CITOESQUELETO

TRAMA COMPLEJA DE FILAMENTOS CONSTITUIDOS POR PROTEINAS QUE CONFIEREN A LA CELULA LA CAPACIDAD PARA ADOPTAR UNA VARIEDAD DE FORMAS Y REALIZAR MOVIMIENTOS COORDINADOS Y DIRIGIDOS

CITOMUSCULATURA

ESTRUCTURA ALTAMENTE DINAMICA QUE SE REORGANIZA EN FORMA CONSTANTE Y CONTINUA CUANDO LA CELULA:

- **CAMBIA DE FORMA**
- **SE DIVIDE**
- **RESPONDE A ESTIMULOS DEL MEDIO AMBIENTE**

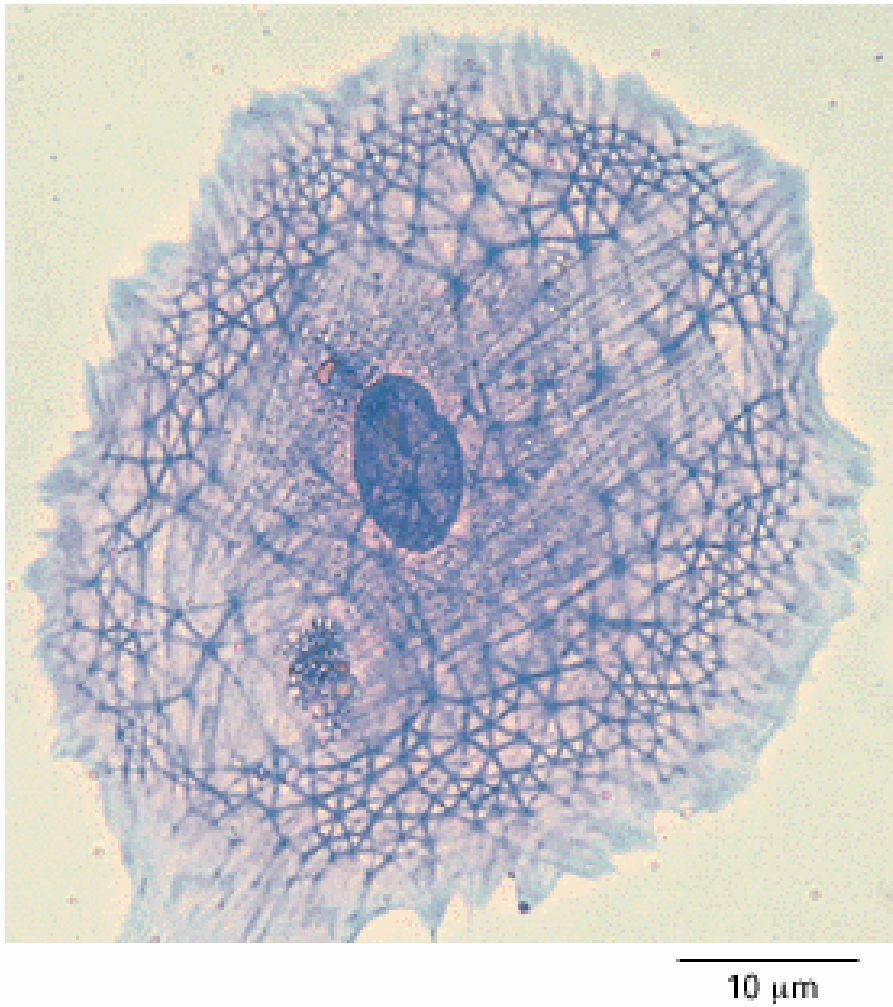
MAQUINARIA ASOCIADA A ACCIONES INTRACELULARES TALES COMO:

- **TRANSPORTE DE ORGANELOS DE UN SITIO A OTRO DE LA CELULA**
- **SEGREGACION DE CROMOSOMAS DURANTE LA MITOSIS**
- **TRANSPORTE DE SUSTANCIAS ENTRE ORGANELOS**
- **SOPORTE MECANICO DE LA CELULA. ESPECIALMENTE IMPORTANTE EN CELULAS ANIMALES DONDE NO HAY PARED EXTERNA RIGIDA.**

¿ COMO UNA CELULA EUCARIOTICA DE 10 nm O MAS PUEDE SER ORGANIZADA ESPACIALMENTE POR MOLECULAS CITOESQUELETICAS PROTEICAS 2.000 VECES MAS PEQUEÑAS EN DIMENSIONES LINEALES ?

¡¡¡POLIMERIZACION!!!!

EL CITOESQUELETO. CELULA EN CULTIVO



ORGANIZACIÖN COMPONENTES DE MEMBRANA Y CITOESQUELETO

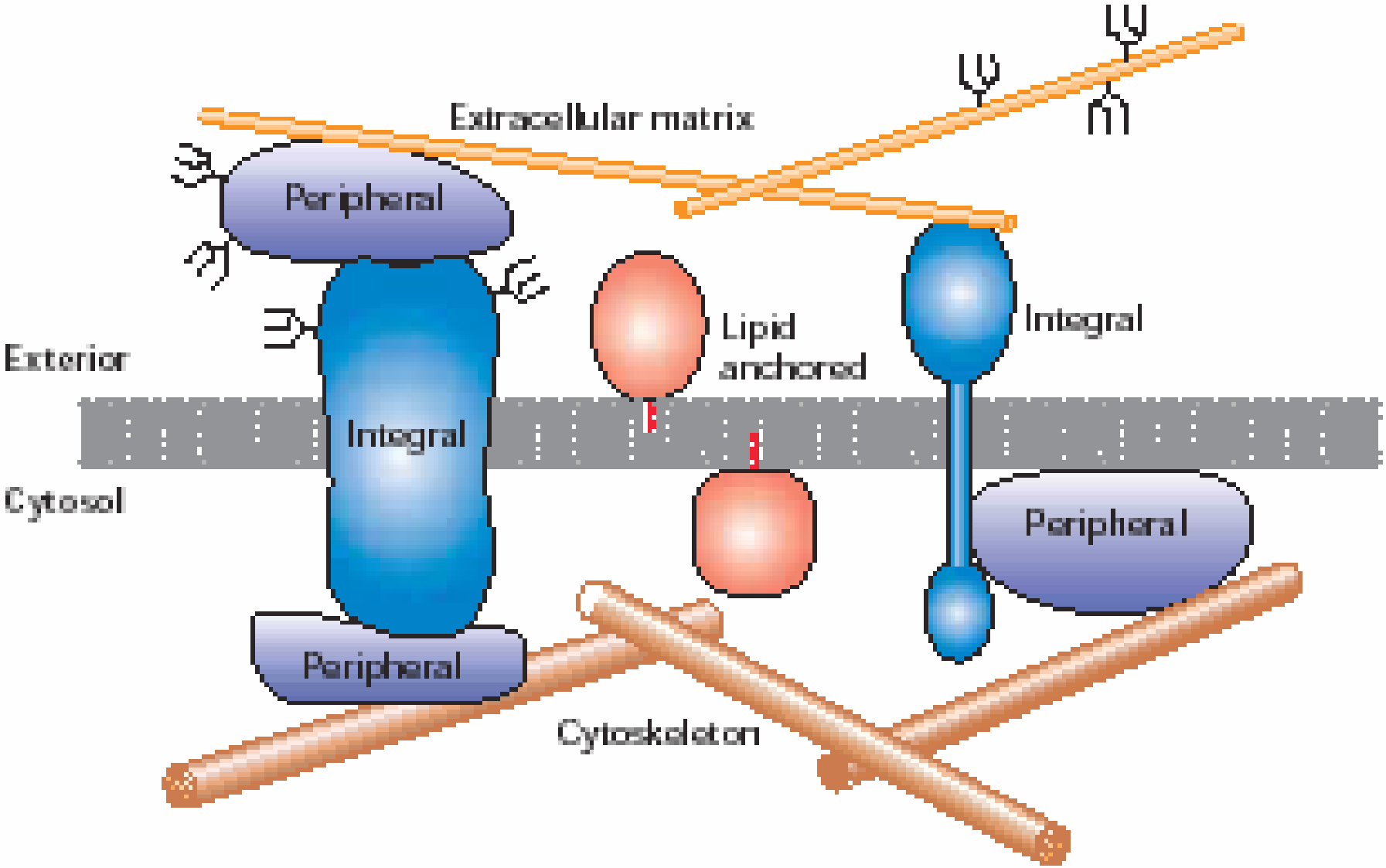
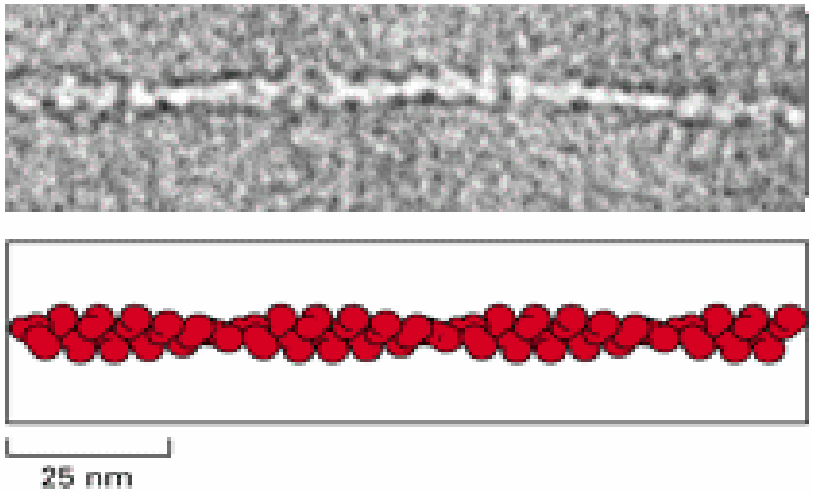


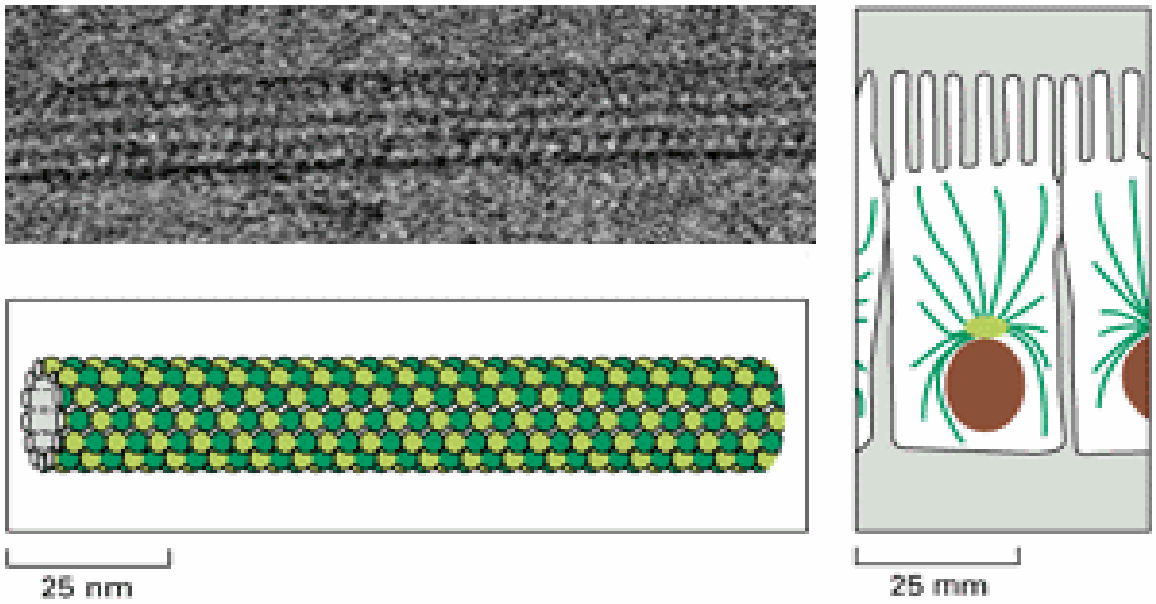
TABLE 5-4 Protein Subunits in Cytoskeletal Filaments

Protein Subunits	MW	Expression	Function
MICROFILAMENTS			
Actin	42,000	Fungi, plant, animal	Structural support, motility
MreB	36,000	Rod-shaped bacteria	Width control
MICROTUBULES			
Tubulin (α and β)	58,000	Fungi, plant, animal	Structural support, motility, cell polarity
FtsZ	58,000	Bacteria	Cell division
INTERMEDIATE FILAMENTS			
Lamins	Various	Plant, animal	Support for nuclear membrane
Desmin, keratin, vimentin, others	Various	Animal	Cell adhesion
OTHER			
MSP	50,000	Nematode sperm	Motility

ACTIN FILAMENTS



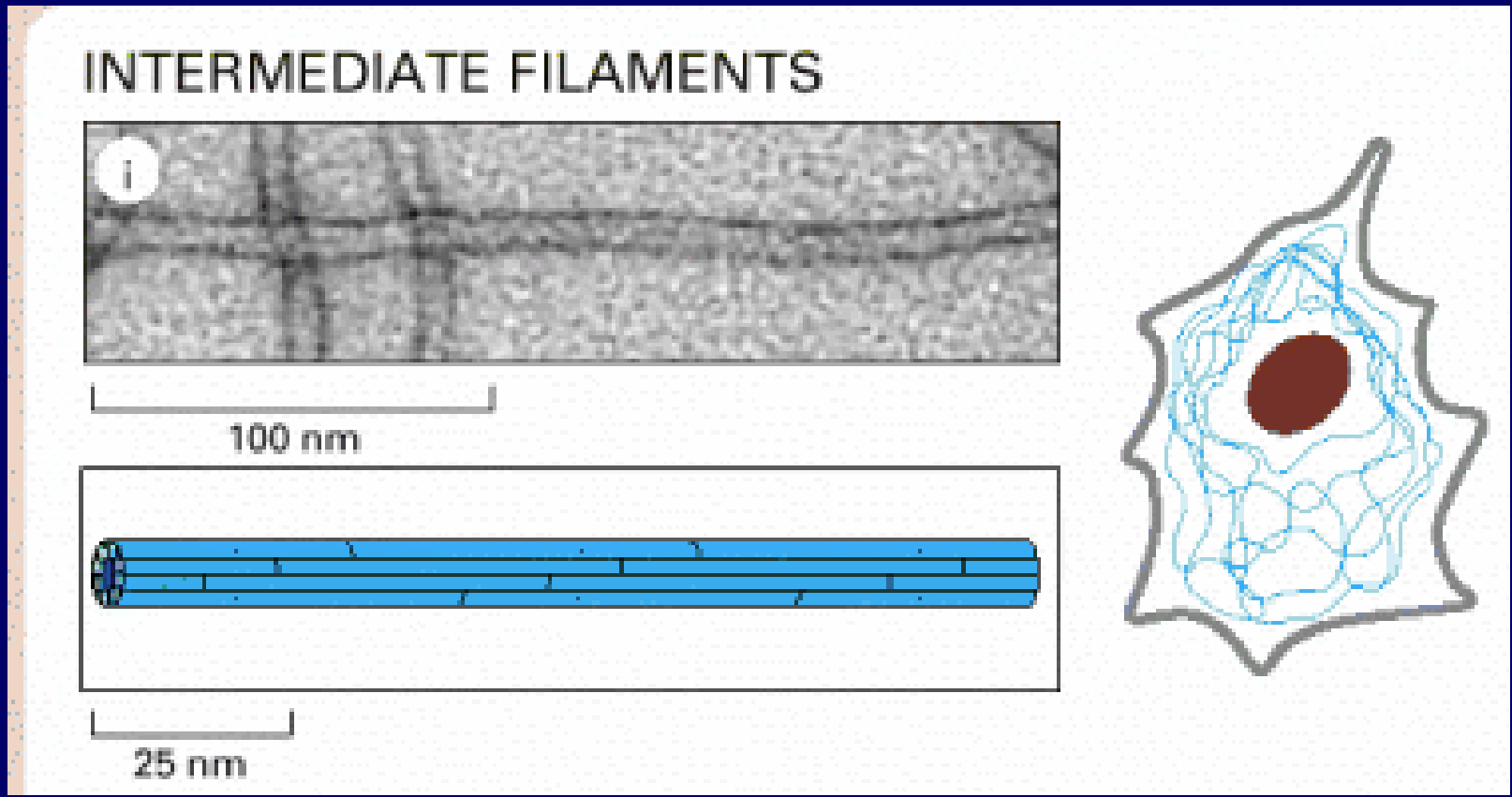
MICROTUBULES



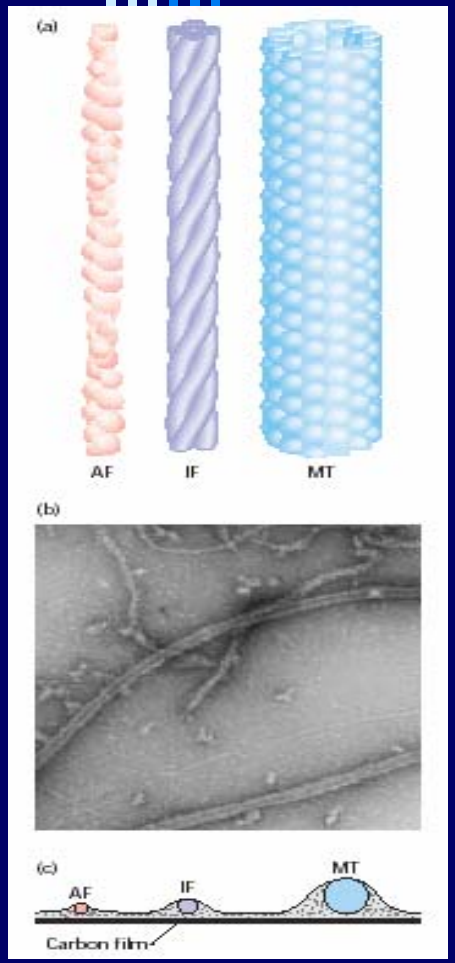
FILAMENTOS DE ACTINA

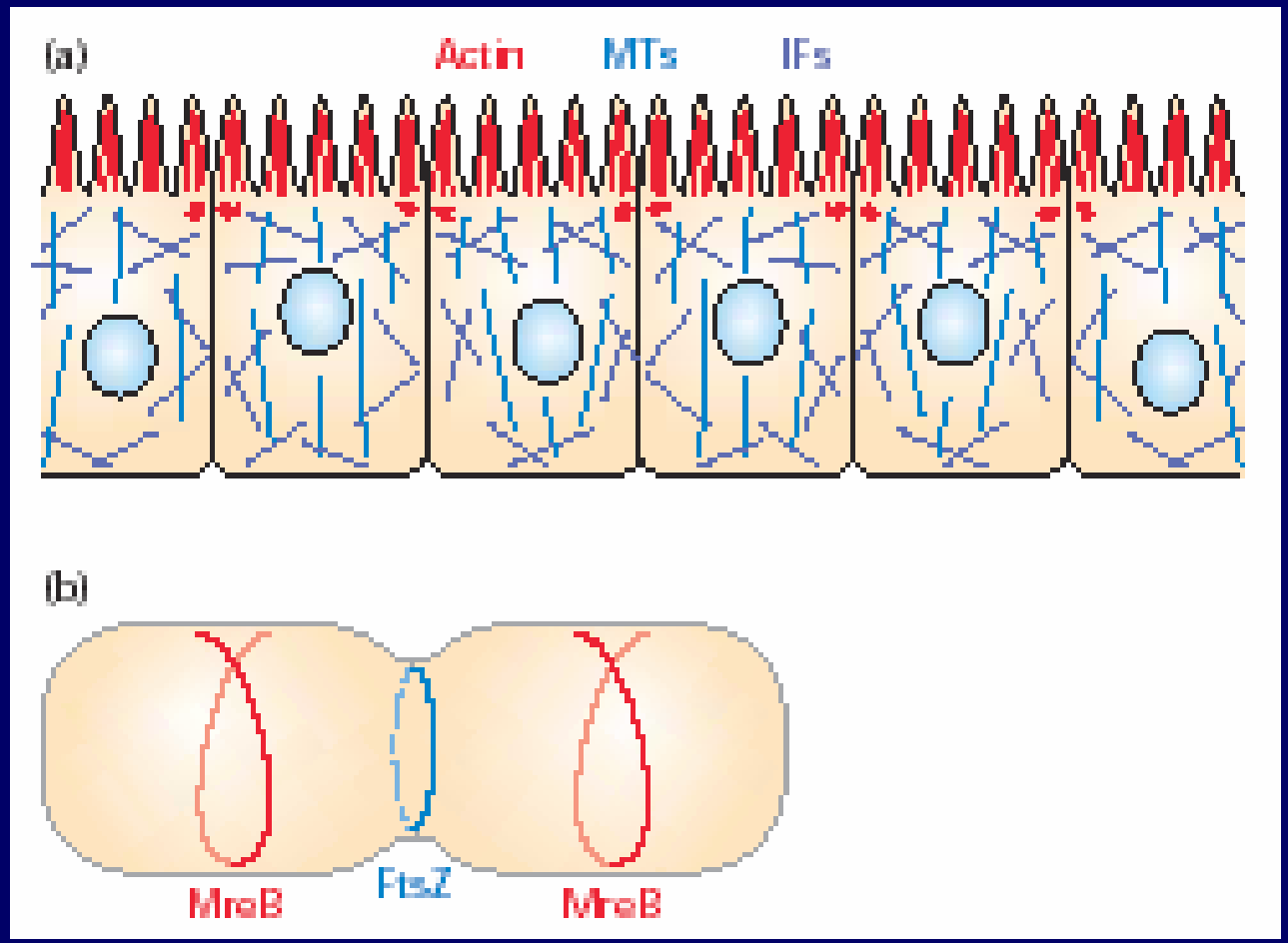
MICROTUBULOS

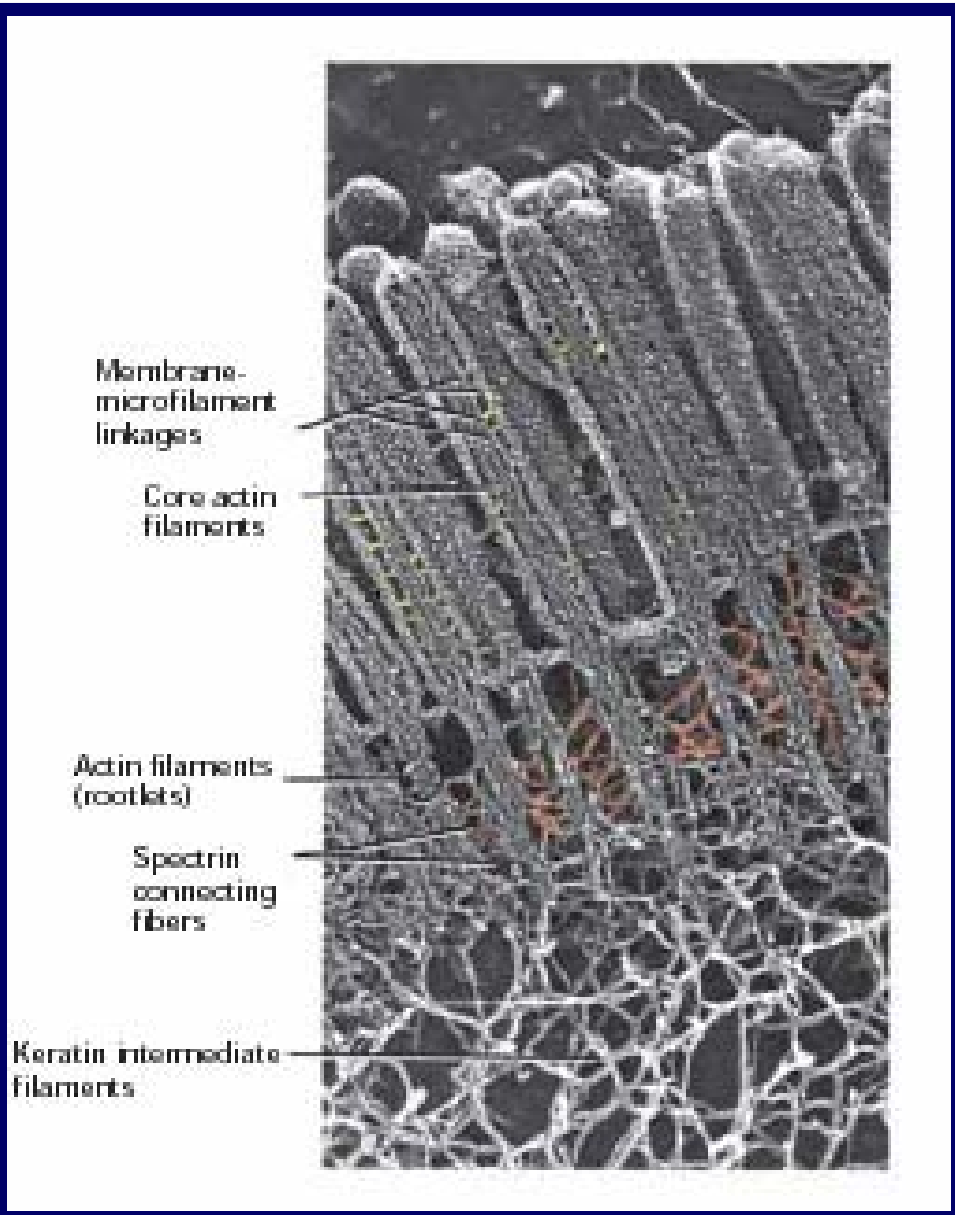
FILAMENTOS INTERMEDIOS.” ROPE-LIKE” ESTRUCTURAS DE ALREDEDOR DE 10nm. STRESS MECANICO



