ABSTRACT

Even though nuclear myosin 1 (NM1) and myosin 1C (Myo1C) are the products of the same gene, NM1 has additional 16 amino acids at the N-terminus due to alternative start of transcription. Studies claim that NM1 and Myo1C are nuclear and cytoplasmic proteins, respectively. Therefore, researchers thought that NM1 translocates into nucleus via nuclear localization signal (NLS) in its N-terminal extension. However, here we show that NLS is placed within second IQ domain where calmodulin (CaM) binds in a calcium- dependent manner. Since both NM1 and Myo1C have identical neck domains where NLS resides, we have confirmed that both myosin isoforms localize to nucleus.

Based on findings indicating Myo1C binding to phosphatidylinositol 4,5-bisphosphate (PIP2) via its tail domain, we tested if NM1 and Myo1C can interact with PIP2 in the nucleus. We show that both isoforms can bind to PIP2 via their tail domains, and interactions with PIP2 can recruit other nuclear proteins into this lipo-protein complex. PIP2 makes complex with a subset of Pol I transcription and processing machinery proteins and modulate their functions in the nucleolus. Moreover, PIP2 depletion results in a dramatic loss of Pol I transcription activity. NM1 and actin were already shown to promote Pol I transcription. Here, we show that myosin mobility is decreased upon inhibition of transcription and actin polymerization. PIP2 localizes to fibrillar centers together with Pol I, and UBF after the inhibition of transcription. It is known that NM1 also localizes to fibrillar centers upon inhibition of transription. Taken together, all these data indicate the cross talk between acto-myosin complex and PIP2 in the cell nucleus. Therefore, one could ask how PIP2 regulates acto-myosin complex via interactions with myosins and actin binding proteins such as profilin and gelsolin during transcription. Naturally, more studies are needed to asnwer this question.