Nuclear Pore Complex:

- The nuclear pore is a large complex structure of 125 million Daltons with 120 nm diameter and 50 nm thickness.
- Electron micrograph has shown that nuclear pore complexes have an eight-fold symmetry.
- Pore complex consists of annuli and a structure is formed from a set of large protein granules arranged in octagonal patterns.
- The hole in the centre of each complex often appears to be plugged by a large central granule.
- Eight radial spokes also extends from plug to rings (Fig.1 & 2).

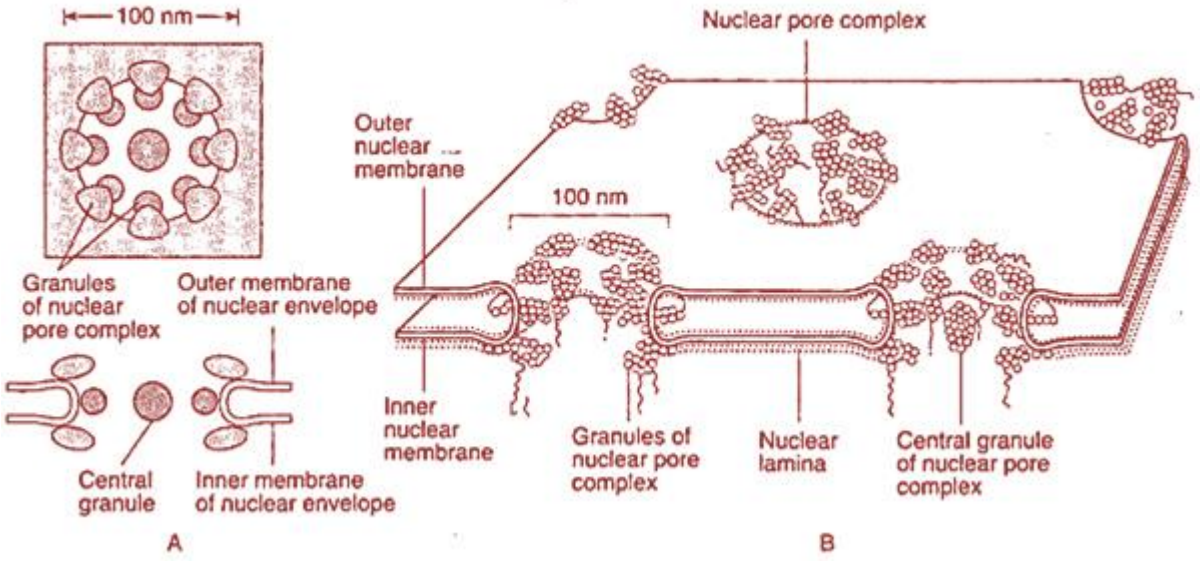

Fig: 1 The arrangement of nuclear pore complex in the nuclear envelop. A: Top view & a central vertical section with central granule. B: 3 D sketch of a small region of nuclear envelop (from Roy & De).

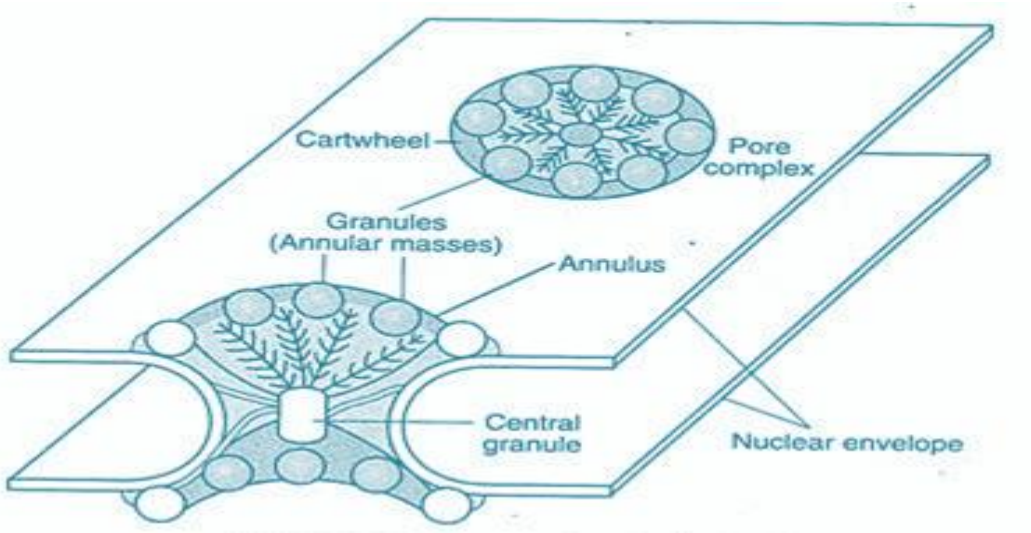

Fig: 2 The Pore Complex,(Franke,1970)

- During 1990s, significant progress has been made towards better understanding of the structure and function of tine nuclear pore.
- New pore protein have been identified, cloned, mutants isolated and detailed mechanism of nucleocytoplasmic transfer has been proposed.
- Further, the pore has been reconstituted in vitro, a number of signal sequences and one or more signal sequence receptors have been identified and a new

'basket like structure' has been attached to the inner side of the nuclear pore.