Distribución de componentes del citoesqueleto en células Eucarioticas y en Bacterias

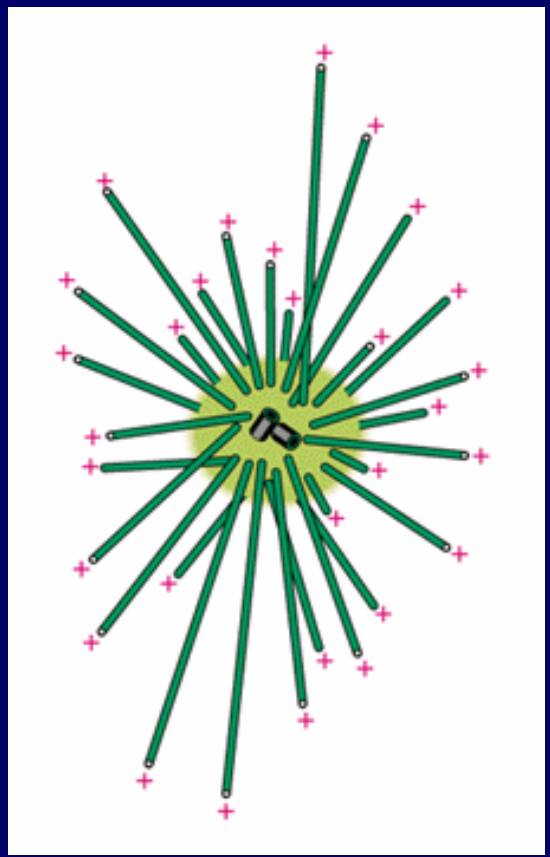


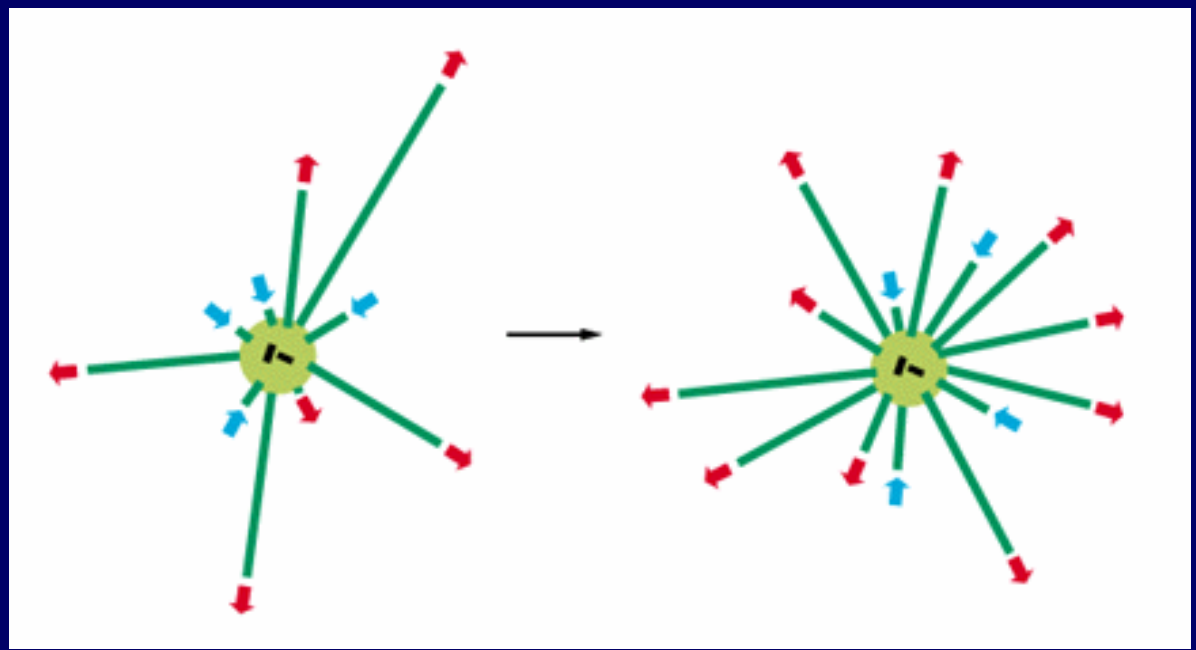




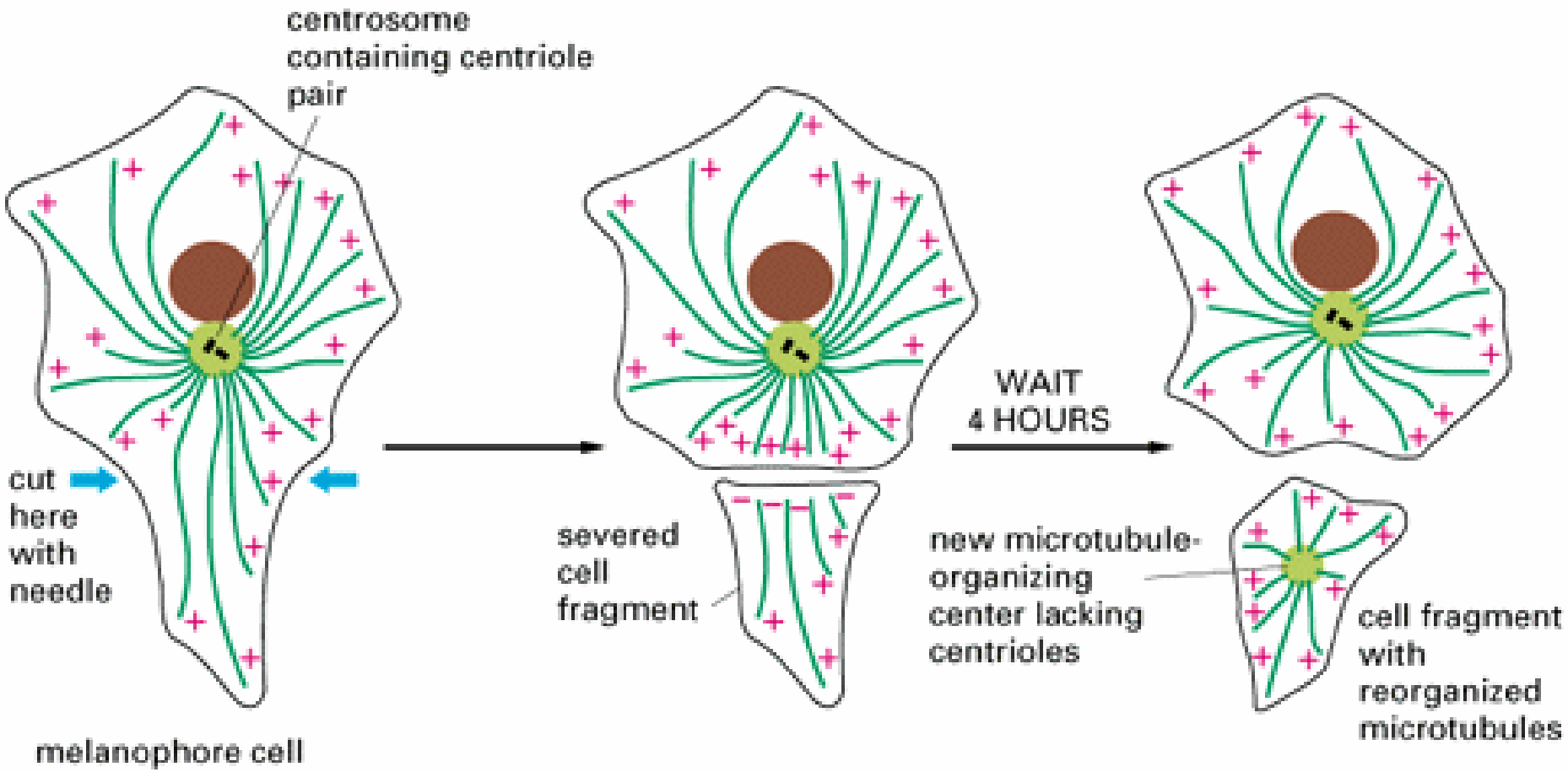
TEM DE LA PARTE APICAL DE UNA CELULA EPITELIAL INTESTINAL SOMETIDA A TRATAMIENTO CON DETERGENTE

UN CENTROSOMA CON MICROTUBULOS ADOSADOS EL ARREGLO DE MICROTUBULOS ANCLADOS A UN CENTROSOMA CAMBIA CONTINUAMENTE, A MEDIDA QUE ALGUNOS MICROTUBULOS CRECEN OTROS SE ENCOJEN

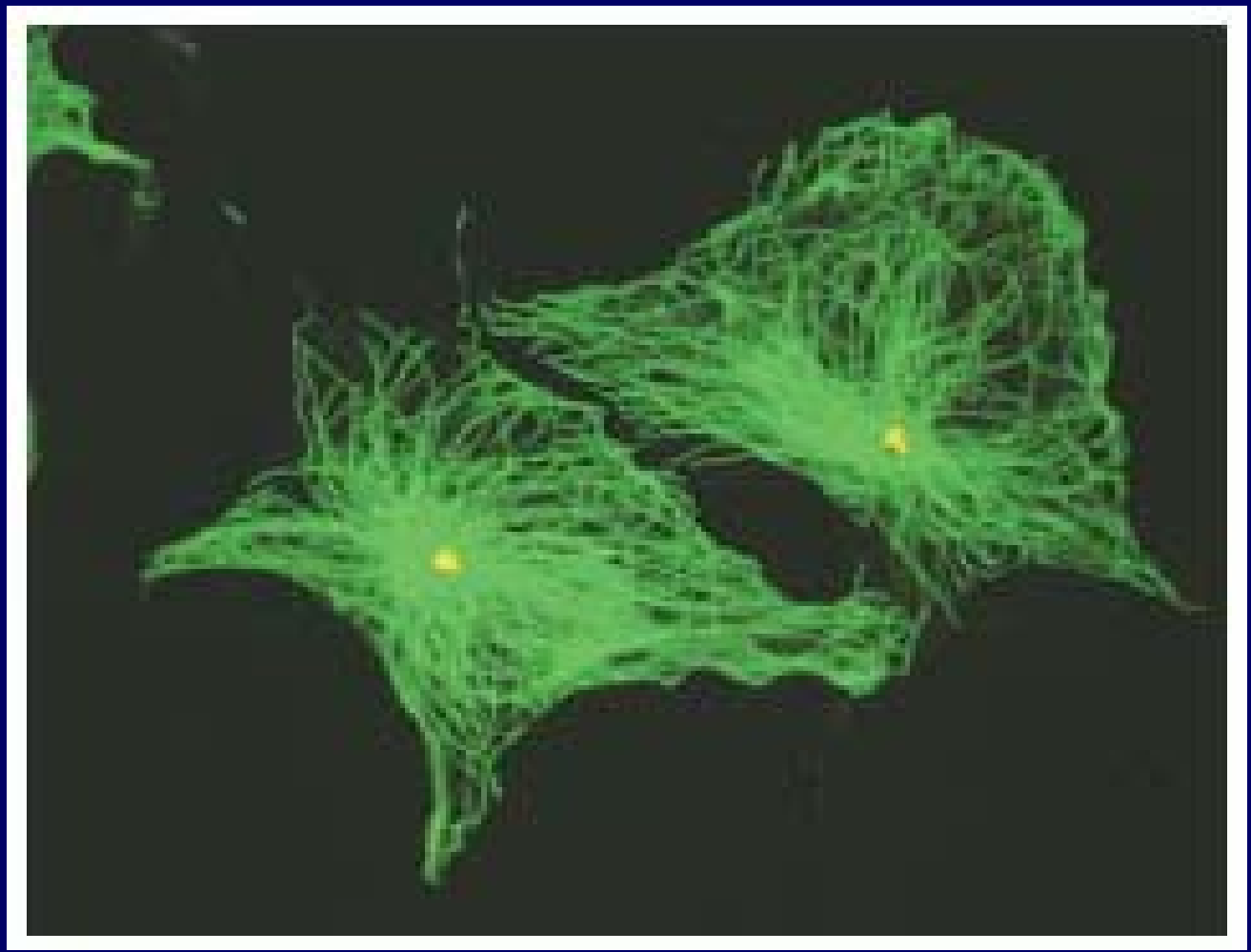




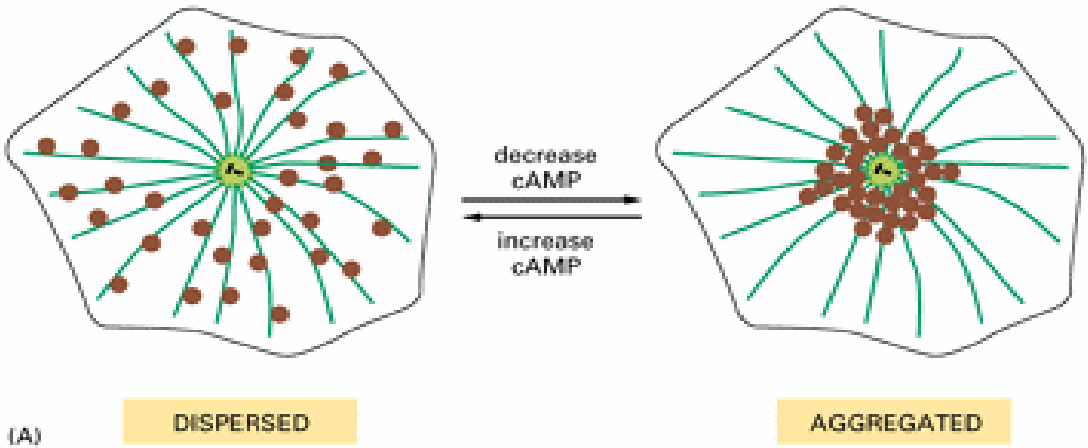
MICROTUBULOS ENCUENTRAN EL CENTRO DE LA CELULA

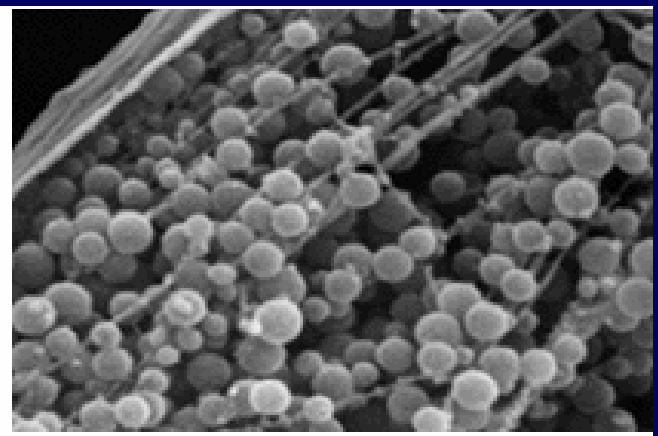


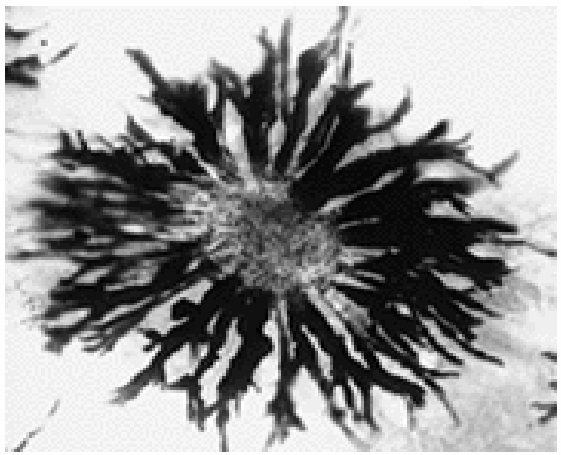
MTOC Y MICROTUBULES DE UNA CELULA OVARICA DE HAMSTER. ESTUDIOS DE INMUNOFLUORESCENCIA

