How cell nuclei import essential proteins

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Video Byte

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Abstract

One of the hallmarks of eukaryotic cells is the presence of organelles. Because each plays a distinct role in cell health, organelles require unique sets of proteins formed in the outlying cytoplasm, which means each organelle must have molecular machinery for recognizing and importing these proteins. For proteins destined for the nucleus, “nuclear localization signals” (NLSs) facilitate this process. An NLS is a short amino acid sequence that signals “pickup” by nuclear transporters. In recent years, NLSs have been widely used in cancer treatment and the prevention of viral infection. The trafficking of proteins into the nucleus through NLSs is mediated by proteins referred to as “importins.” Classical NLSs (cNLSs) on cargo proteins are sequentially recognized by the importin α and β subunits and then shuttled into the nucleus through a series of steps. Nuclear proteins can also rely on non-classical NLSs (ncNLSs) that help them “piggyback” on other proteins that contain classical NLSs. NLSs are a powerful tool for tracking how single proteins travel through the nucleus, which, among other insights, could help researchers find ways of disrupting mechanisms associated with viral infection and other diseases.