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Talin: Structural-Functional Relationships

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The extracellular matrix (ECM) ligands are linked to cytoskeleton by integrin receptors. After integrin binding to the ECM talin molecules are recruited into forming cell adhesion structures. As a result, talin can both regulate integrin activity and connect these receptors to actin cytoskeleton. Talin is an adaptor protein which consists of a head domain being atypical FERM-domain, and a rod domain composed of the 4- or 5-helical bundles. Peculiarities of α-helices packing in bundles determinate their resistance to the tension forces exertion and ability to stretching of talin subdomains. In this review our attention is focused on the revelation of relationships between the structural organization of talin domains and the function distribution between the head and rod domains. Spatial orientation of subdomains (F0, F1, F2, F3) in the head domain maintains the accessibility of binding sites for effector molecules in these subdomains and rapid structural changes in the head domain during the talin activation. Linear configuration

of helical bundles (R1-R13) in the rod domain with predominance of 4-helical bundles in the N-terminal part and 5-helical bundles in its C-terminus determinates 1) effective interbundle interactions during the formation of inactive (autoinhibited) dimer form of talin; 2) possibility of alteration in spiralization level of α-helical rod subdomains under physical stimuli effects. This alteration leads to force-regulated exposure of protein interaction sites to be masked in helical bundles of the talin rod domain. It signifies that the N-terminal part of talin (the head domain) transforms some biochemical signals into others but the C-terminal part of talin (the rod domain) converts physical stimuli into biochemical and physiological signals regulating cell response. Some peculiarities of interactions between talin and different compounds at the molecular level are also discussed.

Keywords: talin domains and subdomains, autoinhibition and activation of talin, integrins, cell adhesion