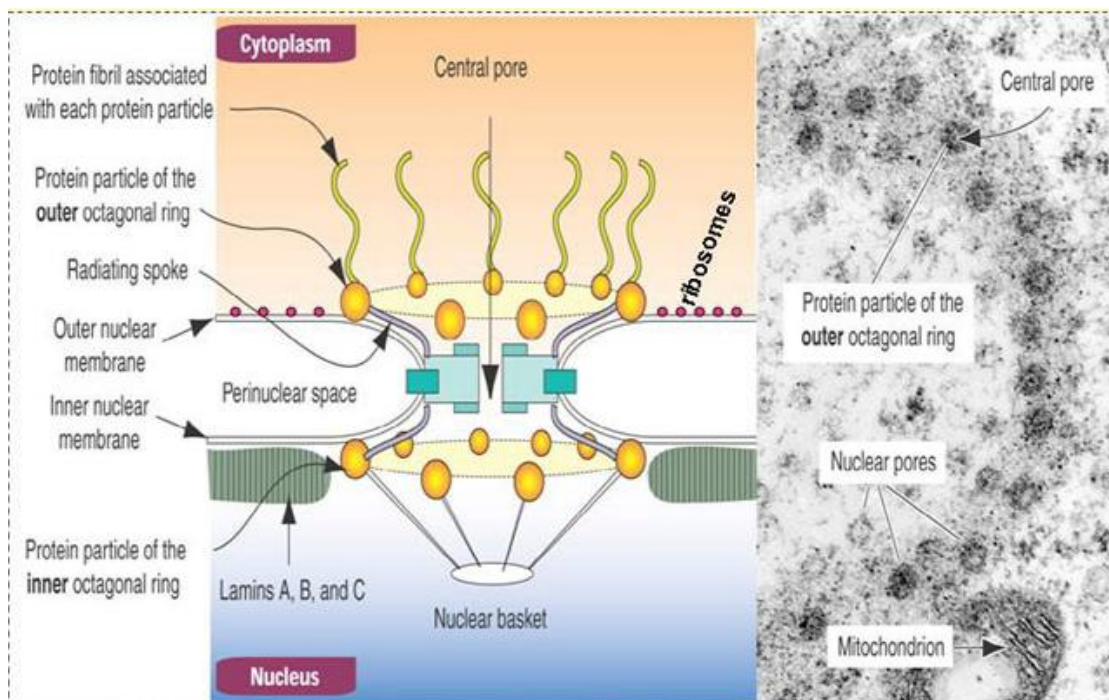


# NUCLEAR PORE COMPLEX (NPC)

The **nuclear pore complex (NPC)** forms the conduit for the exchange of information between the nucleus and cytoplasm. NPC structures are similar in appearance as identified in all eukaryotes from yeast to human. NPC provides an important control point for the regulation of gene expression.

## ULTRASTRUCTURE OF NPC

- Nuclear pore complexes are proteinaceous structures embedded in the double membrane of the nuclear envelope.
- The NPC is a macromolecular architecture with a molecular weight of approximately 125 MDa in vertebrates and 66 MDa in yeast. A vertebrate cell nucleus contains on the order of 2,000 NPCs, whereas the smaller yeast nucleus contains approximately 200.
- It has eight-fold rotational symmetry through the central axis of the pore and two-fold mirror symmetry through the plane of the nuclear envelope, suggesting assembly as a modular structure, a notion that is supported by structural and biochemical analysis of pore complex assembly *in vitro*.
- The main mass of the vertebrate NPC is contained in a three-part structure that surrounds and supports a central transporter.
- The three-layered structure is composed of thin cytoplasmic and nuclear rings that sandwich a central spoke domain.
- The spoke domain is composed of an inner ring element that surrounds a structure called the central transporter and an outer luminal ring that interacts with the nuclear membrane.
- Vertical spoke elements connect the cytoplasmic and nuclear thin rings to the central spoke domain.
- Extending from the cytoplasmic thin ring are eight filaments, each of 2-3 nm in diameter and approximately 50 nm in length.
- The nucleoplasmic side of the NPC is comprised of eight 100 nm filaments that join at a smaller ring structure, forming a fish-basket-like structure emanating from the nuclear thin ring.



## FUNCTIONS OF NPC

- NPC forms a selectively permeable barrier through the nuclear envelope.
- Inert polymers and small proteins less than 9 nm in diameter or less than 30-40 kDa in mass can freely and passively diffuse through the NPC.
- Larger particles traverse the NPC by a facilitated mechanism that is still poorly understood, and the NPC can accommodate the transport of particles as large as 25 nm in diameter.
- NPC forms an aqueous channel between the nuclear and cytoplasmic compartments.
- The pore complexes are regulated channels that behave much like ion channels that can open and close relying on ionic gradient.
- It allows the nascent synthesized RNA from nuclear to cytoplasmic compartment and permits selective proteins from cytoplasmic to nuclear compartment.

