Intermediate Filament

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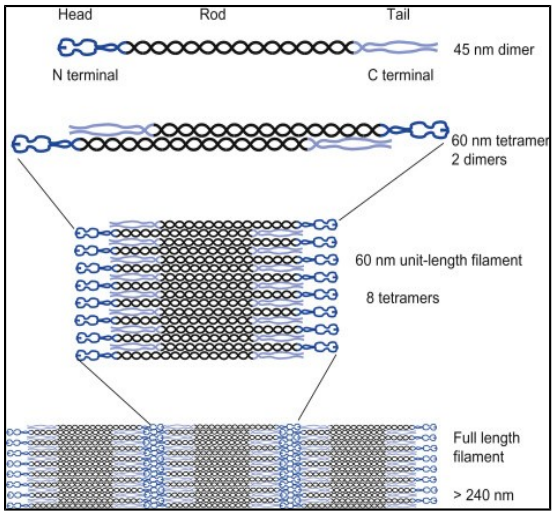
Intermediate filaments are alpha-helical rods that assemble into ropelike filaments of diameter about 10nm. Intermediate filaments are found in nearly all animals but not in plants and fungi. Unlike the actin and tubulin proteins, the intermediate filament proteins are chemically heterogenous and show species-dependent variations in molecular weight. Principal functions of intermediate filaments are structural to reinforce cells and to organize cells into tissues. Unlike microfilaments and microtubules, intermediate filaments do not participate in cell motility

Intermediate filaments were originally named because with diameters between 8 and 10 nm, they are intermediate in size between the microtubules (at 25 nm) and the microfilaments at 7 nm.
These intermediate filaments are composed of a number of different proteins. They play some structural or tension-bearing role.

Structure of Intermediate filaments:

Intermediate filaments are composed of a variety of proteins that are expressed in different types of cells. The elementary subunit of the intermediate filaments consists of an elongated rod with an N-terminal “head” and a C-terminal “tail.” A variety of these elementary subunits are made by the body. These associated laterally to form a homo- or heterodimer, approximately 45 nm long.



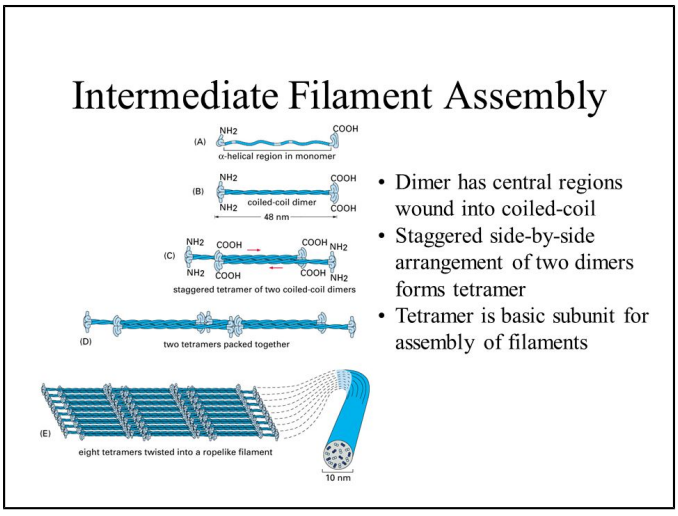


FIG-1: Structure of IF FIG-2: Intermediate filaments Assembly

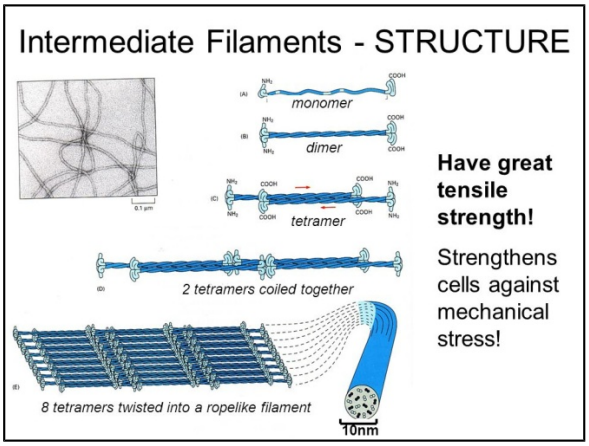


FIG-3: Structure of IF

Types of Intermediate filament:

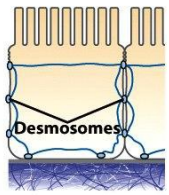
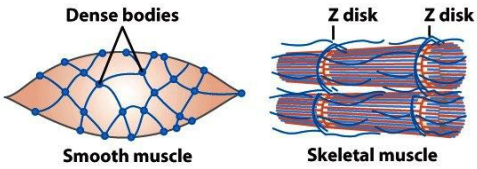
CLASS	PROTEIN	DISTRIBUTION	PROPOSED FUNCTION	
I	Acidic keratins	Epithelial cells	Tissue strength and integrity	
II	Basic keratins	Epithelial cells		
III	Desmin, GFAP, vimentin	Muscle, glial cells, mesenchymal cells	Sarcomere organization, integrity	
IV	Neurofilaments (NFL, NFM, and NFH)	Neurons	Axon organization	
V	Lamins	Nucleus	Nuclear structure and organization	

FIG-4 : Types of Intermediate filaments

Functions of Intermediate filament:

The function of intermediate filaments is largely mechanical, meaning they provide support for the cell so that other microfilaments can more readily do their transport jobs. Some intermediate filaments are even arranged in a mesh-like pattern to provide for the different support needs of different kinds of cells.

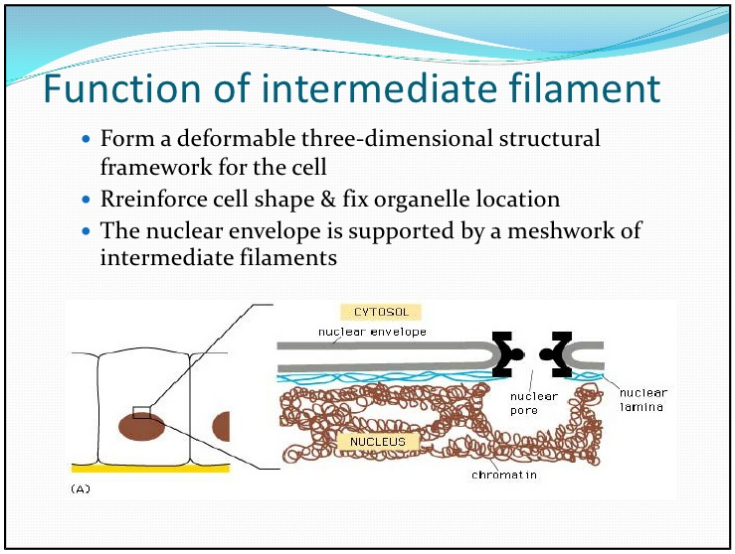


FIG-5: Function of Intermediate filaments

Conclusion:

The tight association between protofilaments provides **intermediate filaments** with a high tensile strength. **This** makes them the most stable component of the cytoskeleton. **Intermediate filaments** are therefore found in particularly durable structures **such as** hair, scales and fingernails.

Ref:

FIG-1 is taken from https://www.sciencedirect.com/topics/medicine-and-dentistry/intermediate-filament

Fig-2 is taken from "Filaments of the Cytoskeleton: Published by Martina Johnson"

Fig-3 is taken from “Cytoskeleton ,**Published by**[**Ashlynn Quinn**]”

Fig-4 is taken from “Lecture 7: the cytoskeleton and cell movement (Microtubules and intermediate filaments) , Dr. Mamoun AhramFaculty of MedicineSecond year, Second semester,Principles of Genetics and Molecular Biology “
Fig-5 is taken from Cytoskelet ON: Dr. I Wayan Sugiritama, M.Kes