It consists of four separate elements:

(i) Scaffold, which included majority of the pore,

(ii) Transporter, the central hub which carries out active transport (both import and export) of proteins and RNAs,

(iii) Short thick filaments attached to the cytoplasmic side of the pore,

(iv) A basket attached to the nucleocytoplasmic side of the pore (Fig. 3).

(i) SCAFFOLD:

- The scaffold is a stack of three closely apposed rings — cytoplasmic ring, nucleocytoplasmic ring and a central ring of thick spokes.
- The spokes of central ring are attached to the transporter on the inner side and to the nucleocytoplasmic and cytoplasmic rings on the outer side.
- Interspersed between the spokes are aqueous channels, 9 nm wide, which allow diffusion of

proteins and metabolites between the nucleus and the cytoplasm.

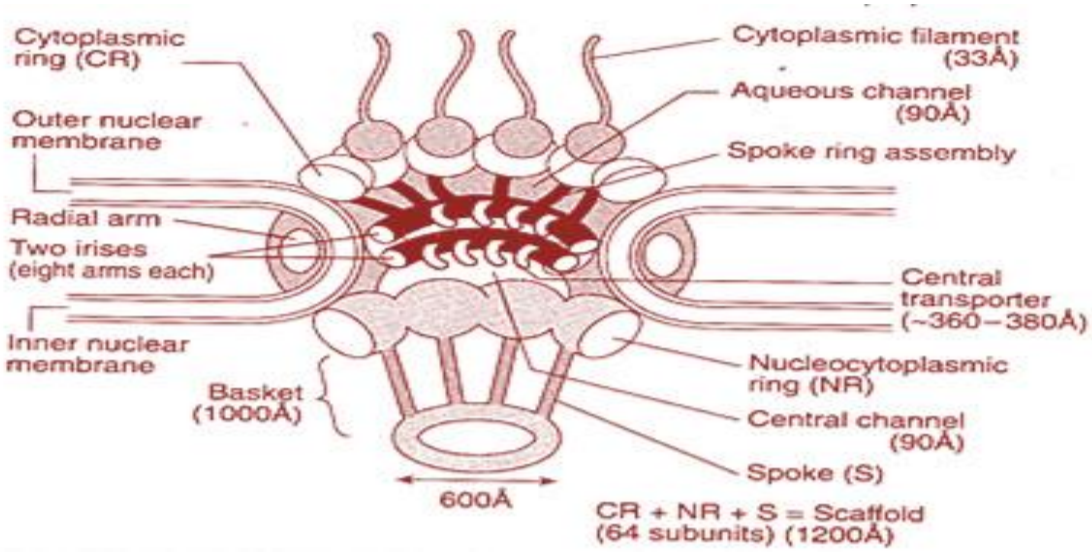

Fig: 3 Detailed Structure of the nuclear pore, showing iris & transporter.

(ii) TRANSPORTER:

- The transporter is a proteinaceous ring, 36-38 nm in diameter and consists of two irises of eight arms each.
- The two irises are assumed to be stacked atop one another and open sequentially, each like the diaphragm of a camera, to let a nuclear protein or RNA pass through from the nucleus to the cytoplasm.

(iii) Short thick filaments:

- On the cytoplasmic side of the pore, thick filaments of 3.3 nm in diameter, extend into the cytoplasm.

(iv) BASKET:

- On the nuclear side, a large basket like structure is found, which consists of eight filaments of 100 nm long, extending from nucleocytoplasmic ring of the pore and meeting a smaller ring of 60 nm in diameter within the nucleus.
- This basket plays an important role in RNA export.

FUNCTIONS OF NPC:

The function of nuclear pore complex is the nucleocytoplasmic transport mediated through a number of proteins, called nucleoporin (NUP).' The nuclear pore complex has a passive diffusion channel and also can diffuse many substances by active process using energy or signal sequence mediated by carrier molecules.

(a) Import of nuclear proteins through nuclear pore involves the formation of NLS- Protein-lmportin complex (NLS = nuclear localization sequence).

(b) Export of RNA from the nucleus across the pore is mediated through NES-Rev protein (NES = nuclear export sequence). (Rev is a transactivating protein that is

essential to the regulation of HIV-1 (and other lentiviral =retrovirus ,protein expression.) (Re=retro V=virus.)

(c) Export followed by reimport of 5SrRNA and UsnRNA occurs through the nuclear pore by the protein with NES like sequence. (Uridylate rich small nuclear RNA).