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Although the actin cytoskeleton is recognised as being important for Golgi morphology and vesicle trafficking, the actin filaments associated with the Golgi have not been clearly defined. We have previously shown that the actin-associated protein, tropomyosin (Tm), defines in an isoform specific manner the function of actin filament populations. In this study, we have found that a specific Tm isoform, Tm4 was located in stress fibres and at the perinuclear area colocalised with cis- and trans-Golgi proteins (GM130 and Golgin97, respectively) in undifferentiated 3T3-L1 fibroblasts. In differentiated 3T3-L1 adipocytes, Tm4 and β-actin became concentrated to the Golgi. Gamma-actin and other Tm isoforms (Tm1-3, Tm6, Tm5a/5b) were not localised to the Golgi in adipocytes, speaking to the specificity of Tm4 and β-actin at the Golgi. Tm4 and β-actin localisation was sensitive to the Golgi disrupting drug, Belfeldin A (BFA), and with BFA removal, Tm4 and β-actin re-association with the Golgi is observed as soon as the Golgi membranes start to reform (15min of BFA washout). In embryonic fibroblasts from mice that lack the full-length Tm4 protein (Tm4 KO MEFs), the reestablishment of Golgi morphology after BFA treatment was altered (β-COP staining more dispersed) compared to wild-type cells. Using KDEL-containing constructs, we show that anterograde ER-to-Golgi but not retrograde Golgi-to-ER trafficking was disrupted in the Tm4 KO MEFs. In conclusion, we have identified a novel Tm4/β-actin filament population associated with the Golgi apparatus that has a role in ER-to-Golgi vesicle trafficking.