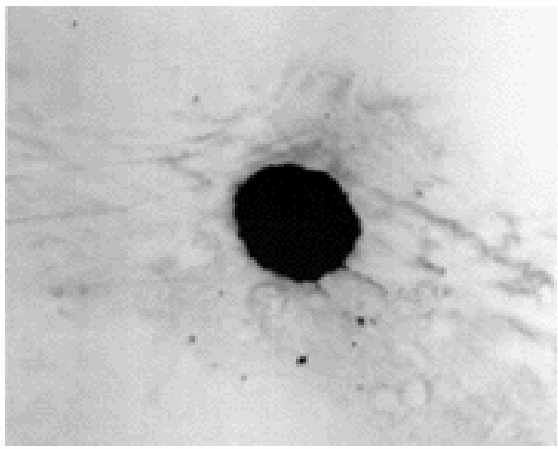


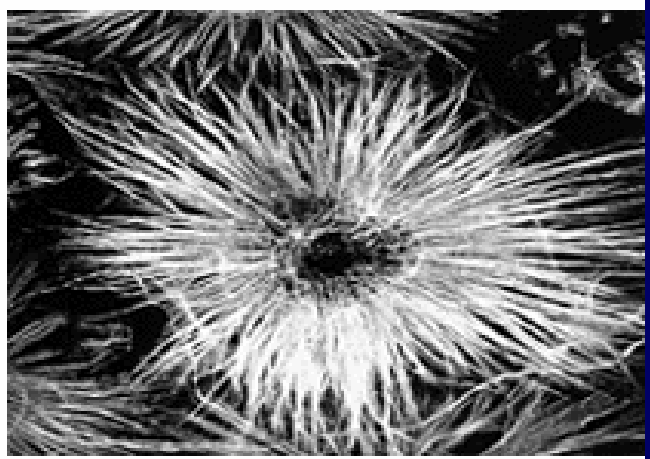
CELULAS PIGMENTADAS EN PECES



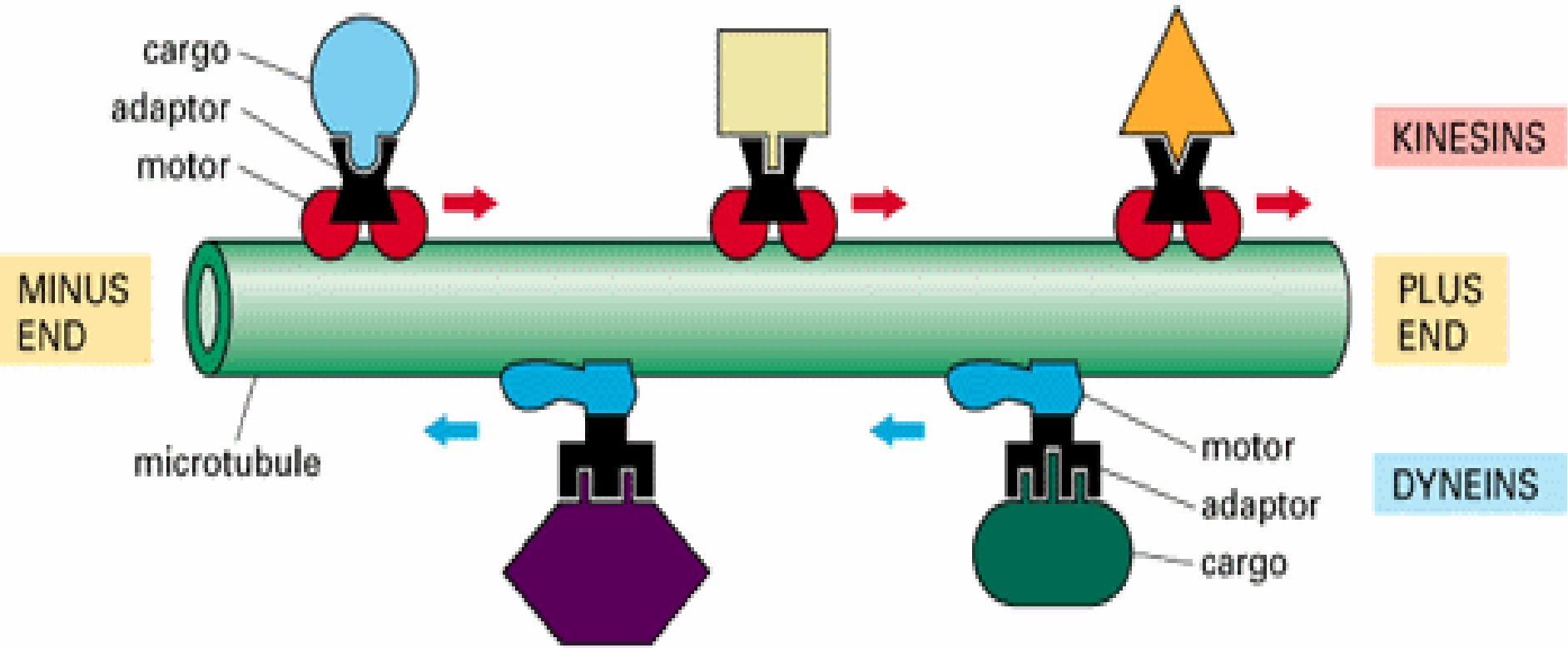




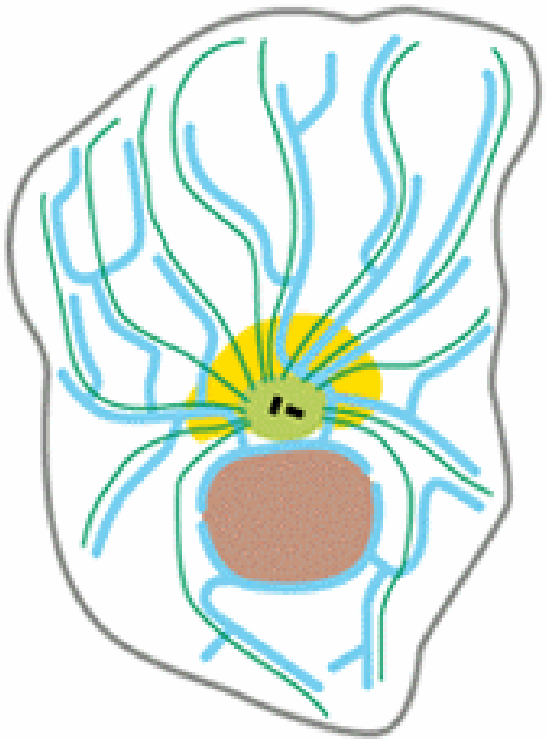




PROTEINAS MOTORAS Y MICROTUBULOS



ORGANELOS Y MICROTUBULOS. LOCALIZACION



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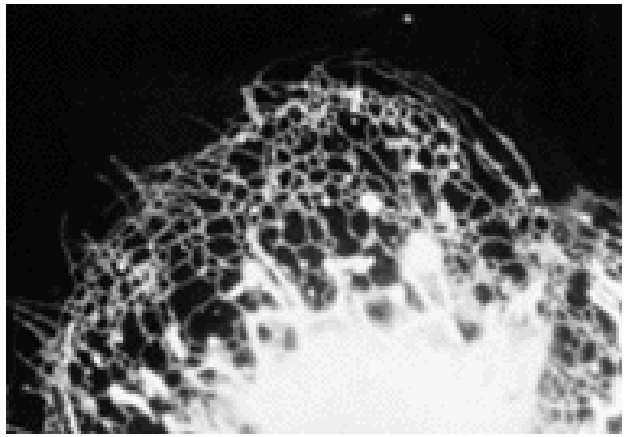
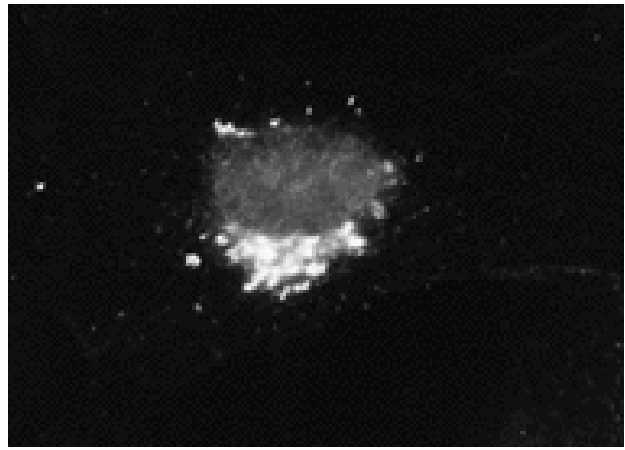
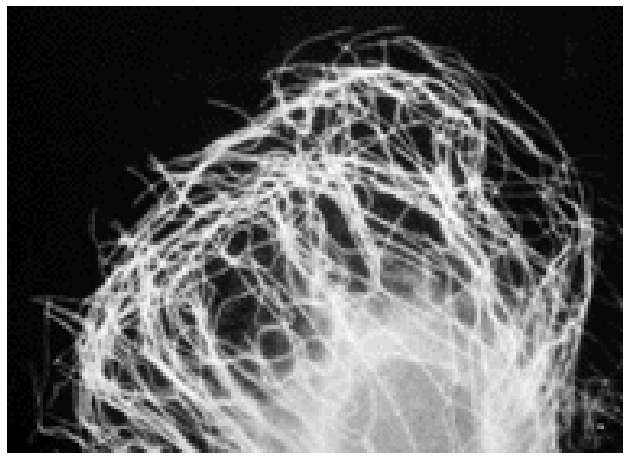
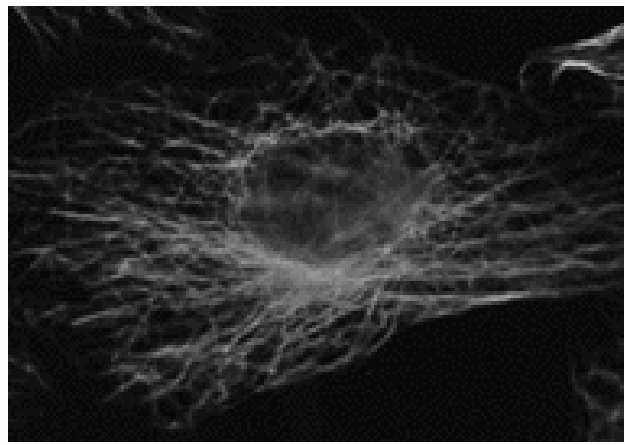






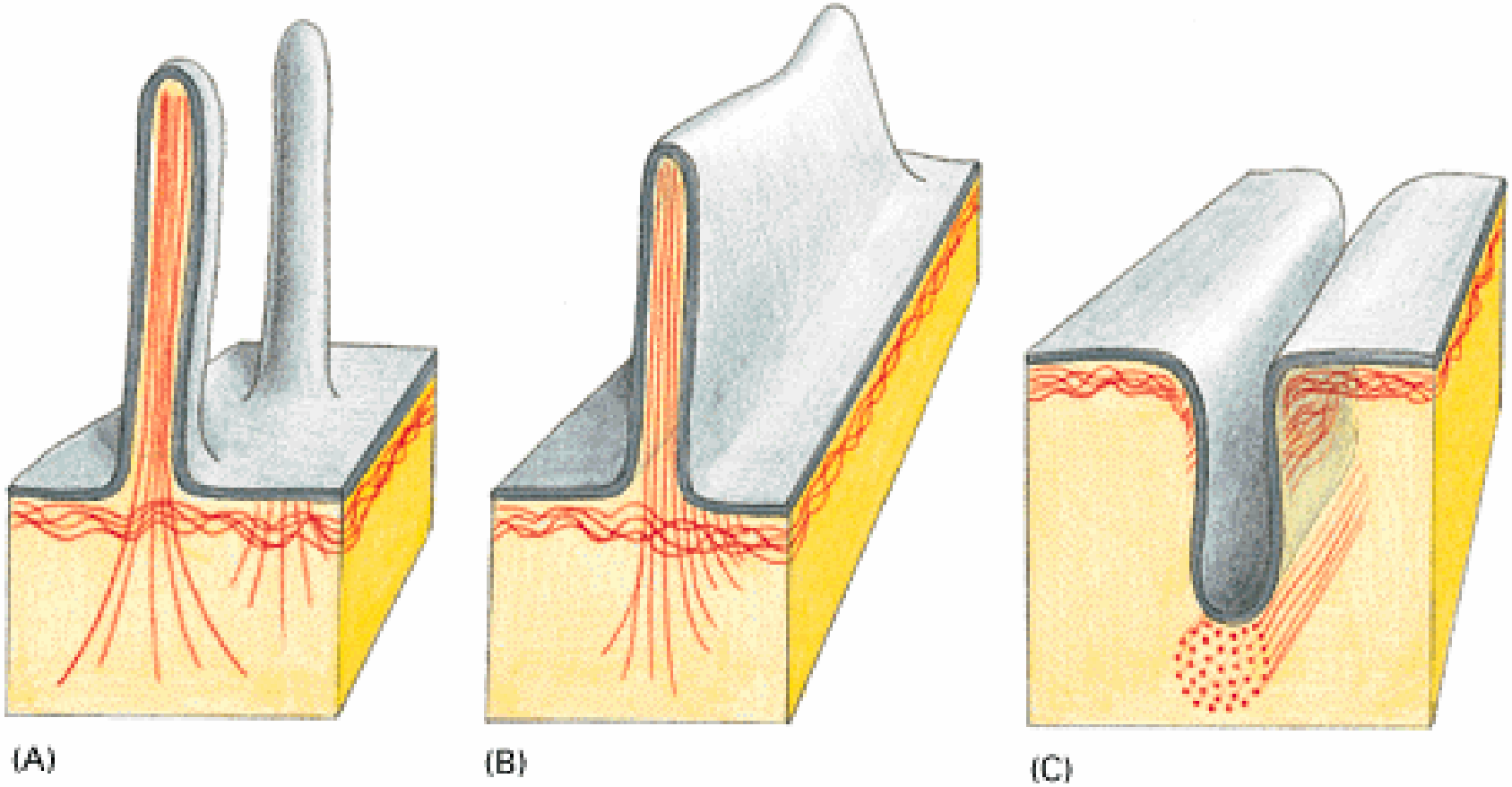


(B)

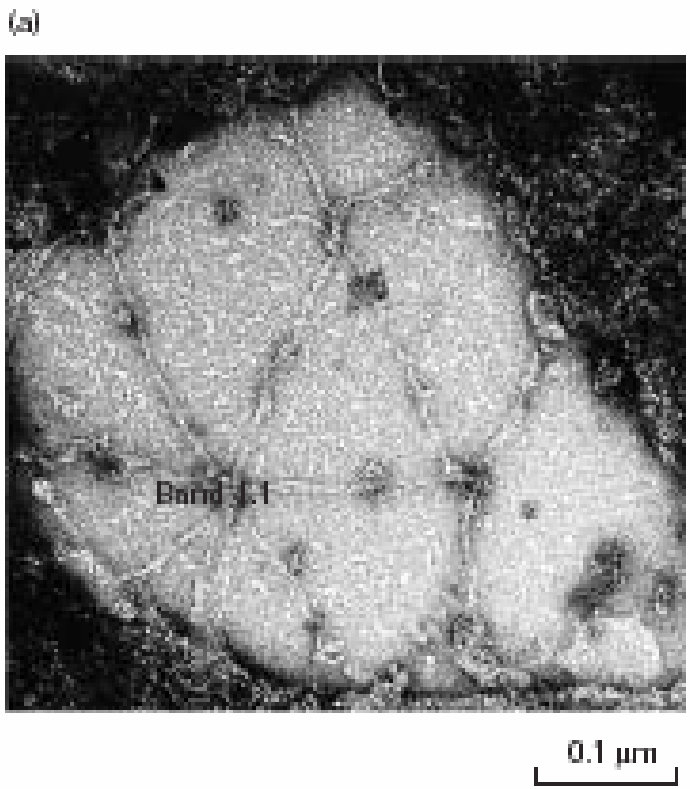
10 μm

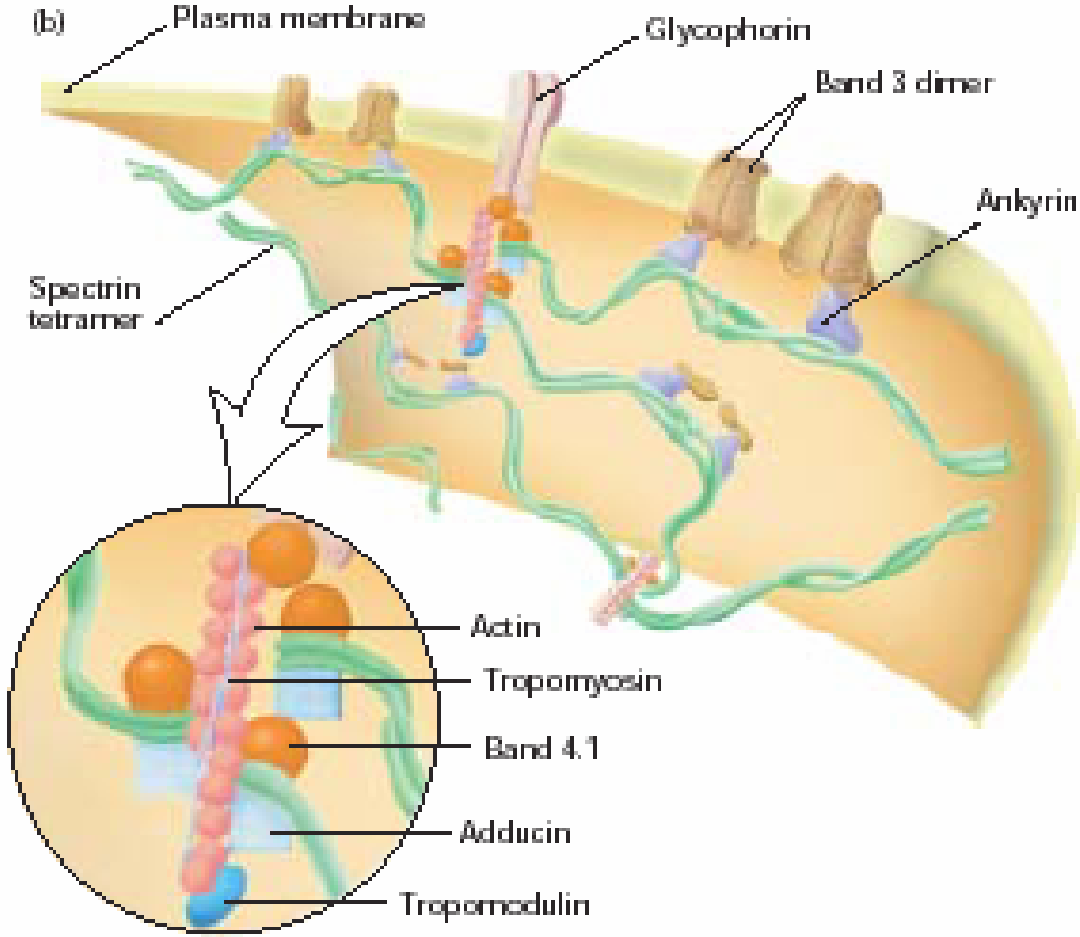
(C)

FILAMENTOS DE ACTINA Y DEFORMACIONES DE LA MEMBRANA PLASMATICA EN CELULAS ANIMALES

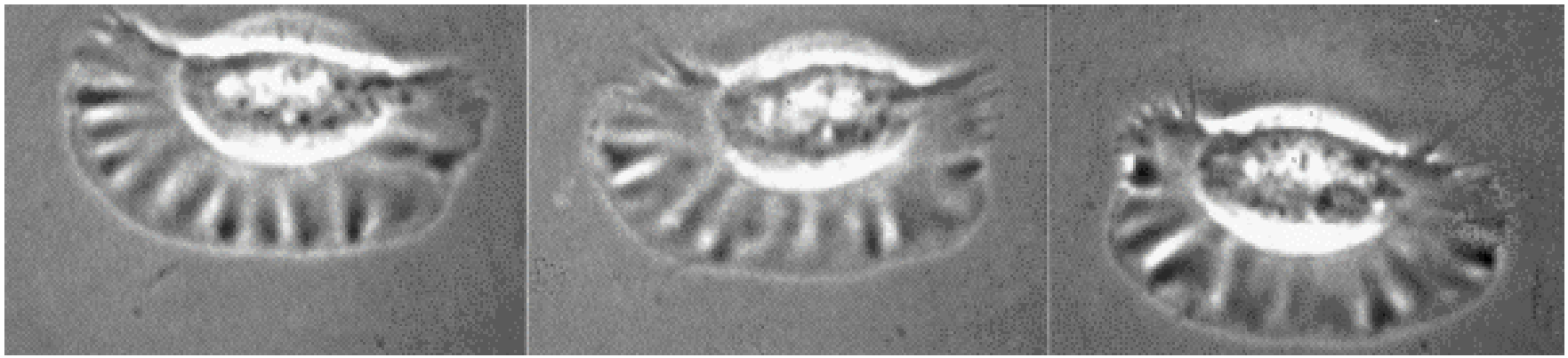


CITOESQUELETO CORTICAL COMO EL SOPORTE DE LA FORMA Y LA MEMBRANA PLAMATICA DEL ERITROCITO HUMANO





CELULAS MIGRATORIAS DE LA EPIDERMIS DE PECES



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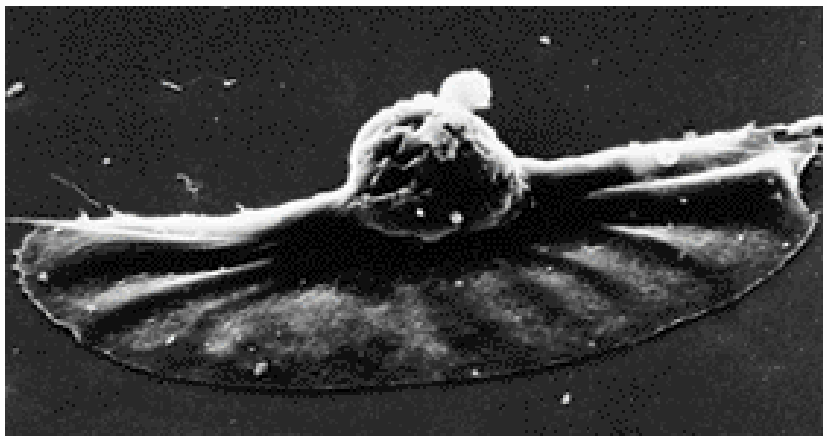
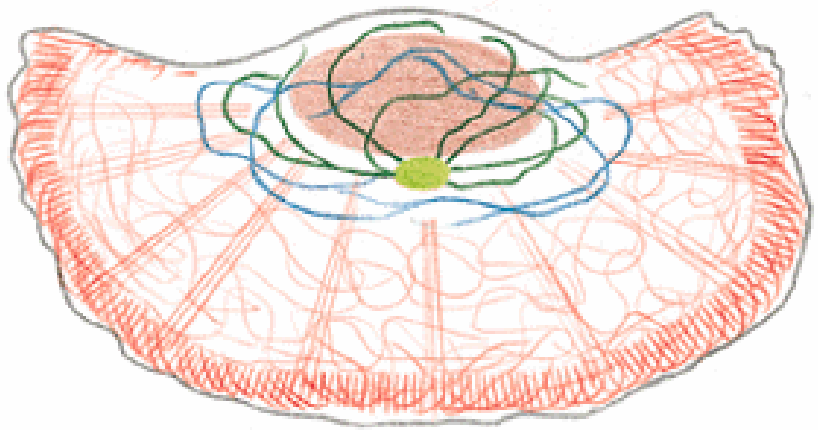


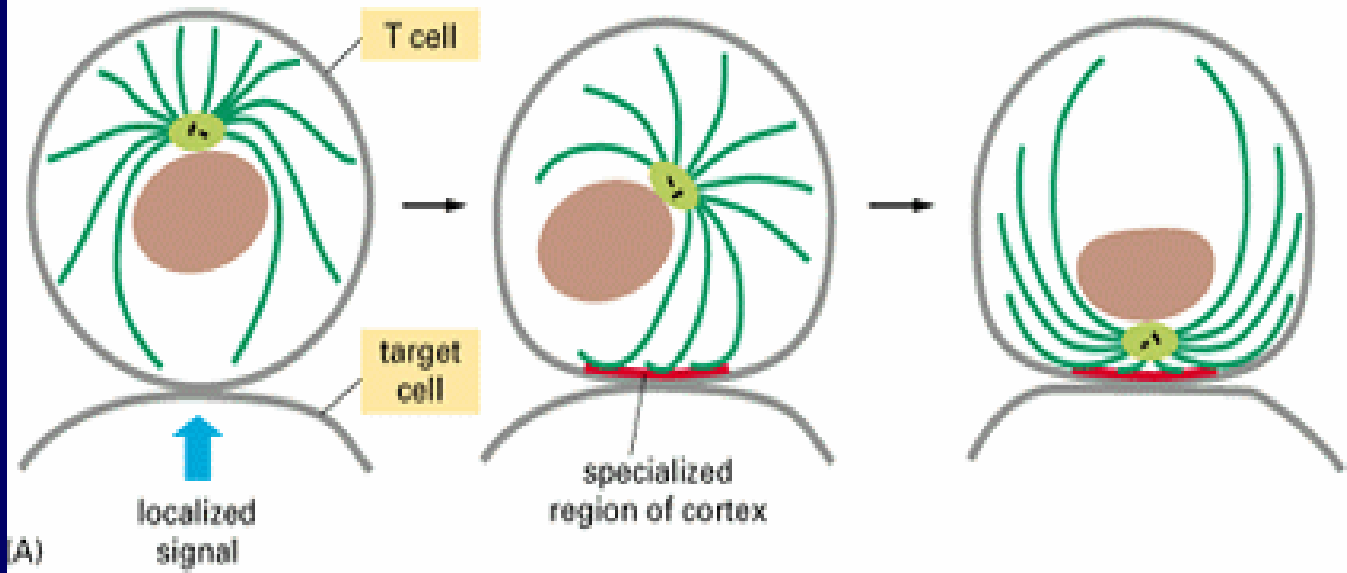
(B)

