ABSTRACT

The cell is a highly intricate and complex entity, in which different substances need to be transported from one place to another constantly for normal development and homeostasis. Microtubules are major cytoskeletal elements that function like tracks for kinesin- and dynein-based transport inside the cell. Kinesins are largely plus end-directed motors, majorly involved in organelle and vesicle trafficking towards the plasma membrane. A major family of these motors- the kinesin-3 super family is well- known for its unique ability to transport cargo across long distances. By virtue of super processivity, these motors are predominantly found to traffic cargo in neurons and in relatively much lesser time. KIF14 motor is a unique member of this super family that is critically associated with division of cells. It's importance in cytokinesis is well understood because any change in its activity is found to result in diseases. While in a variety of cancers KIF14 expression is unusually high, microcephaly is caused if the protein levels go below-normal. Additionally, KIF14 is structurally very different from other kinesin-3 motors, due to a disordered domain that is present at the N-terminal before the motor domain. Furthermore, the activity, regulation and processive motility of KIF14 remain largely uninvestigated. Although there are studies that report a high ATPase activity for this motor, it is, in general, believed to be stationary due to its specialized function during cytokinesis at the midbody. The dichotomy in the motor's properties led us to investigate the regulatory mechanism that the cells have in place to modulate the activity of KIF14. Our results from domain swapping and imaging experiments suggest that the motor domain of KIF14 is intrinsically designed to be non-processive inside the cell, for reasons yet to be elucidated.