Intermediate filaments – Dynamic structures between biomechanics and signaling

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Intermediate filaments (IFs) have received significant attention due to the broad range of diseases they have been shown to be associated with. There is accumulating evidence to show that many of the numerous IF-related diseases are associated with compromised tissue homeostasis as well as failing tissue regeneration and healing. Our research has established that IFs act as signaling scaffolds, organizers, and gate-keepers that are able to integrate and direct signaling machineries, with direct consequences for cell fate in tissues. Our accumulated results imply that IFs have a key role in homeostatic and regenerative signal integration. IFs have a key role in fibroblastic migration, which is of key physiological importance in wound healing. We have already demonstrated that vimentin affects migration through functions related to actomyosin complexes and show that vimentin affects directionality by guiding focal adhesions in fibroblasts. The results demonstrate that vimentin intermediate filaments are in dynamic bidirectional interplay with focal adhesion proteins, thereby controlling the maturation, stability, dynamics, arrangement, and overall orientation of focal adhesions, with a net effect on focal adhesion coordination during directional migration. In this way the also affect the organization of extracellular matrix, which in turn will be reflected upon the sensory systems of the cell that in turn will give cues to the signaling machinery that is coupled to IFs.