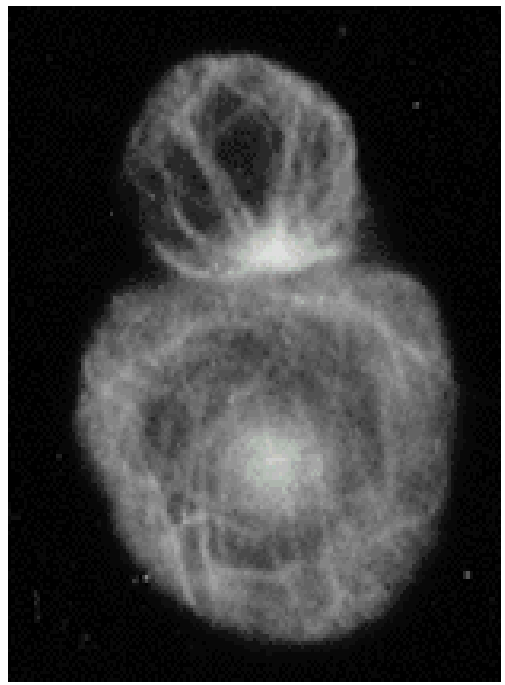
10 µm



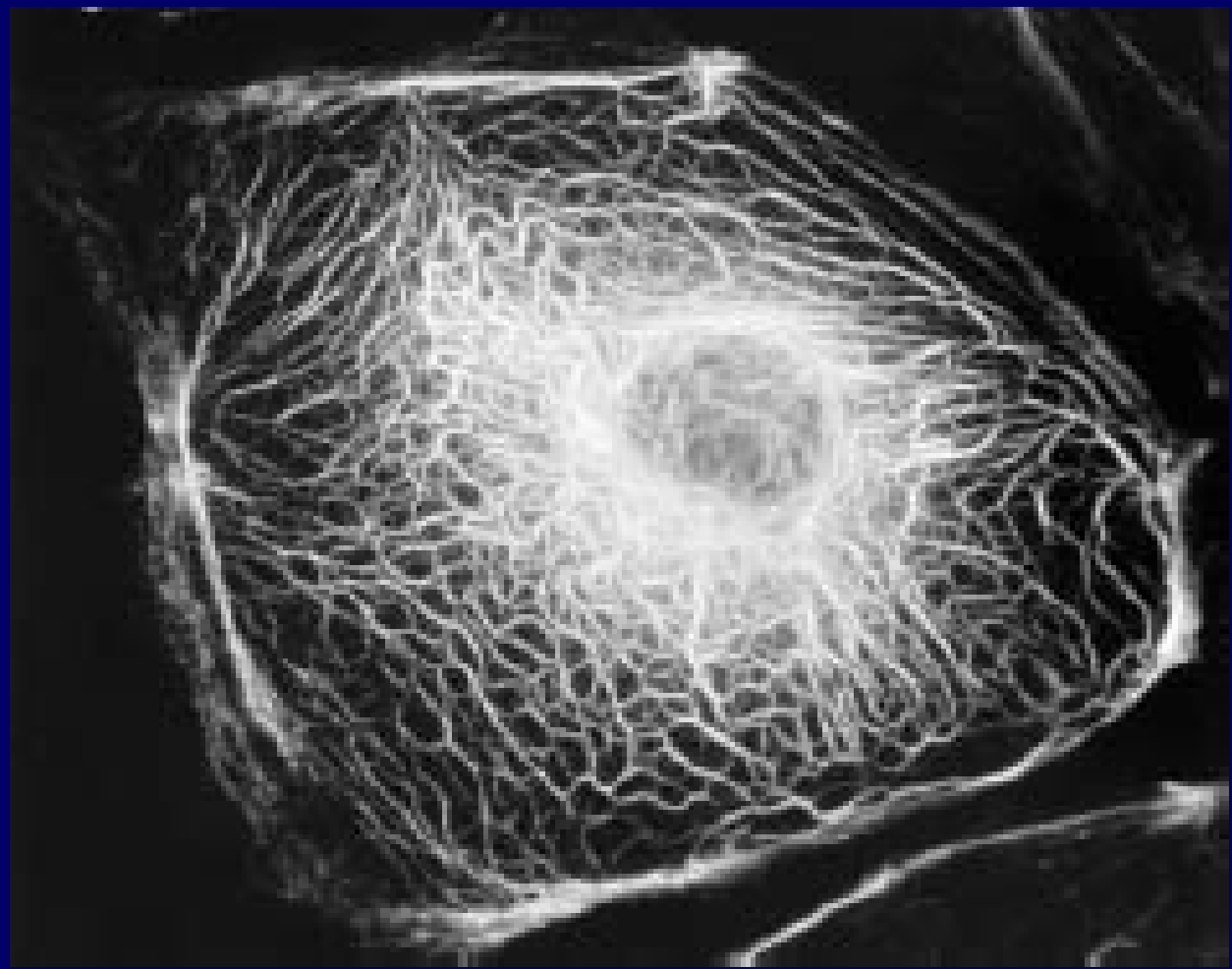
(C)

POLARIZACION DE UNA CELULA T CITOTOXICA LUEGO DE RECONOCER UNA CELULA BLANCO

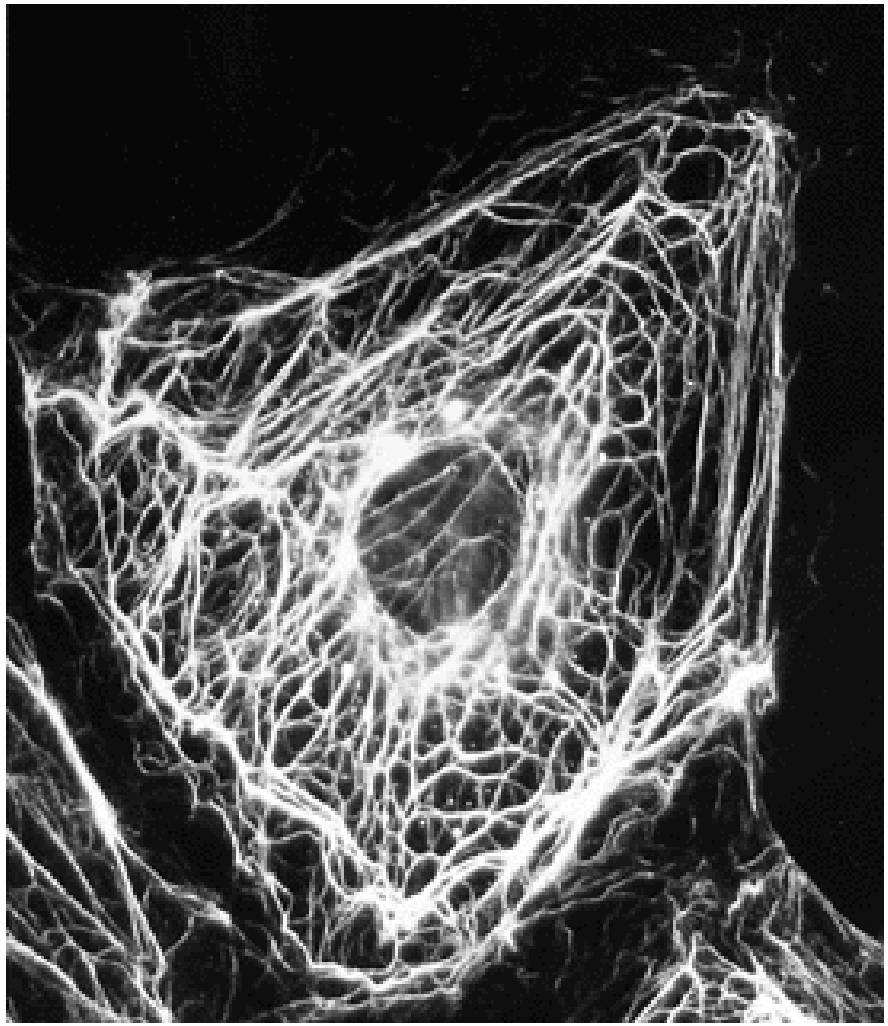




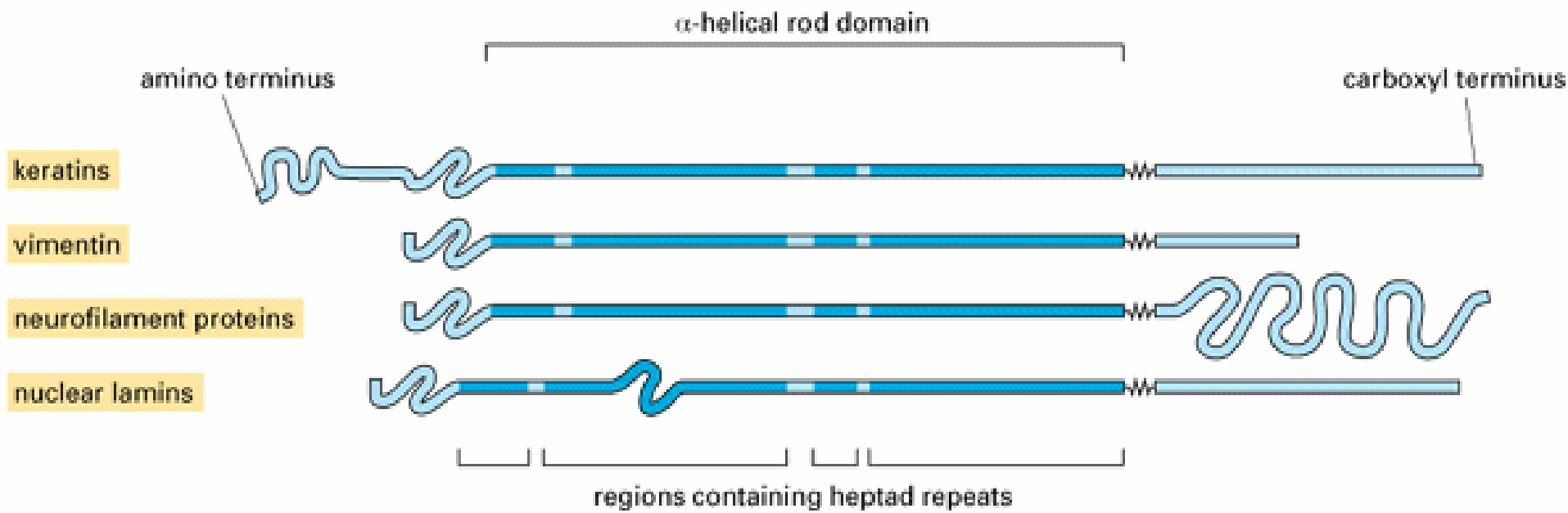
FIBROBLASTO EN CULTIVO. ESTUDIOS DE INMUNO FLUORESCENCIA PARA REVELAR FILAMENTOS INTERMEDIOS DE KERATINA.



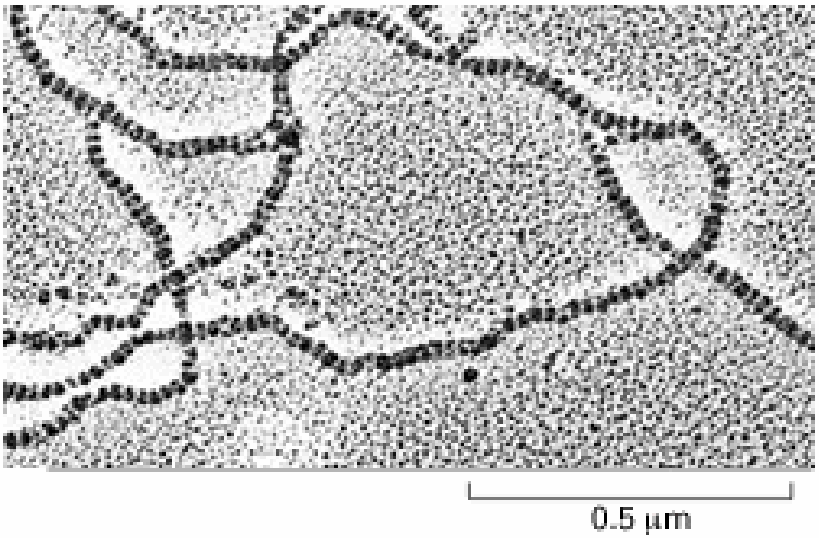
FILAMENTOS INTERMEDIOS EN EL CITOPLASMA DE UNA CELULA EN CULTIVO

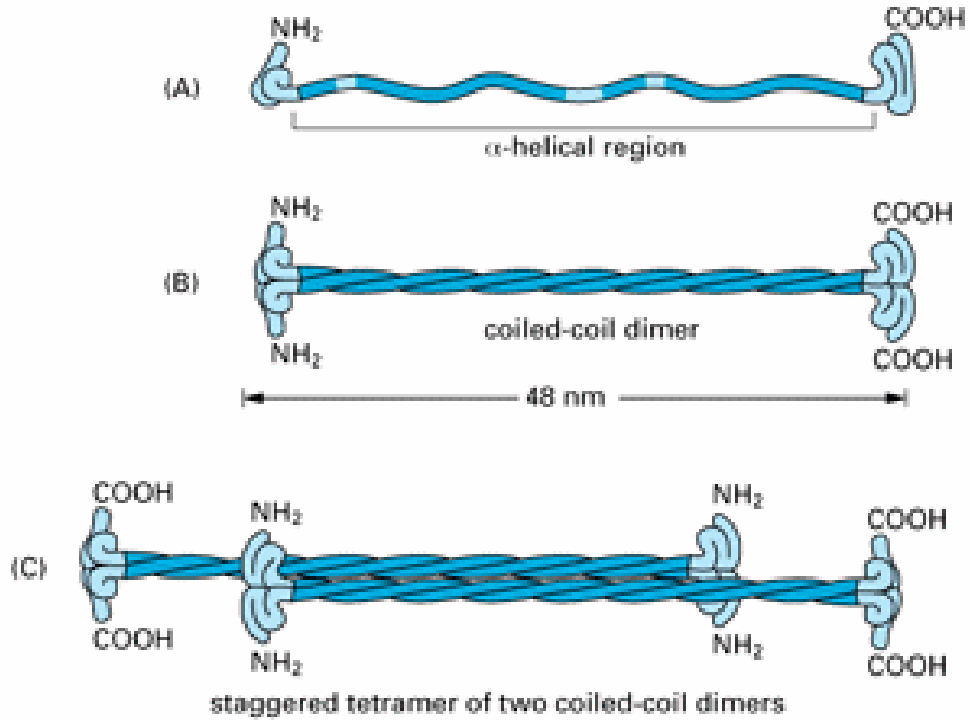


MONOMEROS PROTEICOS DE FILAMENTOS INTERMEDIOS



MODELO PARA LA CONSTRUCCION DE FILAMENTOS INTERMEDIOS





ARREGLO DE TETRAMEROS EN FORMA HELICOIDAL PARA FORMAR UN FILAMENTO INTERMEDIO "TIPO-CORDEL"

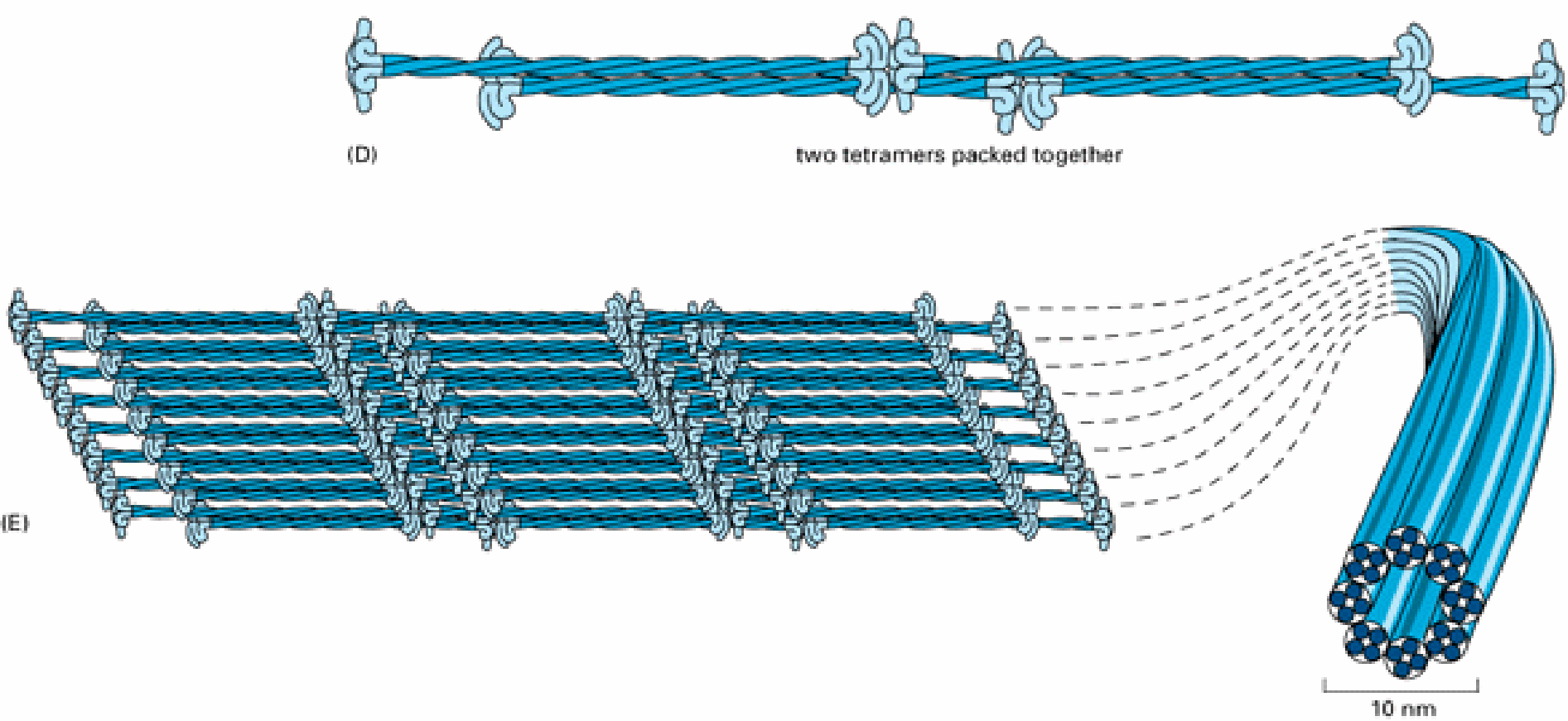
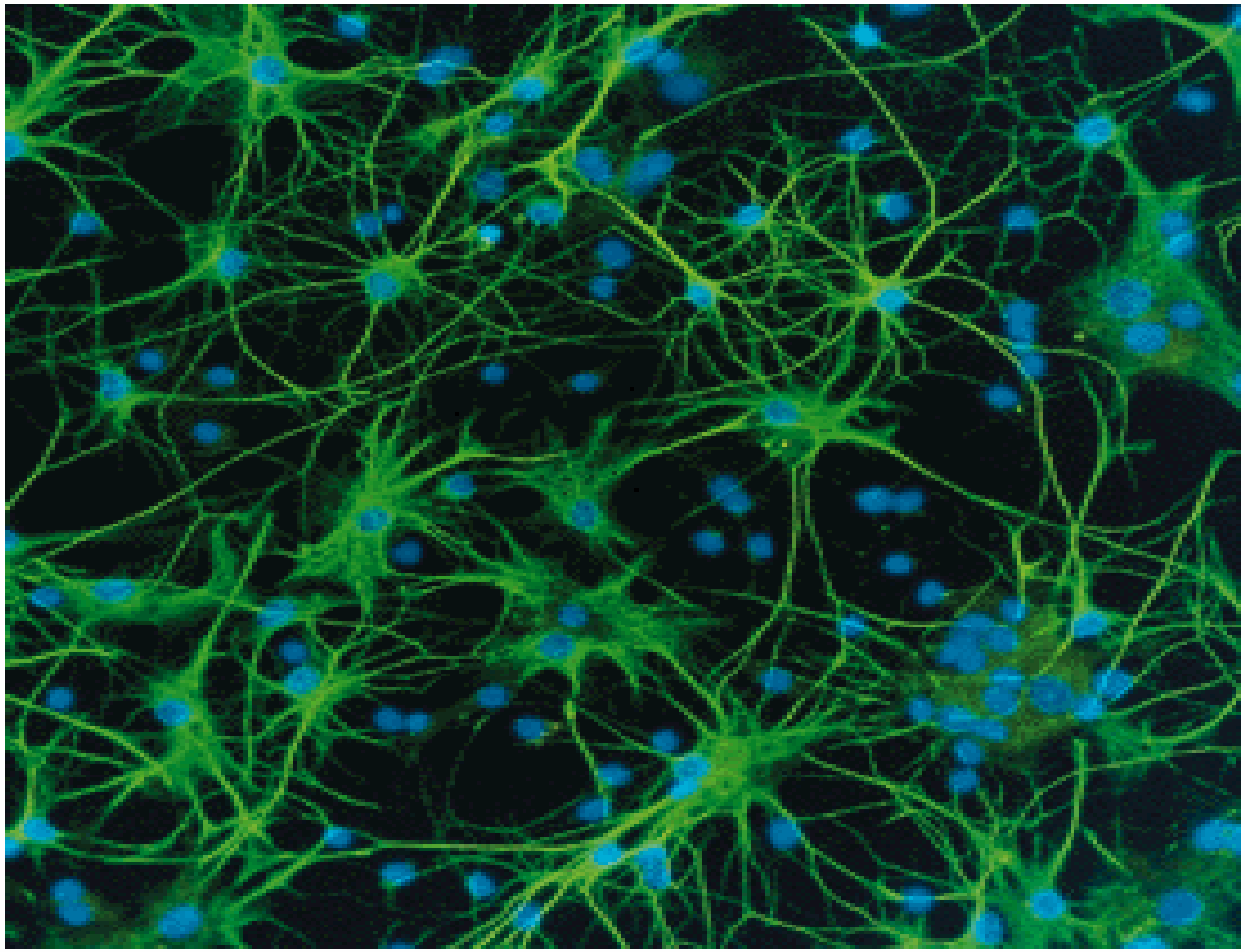


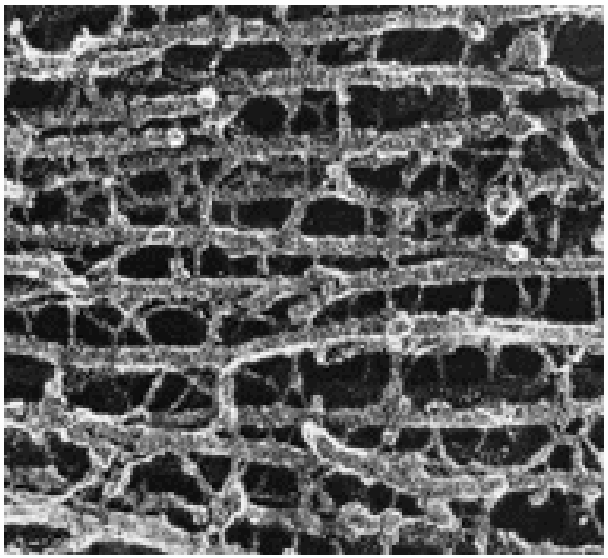
Table 16-1. Major Types of Intermediate Filament Proteins in Vertebrate Cells

