Does Palladin Bind to Monomeric Actin?

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Every cell has a cytoskeleton that in eukaryotes contains microfilaments composed of actin subunits. Actin is one of the most abundant proteins in the cell and is crucial for vital cellular processes such as cell motility, maintenance of cell shape, cell division, and muscle contraction. However, actin requires numerous other proteins for regulation. Of over 150 actin binding proteins, palladin is one of the most recently discovered. Palladin also binds directly to other actin regulating proteins and actin cross-linking proteins in addition to binding directly to F-actin. Palladin has also been functionally linked to the regulation of actin dynamics in normal embryonic development, wound healing, and recently in invasive cancers.

Additionally, palladin was found to be involved in the rate limiting step of actin polymerization. Actin is found in two forms in the cell. G-actin or globular actin is monomeric, and F-actin is the polymer microfilament. The rate-limiting step of this polymer formation is called nucleation. During actin nucleation, three G-actin monomers come together with the aid of other actin binding proteins to form a nucleus from which the filament can elongate. The lag phase, corresponding to the nucleation step, was not observed for either F-actin or G-actin in the presence of palladin suggesting that palladin either stabilizes actin nuclei or lowers the critical concentration for polymer formation. Therefore*, we hypothesize that palladin binds to monomeric G-actin as well as F-actin.*

Preliminary studies are presented here that were performed using affinity chromatography. The minimal F-actin binding domain of palladin (Ig3) did appear to also interact with G-actin. Since the presence of palladin's Ig4 domain dramatically increases actin binding and bundling properties, these experiments were also supported by use of the Ig34 tandem domains. Future research will be conducted using non-polymerizable AP actin monomers and binding assays.