Supplementary Figure 1. **Flow cytometry gating information for satellite cell identification.**

Flow cytometry gating to identify α7-integrin^{+}CD31^{-}CD45^{-}Scal-1^{-} satellite cells from enzymatically dissociated hindlimb muscles.

Supplementary Figure 2. **No degeneration or regeneration in uninjured KPNA1 KO muscles.**

(A) TA myofiber cross-sectional area (CSA) of 3 months old KPNA1 KO was significantly decreased compared to WT. Total 520 WT myofibers (n=4) and 442 KO myofibers (n=3) were analyzed. (B) Representative hematoxylin and eosin stained TA muscle sections are shown from 3 months old KPNA1 WT and KO mice. Bar = 100 µm. n= 3 mice per genotype.

Supplementary Figure 3. **Apoptotic satellite cells are increased in uninjured KPNA1 KO muscles.**

(A) Representative images of immunostaining for active caspase-3 and Pax7 as well as DAPI staining in uninjured TA muscle sections from WT and KPNA1 KO mice. White arrowheads indicate Pax7^{+} satellite cells co-stained with active caspase-3 and DAPI. Bar = 20 µm. (B) The percentage of active caspase-3^{+}Pax7^{+} satellite cells was increased in uninjured TA muscles of KPNA1 null (KO) mice relative to WT demonstrating a higher level of apoptosis in KO satellite cells. Data represent the mean ± SEM. n=3 for all experiments. *$p<0.05$.

Supplementary Figure 4. **Increased apoptosis of activated satellite cells in KPNA1 KO muscles.**

(A) Representative images of immunostaining for active caspase-3 and MyoD as well as DAPI staining in TA muscle sections 7 days post injury from WT and KO mice. White arrowheads indicate MyoD^{+} satellite cells co-stained with active caspase-3 and DAPI. Bar = 20 µm. (B) The percentage of active caspase-3^{+}MyoD^{+} satellite cells was increased in injured KPNA1 KO TA muscles relative to WT demonstrating a higher level of apoptosis in activated KO satellite cells. Data represent the mean ± SEM. n=3 for all experiments. *$p<0.05$.

Supplementary Table 1. **Top groups of enriched cNLS proteins in quiescent and activated satellite cells.**

Proteins were considered to be enriched if their spectral counts differed by 2-fold or greater between quiescent and activated satellite cells. In quiescent satellite cells, 92 cNLS proteins were enriched, whereas 21 cNLS proteins were enriched in activated satellite cells three days post-injury. Top groups were determined by gene ontology (GO) process analysis.

Supplementary Table 2. Levels of Wnt signaling related proteins in quiescent KPNA1 KO satellite cells.

Proteomic analysis of KPNA1 WT and KO satellite cells suggests down-regulation of Wnt signaling in KO satellite cells.

Graphical abstract

Karyopherin alpha 1 (KPNA1), a classical nuclear import receptor, binds to Karyopherin beta (KPNB) to transport proteins such as p27 and LEF1 into the nucleus. After release from KPNA1, p27 acts as a cell cycle inhibitor to maintain satellite cell quiescence and LEF1 stimulates transcription of *survivin*, an anti-apoptotic protein, to promote satellite cell survival.