Type of IF	Component Polypeptides (mass in daltons)	Cellular Location
Nuclear lamins	lamins A, B, and C (65,000–75,000)	nuclear lamina of eucaryotic cells
Vimentinlike proteins	vimentin (54,000)	many cells of mesenchymal origin, often expressed transiently during development
	desmin (53,000)	muscle
	glial fibrillary acidic protein (50,000)	glial cells (astrocytes and Schwann cells)
	peripherin (66,000)	neurons
Keratins	type I (acidic) (40,000–70,000) type II (neutral/basic) (40,000–70,000)	epithelial cells and their derivatives (e.g., hair and nails)
Neuronal intermediate filaments	neurofilament proteins NF-L, NF-M, and NF-H (60,000–130,000)	neurons

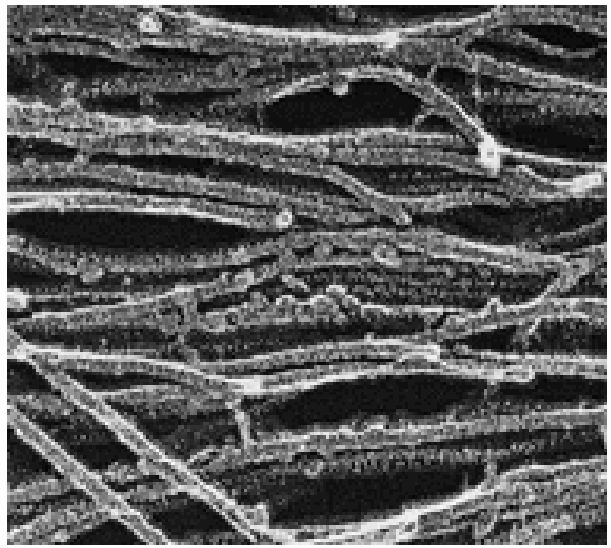
INMUNOFLUORESCENCIA PARA PROTEINAS FIBRILARES EN ASTROCITOS EN CULTIVO



DOS TIPOS DE FILAMENTOS INTERMEDIOS EN CELULAS DEL SISTEMA NERVIOSO. MICROSCOPIA ELECTRONICA DE TRANSMISION



(A)



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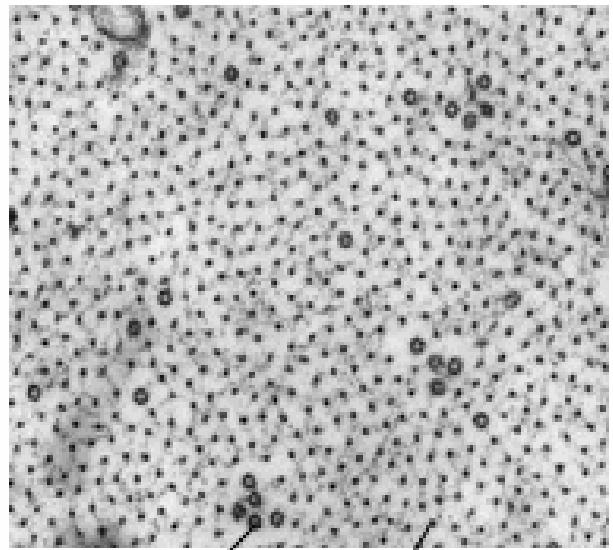
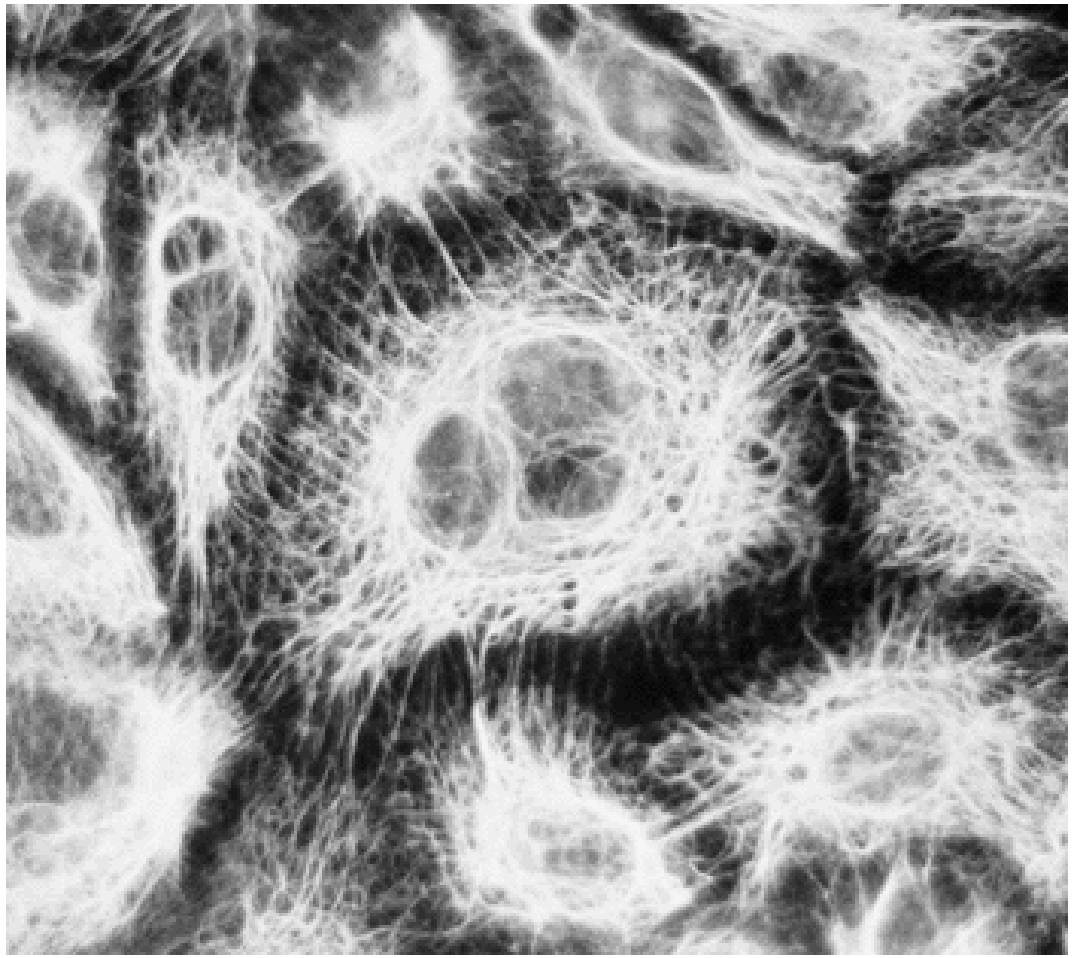
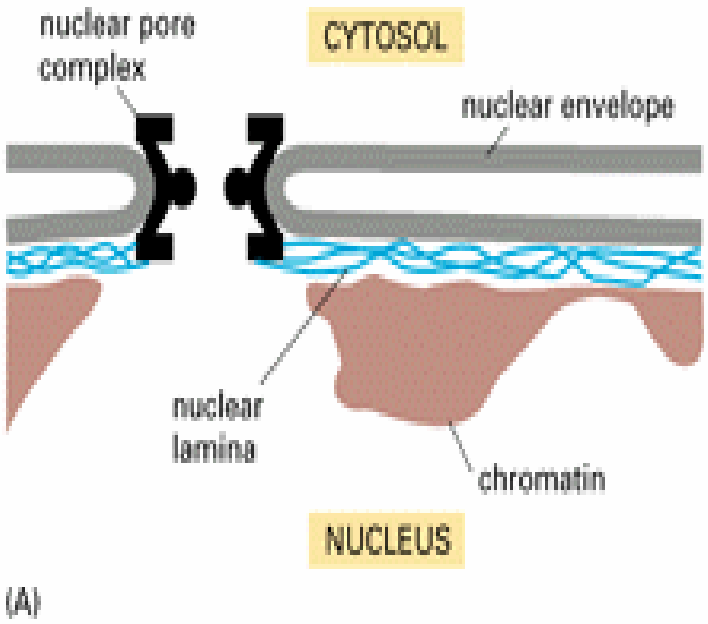


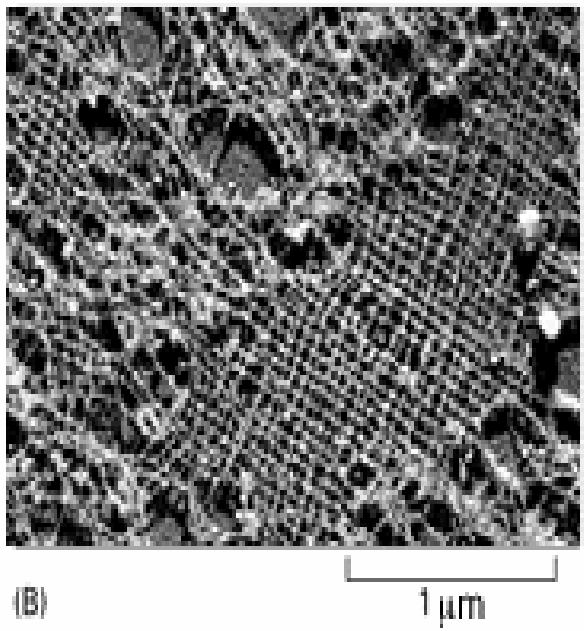
(C)

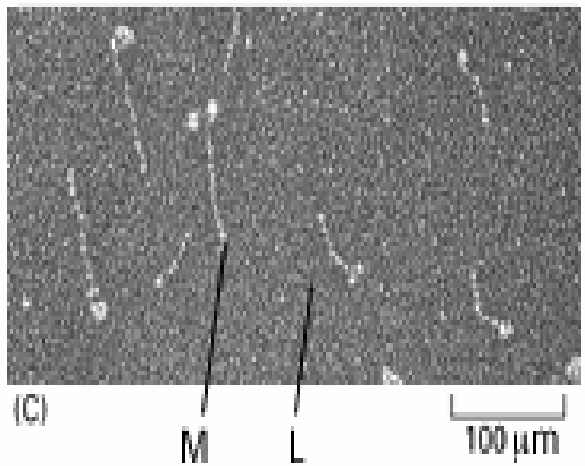
FILAMENTOS DE KERATINA Y FORMACIÖN DE UNA CAPA DE CELULAS



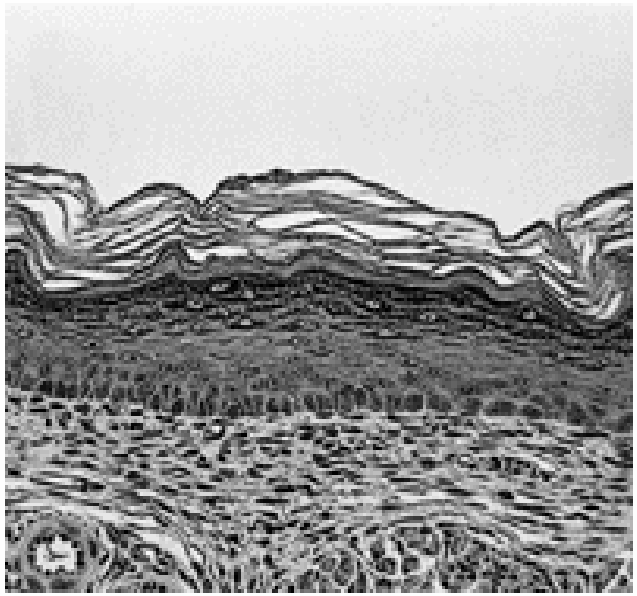
LA LAMINA NUCLEAR





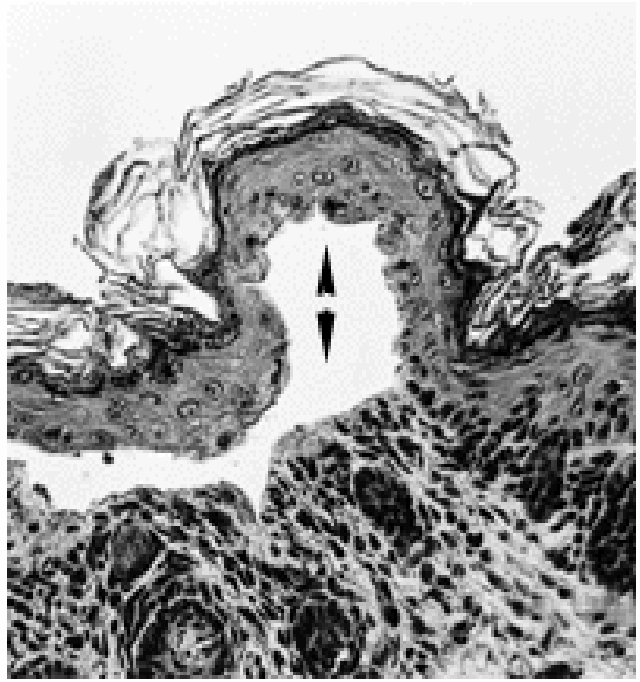


FILAMENTOS INTERMEDIOS DAN ESTABILIDAD MECANICA A LAS CELULAS ANIMALES

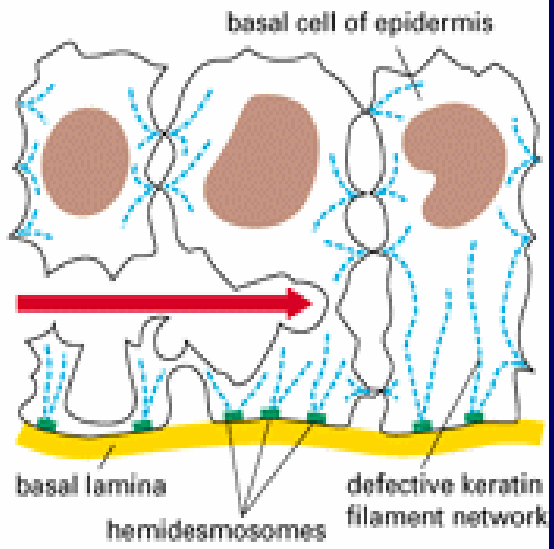


(A)

40 µm

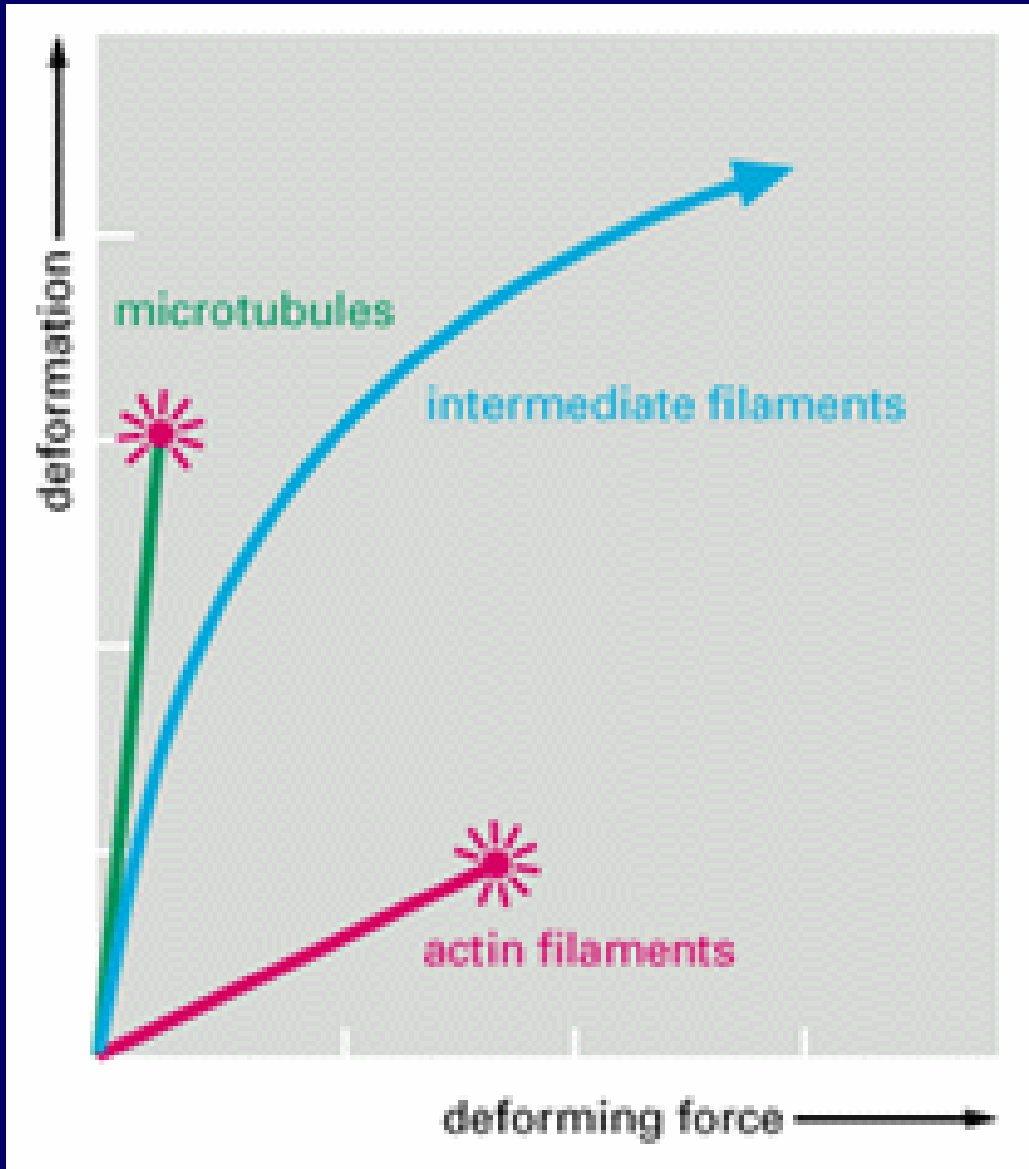


(B)

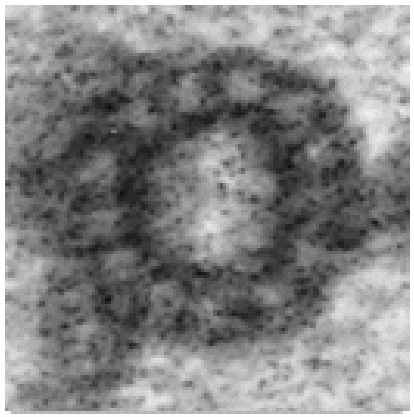


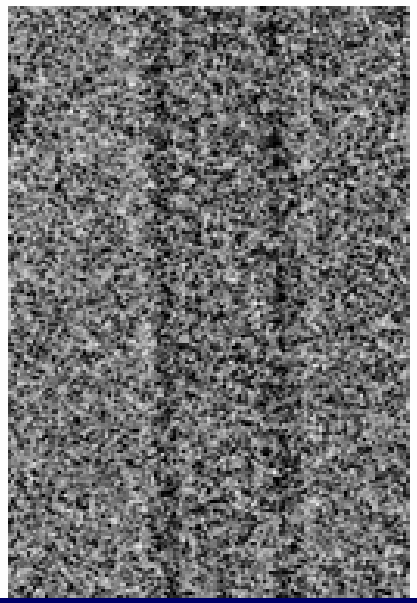
(C)

