

Formation and dynamics of focal adhesions during cell spreading

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Focal adhesions are linked to contractile actomyosin bundles, and assembled/disassembled in migrating cells. Therefore, cells generate contractile force through the focal adhesions, and this force is essential for the formation and maintenance of focal adhesions. However, the underlying mechanisms by which actomyosin tension regulates the formation and dynamics of focal adhesions are unclear. To elucidate this mechanism, we studied the formation and dynamics of focal adhesions during cell spreading using total internal reflection fluorescence microscopy. Within 0.5 h after cell adhesion, dot-like focal complexes were formed at the tips of filopodia and at the leading edge of lamellipodia. At 1 h after cell adhesion, focal complexes elongated and matured into focal adhesions with the formation of actomyosin bundles. At 4 h after cell adhesion, focal adhesions were located at the ends of organized stress fibers in well-spread cells. In the presence of myosin-II inhibitor (-)-Blebbistatin or Rho-kinase inhibitor Y-27632, dot-like focal complexes were formed, but less elongated focal adhesions. These results clarify actomyosin-dependent contractile force is essential for the anisotropic elongation of focal adhesions.