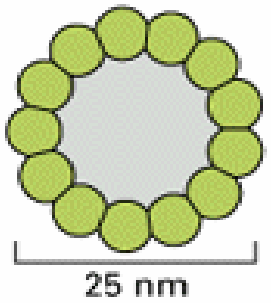
PROPIEDADES MECANICAS DE POLIMEROS DE ACTINA VIMENTINA Y TUBULINA

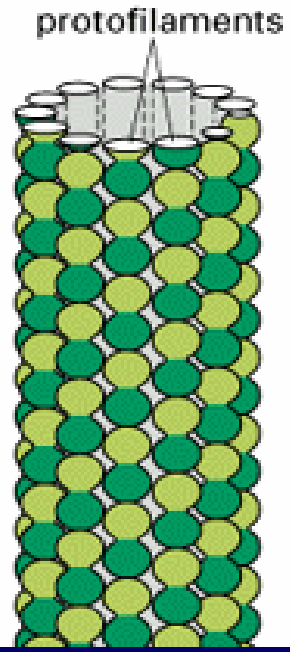


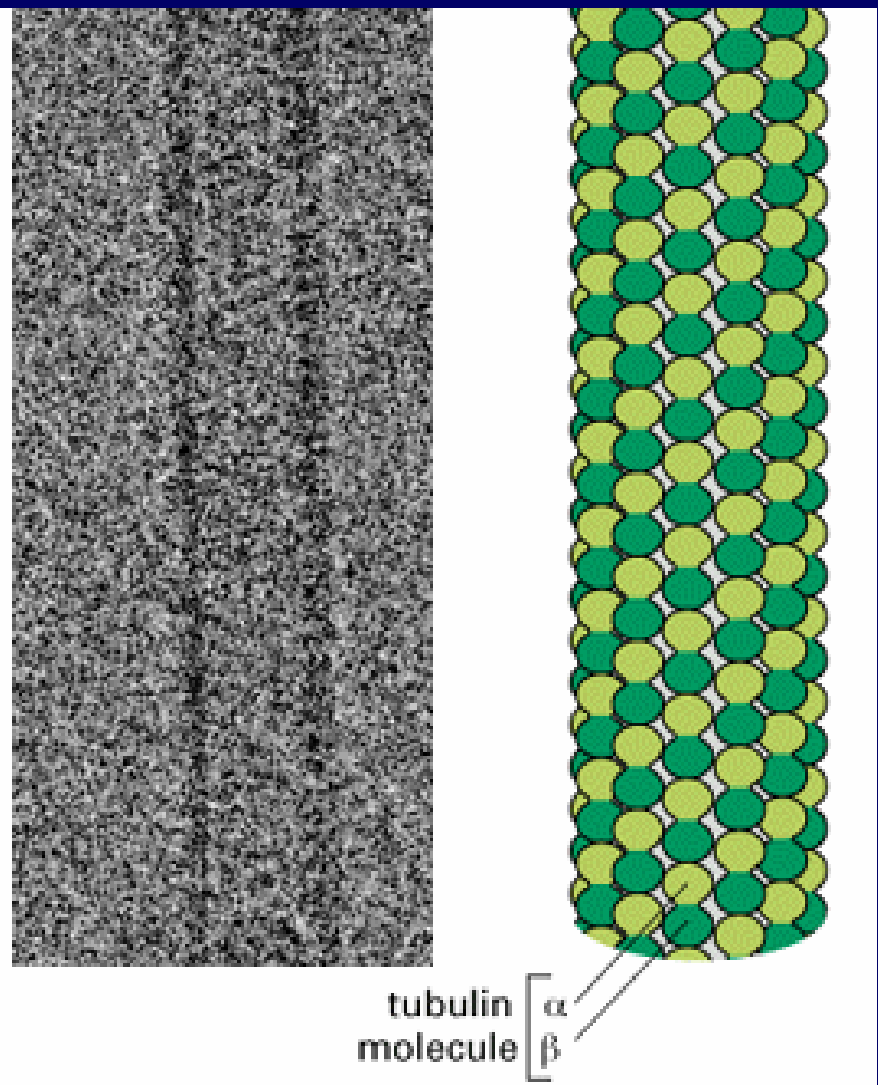
MICROTUBULOS



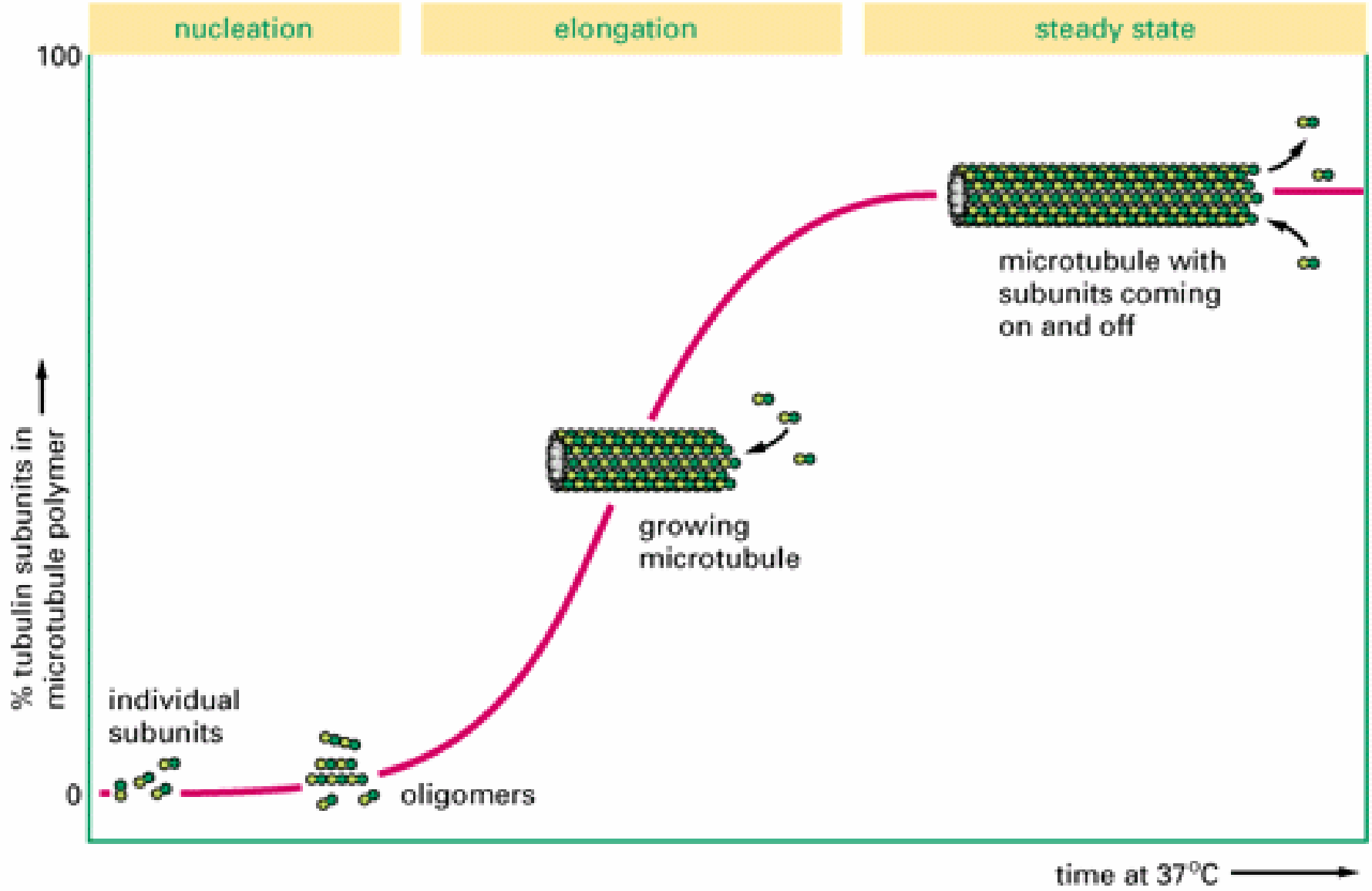




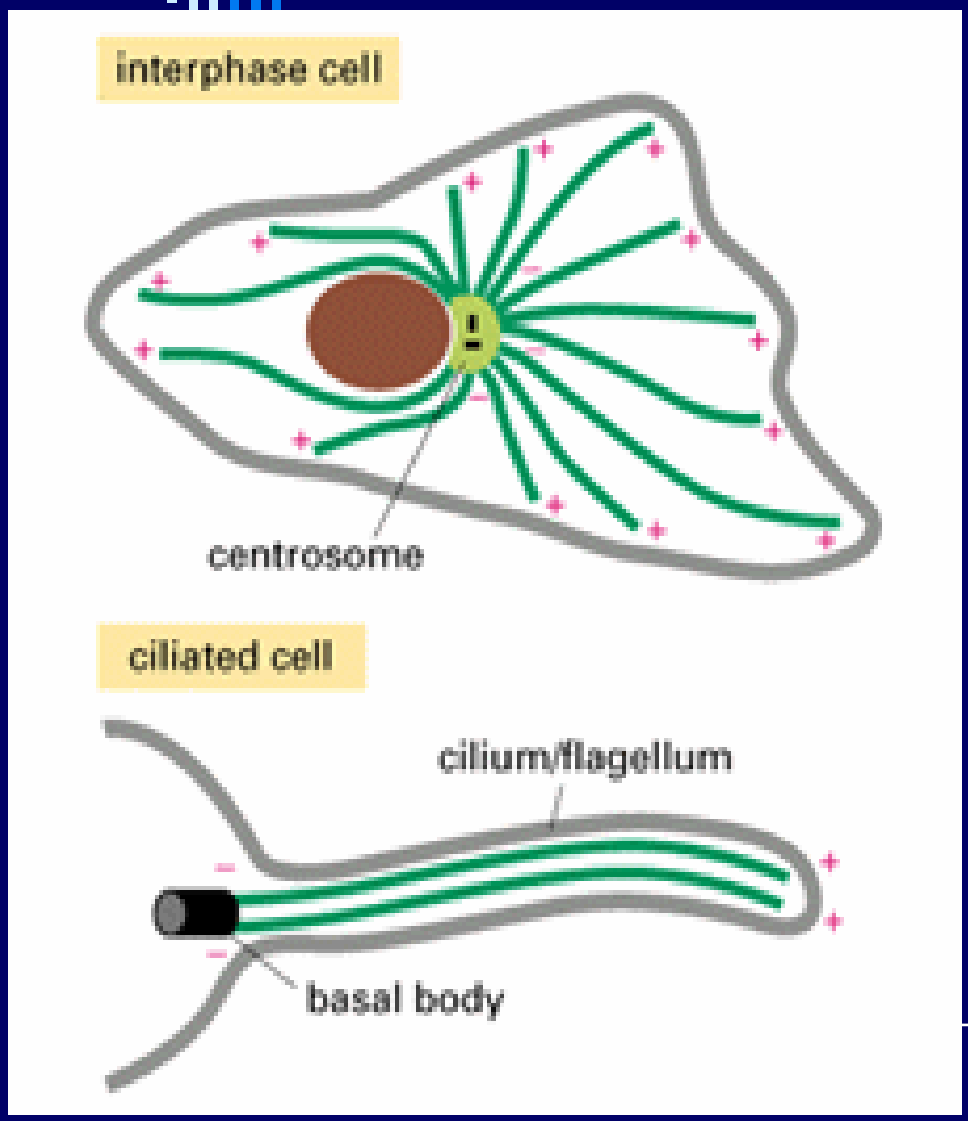


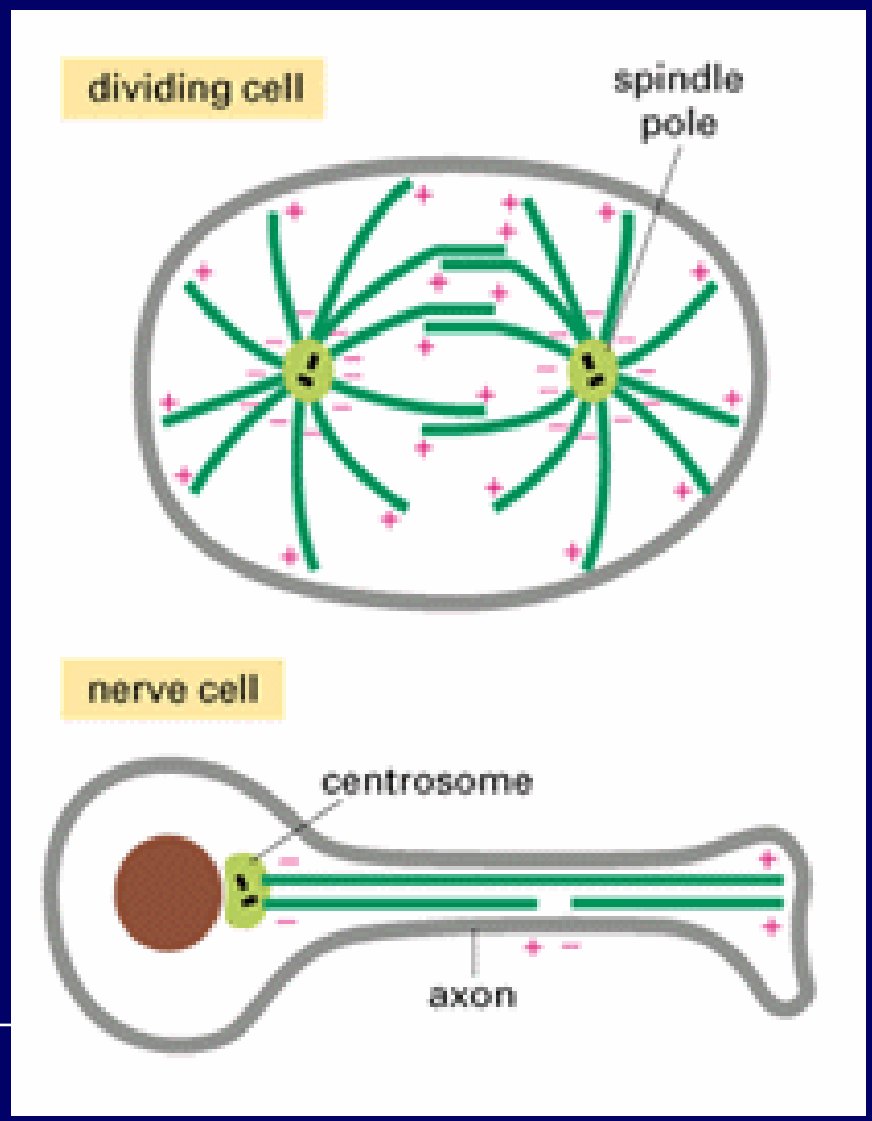


POLIMERIZACION DE TUBULINA PURA

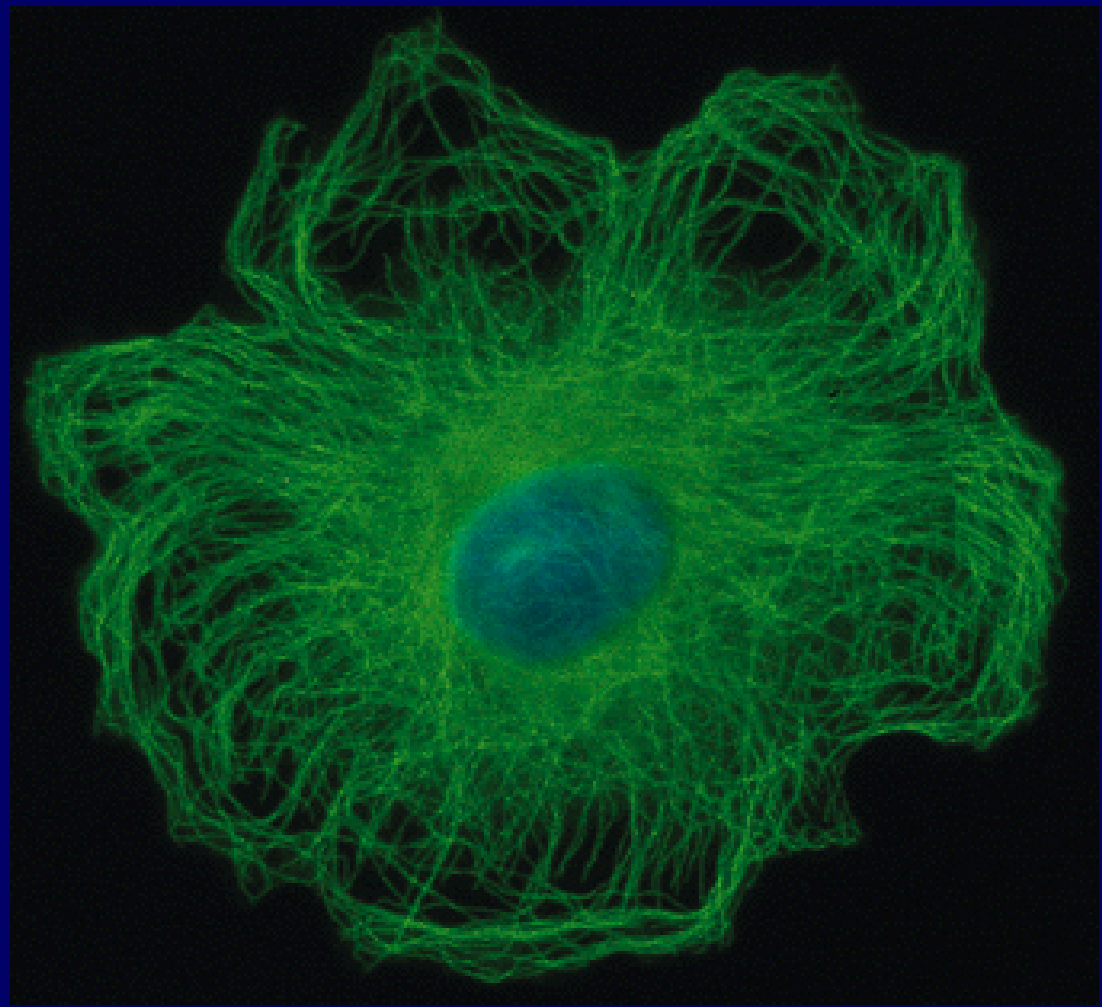


POLARIDAD DE MICROTUBULOS

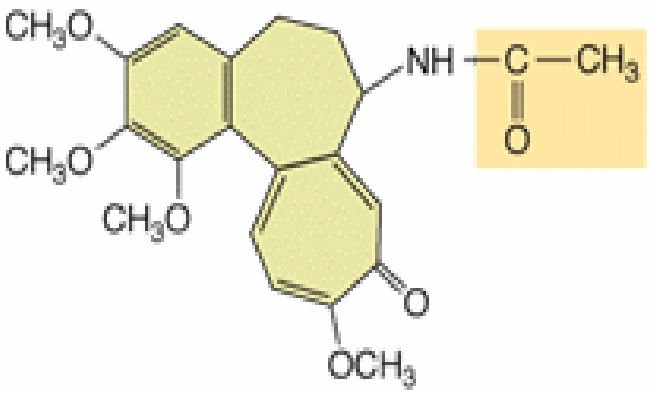




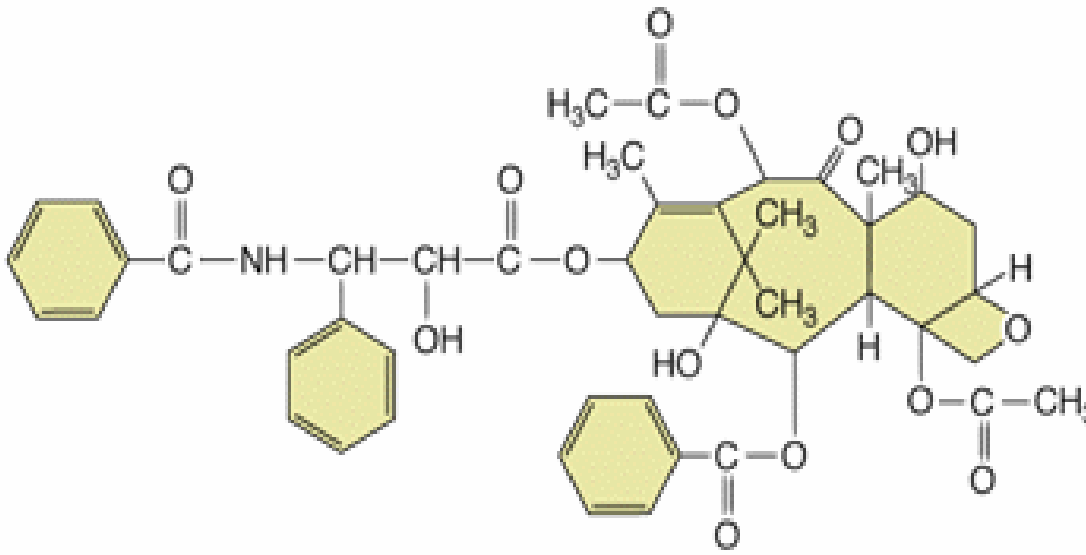
MICROTUBULOS EN UNA CELULA EN CULTIVO : INTERFASE



DROGAS ANTIMITOTICAS



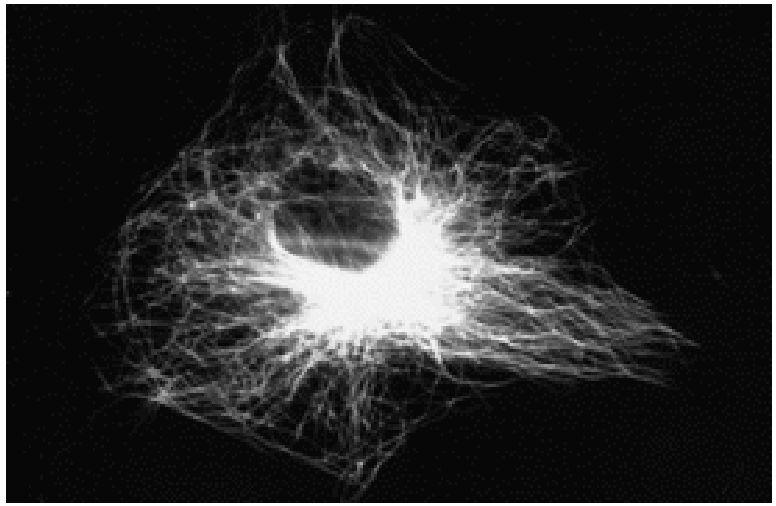
colchicine



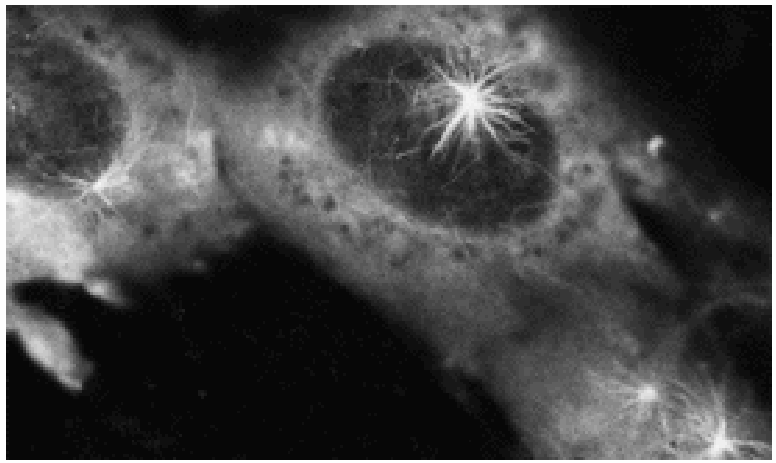
taxol

PERTURBAN POLIMERIZACION-DEPOLIMERIZACION DE TUBULINA

REORGANIZACION DE MICROTUBULOS LUEGO DEL TRATAMIENTO CON UNA DROGA INHIBIDORA DE LA POLIMERIZACION (COLCEMIDA)



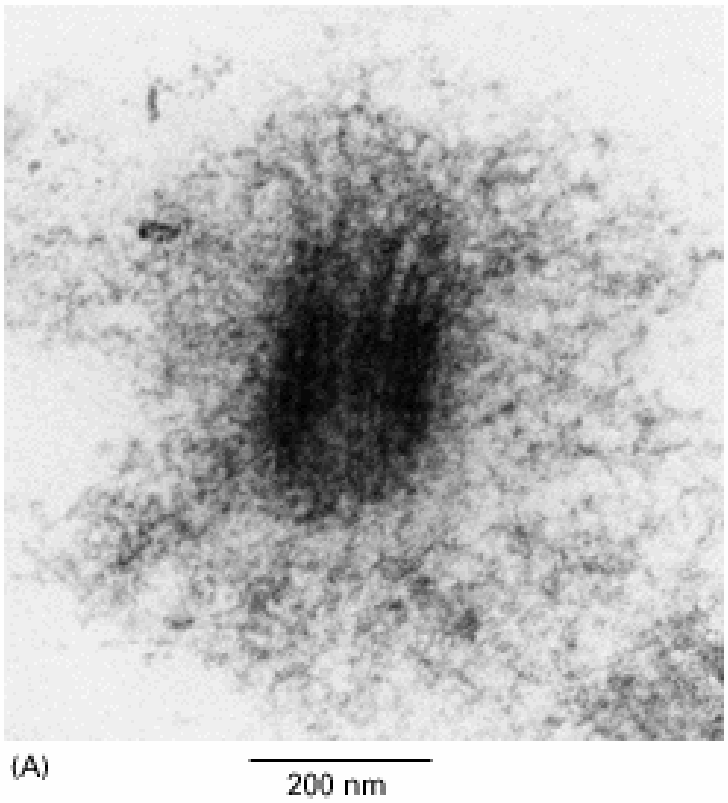
(A)



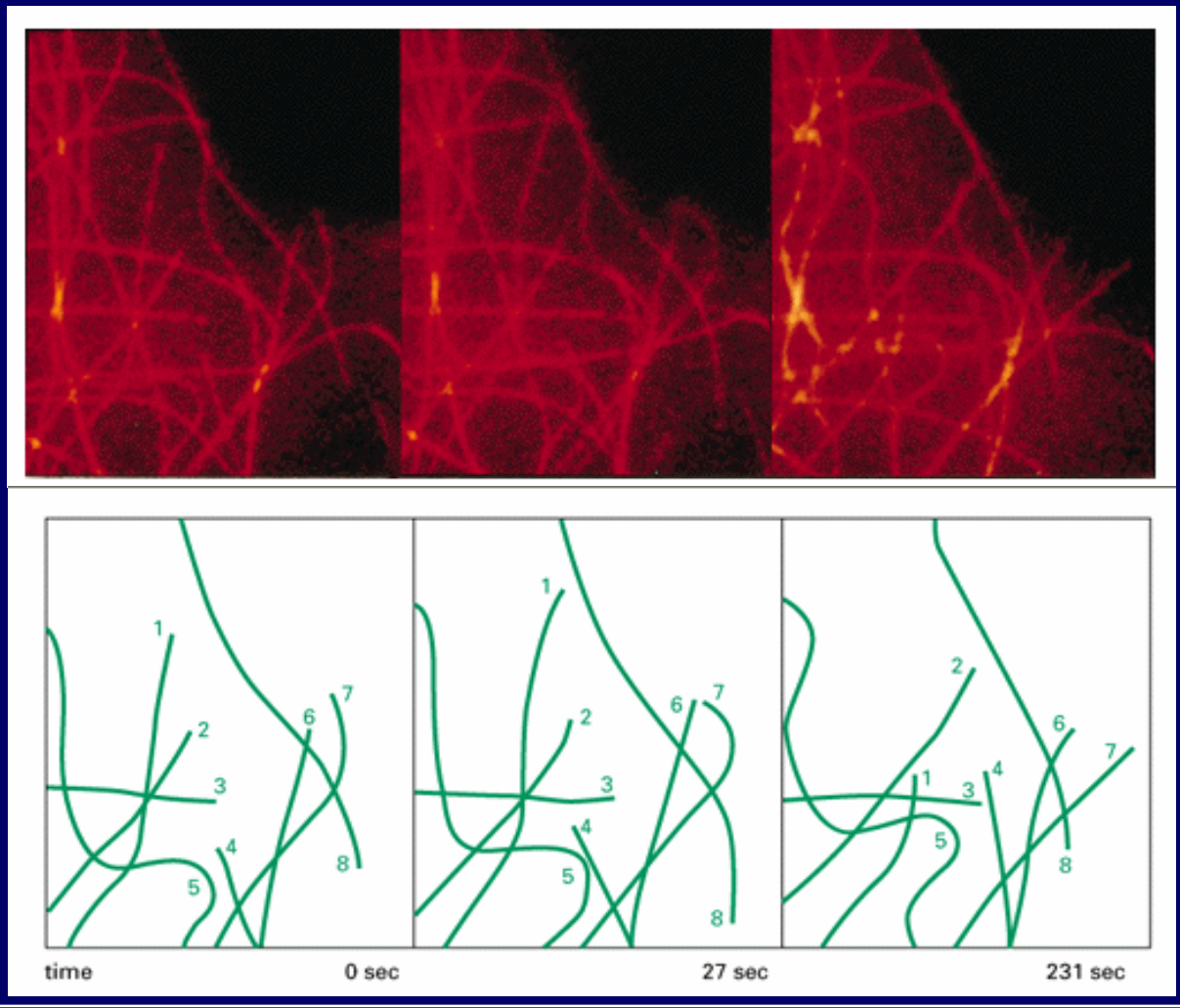
(B)

20 μm

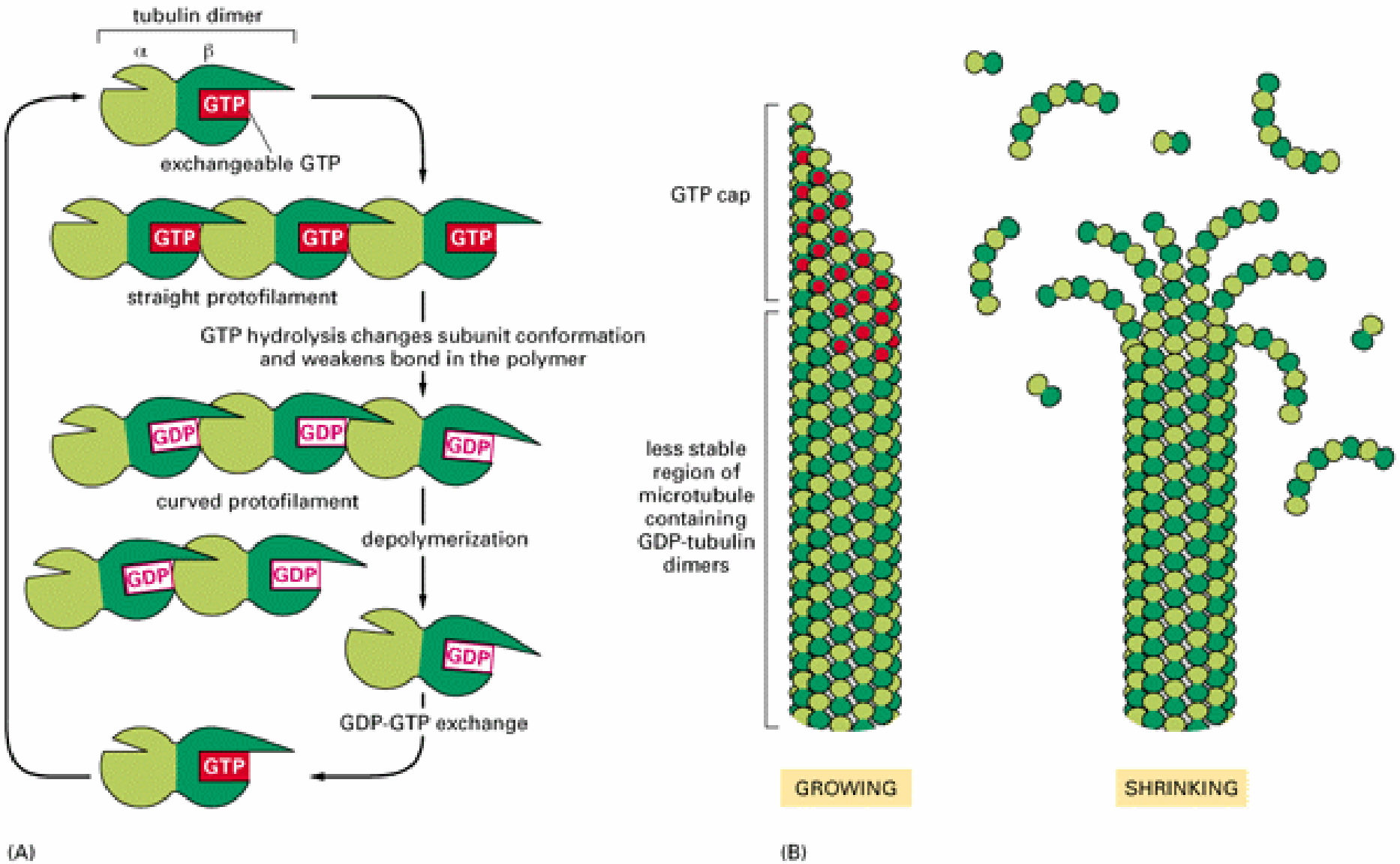
CENTROSOMA ORGANIZACIÓN EN UNA CELULA EN DIVISION



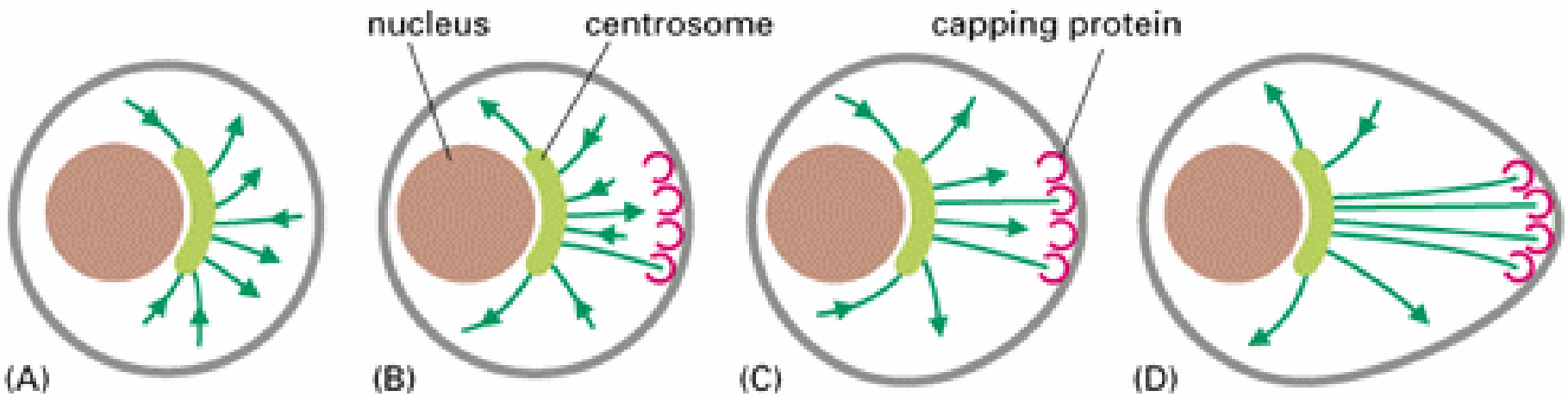
DINAMICA DE MICROTUBULOS (TUBULINA MARCADA CON RHODAMINA)



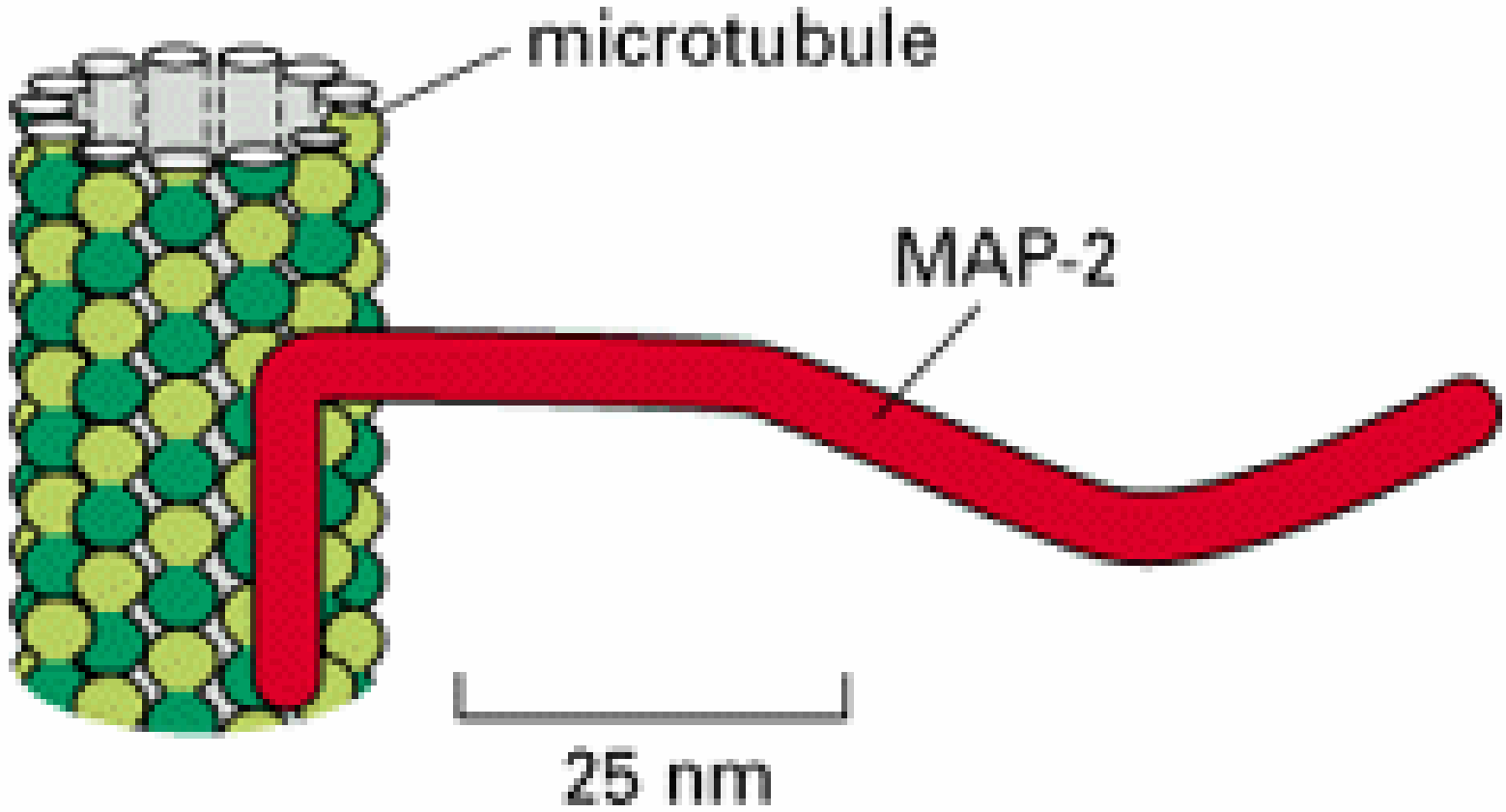
HIDRÓLISIS DE GTP LUEGO DE LA POLIMERIZACION DESESTABILIZA LA ORGANIZACIÓN DE MICROTUBULOS



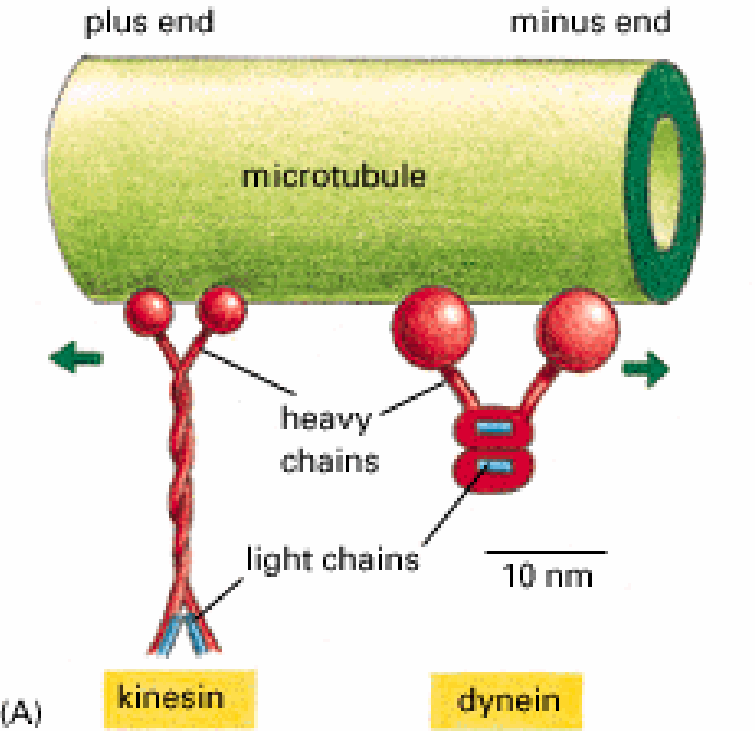
LA ESTABILIZACION SELECTIVA DE MICROTUBULOS PUEDE POLARIZAR UNA CELULA

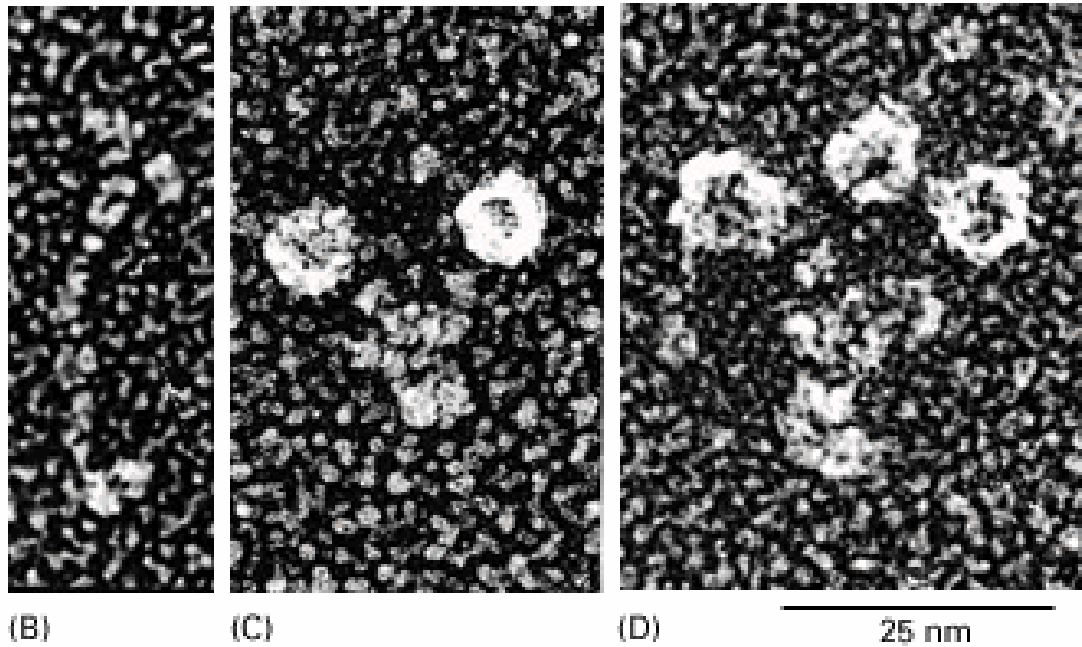


PROTEINA ASOCIADA A MICROTUBULO MAP-2

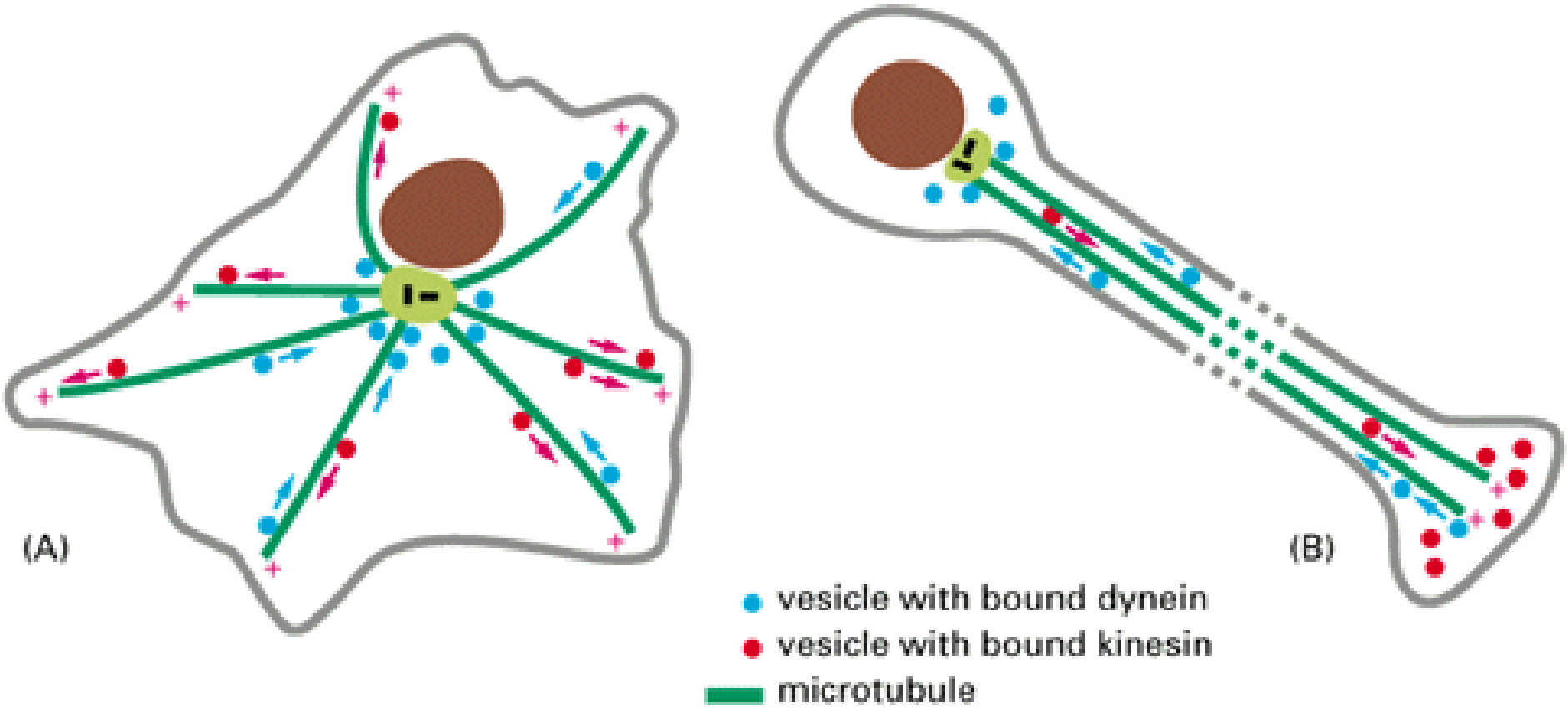


PROTEINAS MOTORAS DE MICROTUBULOS

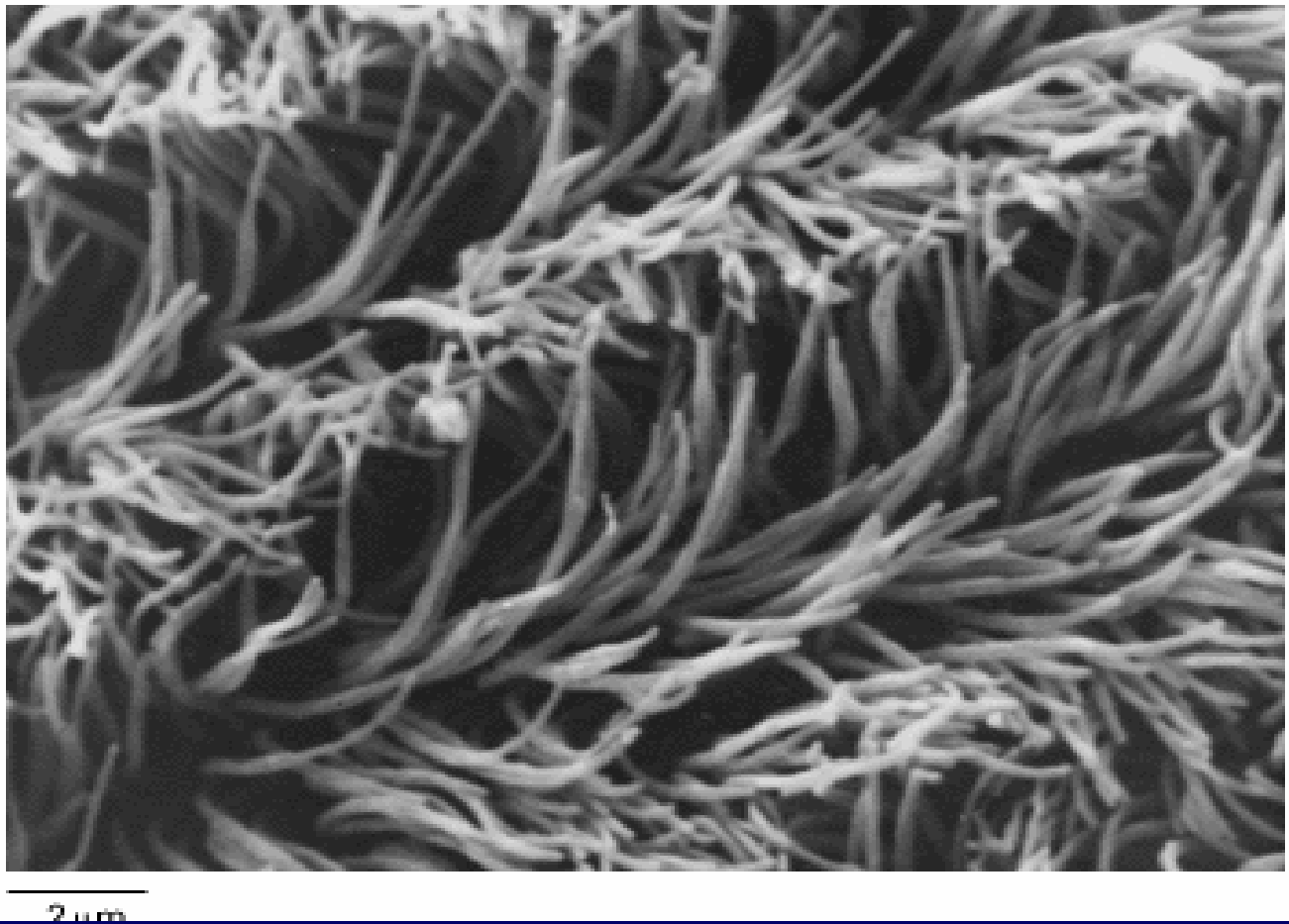




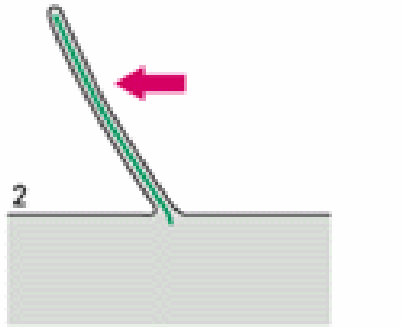
TRANSPORTE BIDIRECCIONAL DE VESICULAS INTRACELULARES

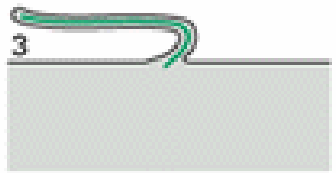


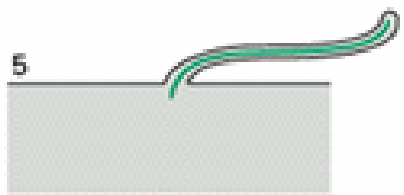
CAMPO DE CILIOS INTESTINALES



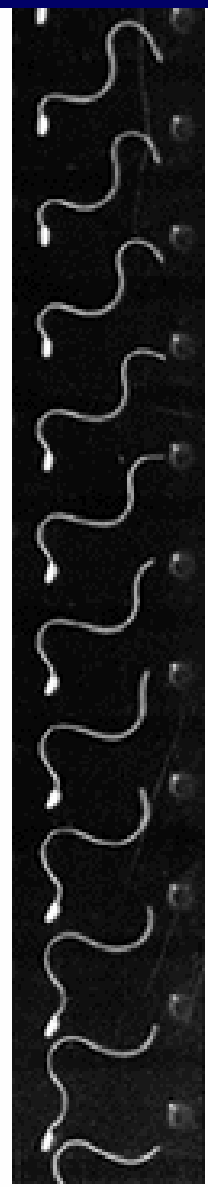
MOVIMIENTOS DIFERENTES EN CILIOS y FLAGELOS





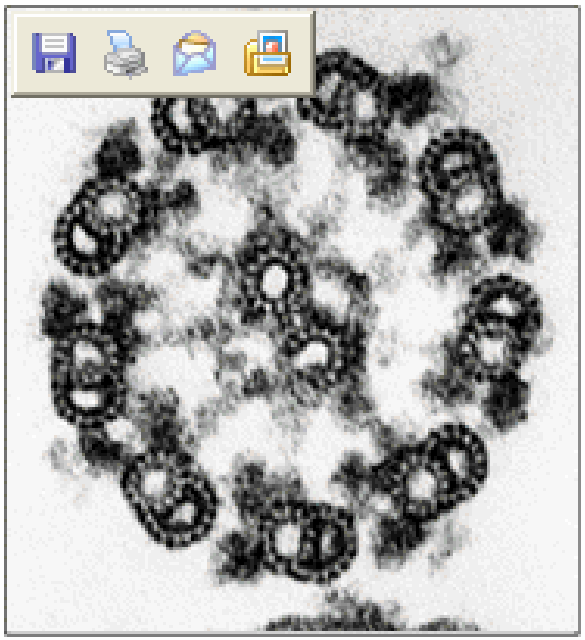


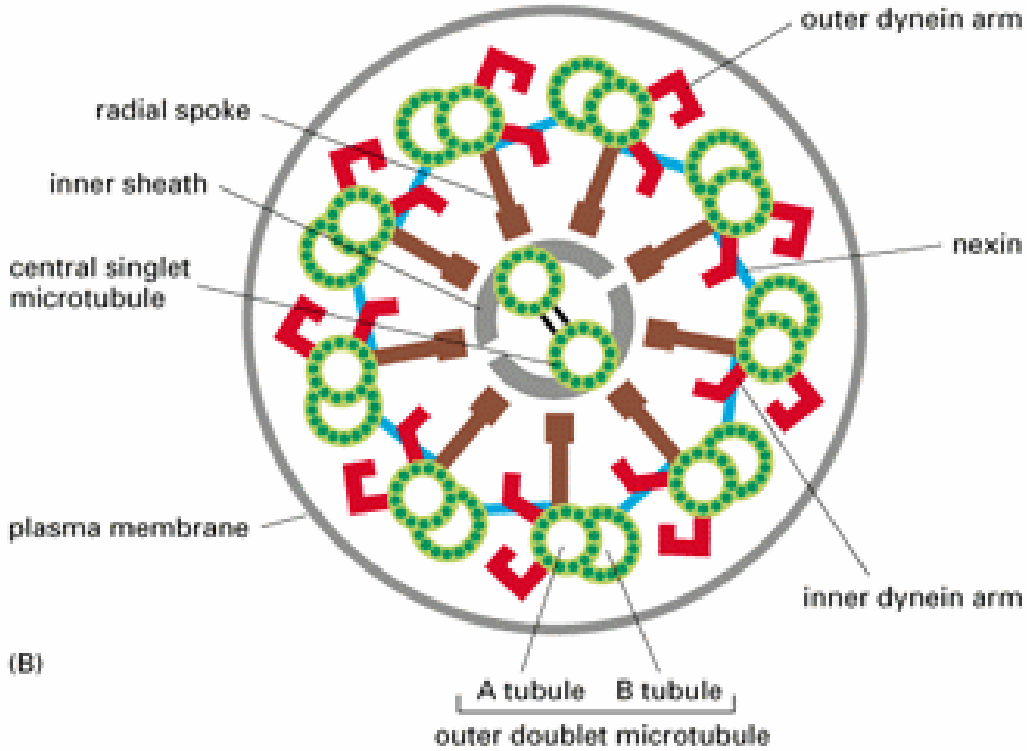
(A)



(B)

DISTRIBUCION DE MICROTUBULOS EN CILIOS Y FLAGELOS EL AXONEMA

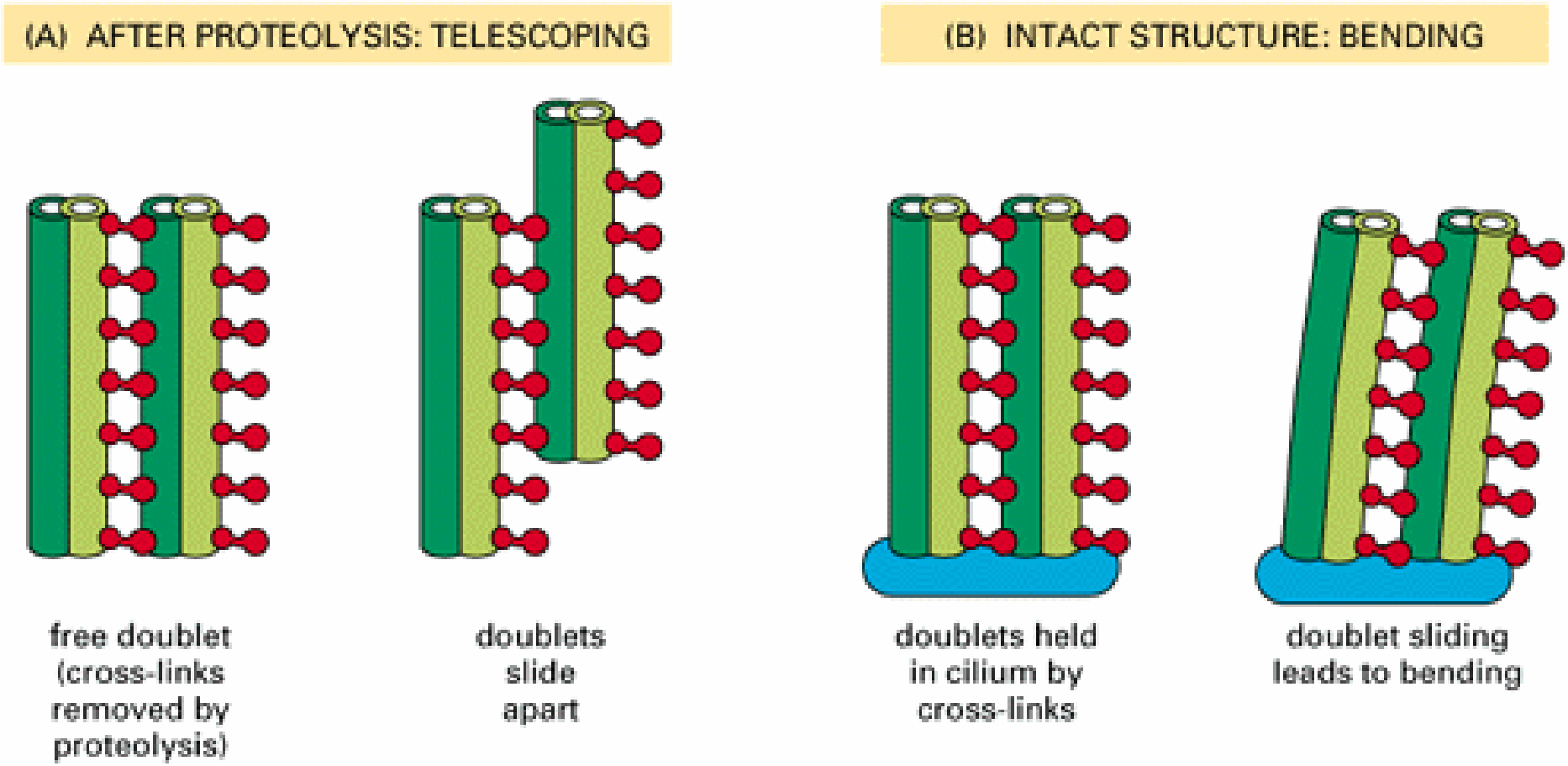




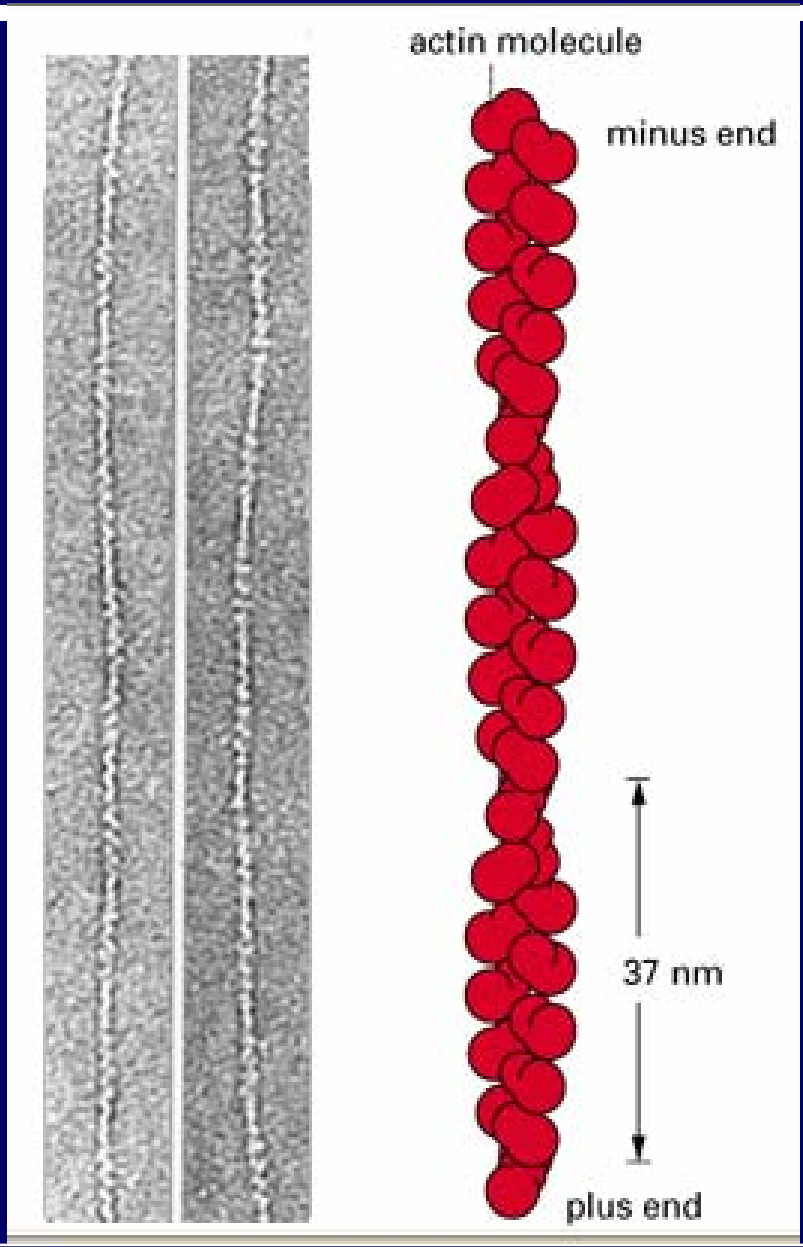
DESLIZAMIENTO DE MICROTUBULOS EN UN AXONEMA MODIFICADO POR UNA BREVE EXPOSICION A UNA ENZIMA PROTEOLITICA (TRIPSINA)

CURVAMIENTO DE UN AXONEMA

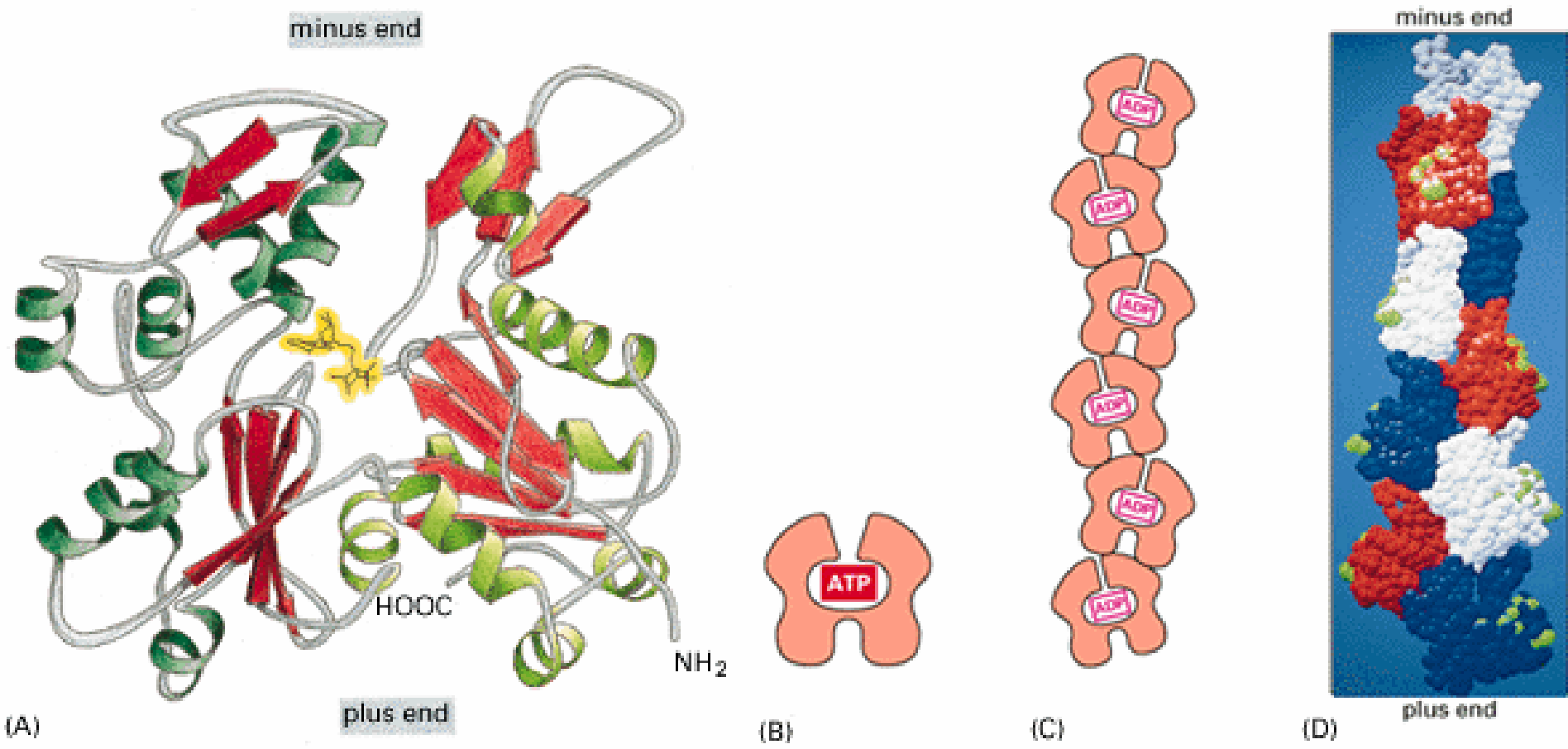
PRESENCIA/AUSENCIA DE PROTEINAS DE ENTRECRUZAMIENTO



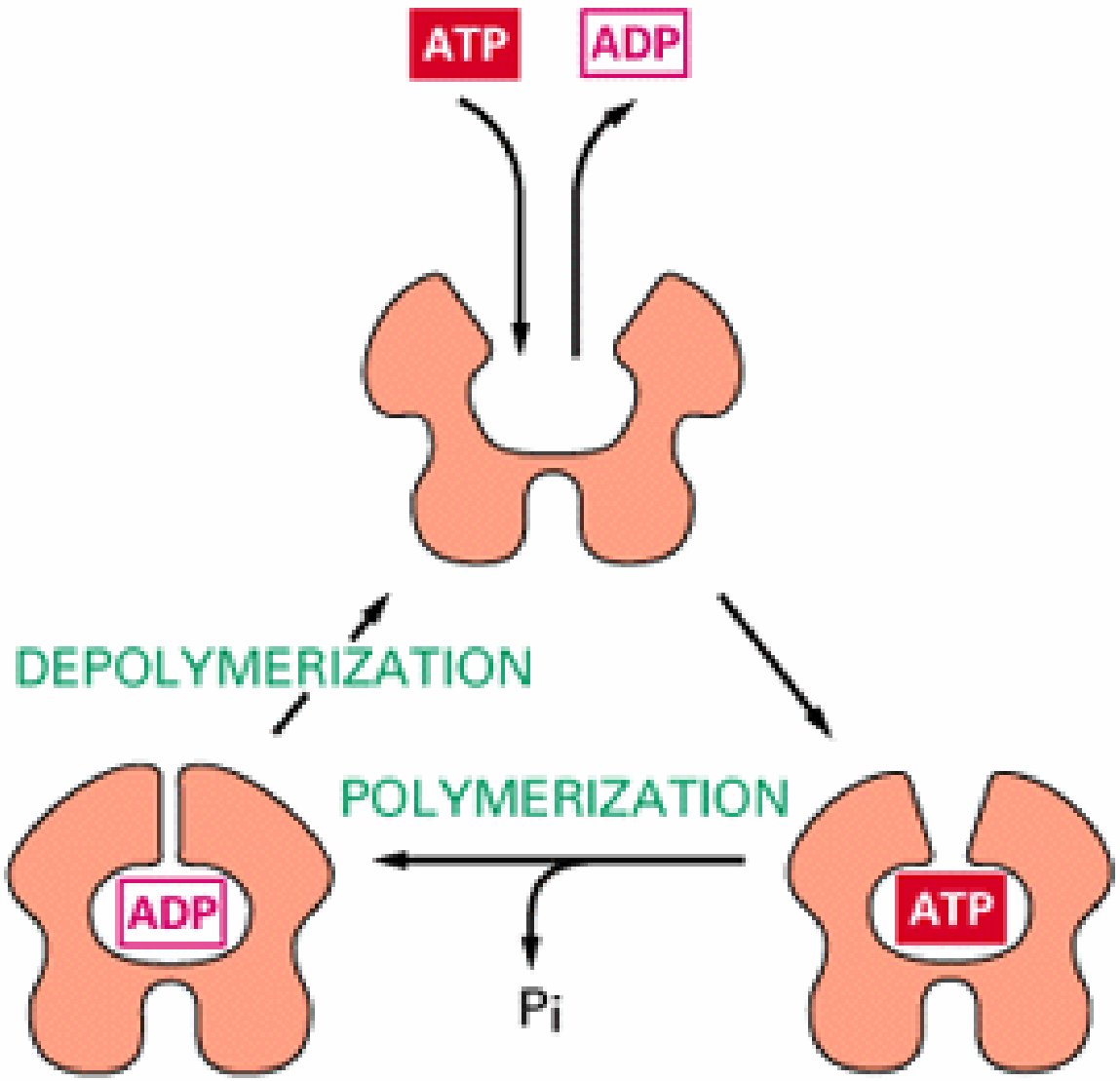
ORGANIZACIÓN HELICOIDAL DE ACTINA PARA CONFORMAR UN MICROFILAMENTO



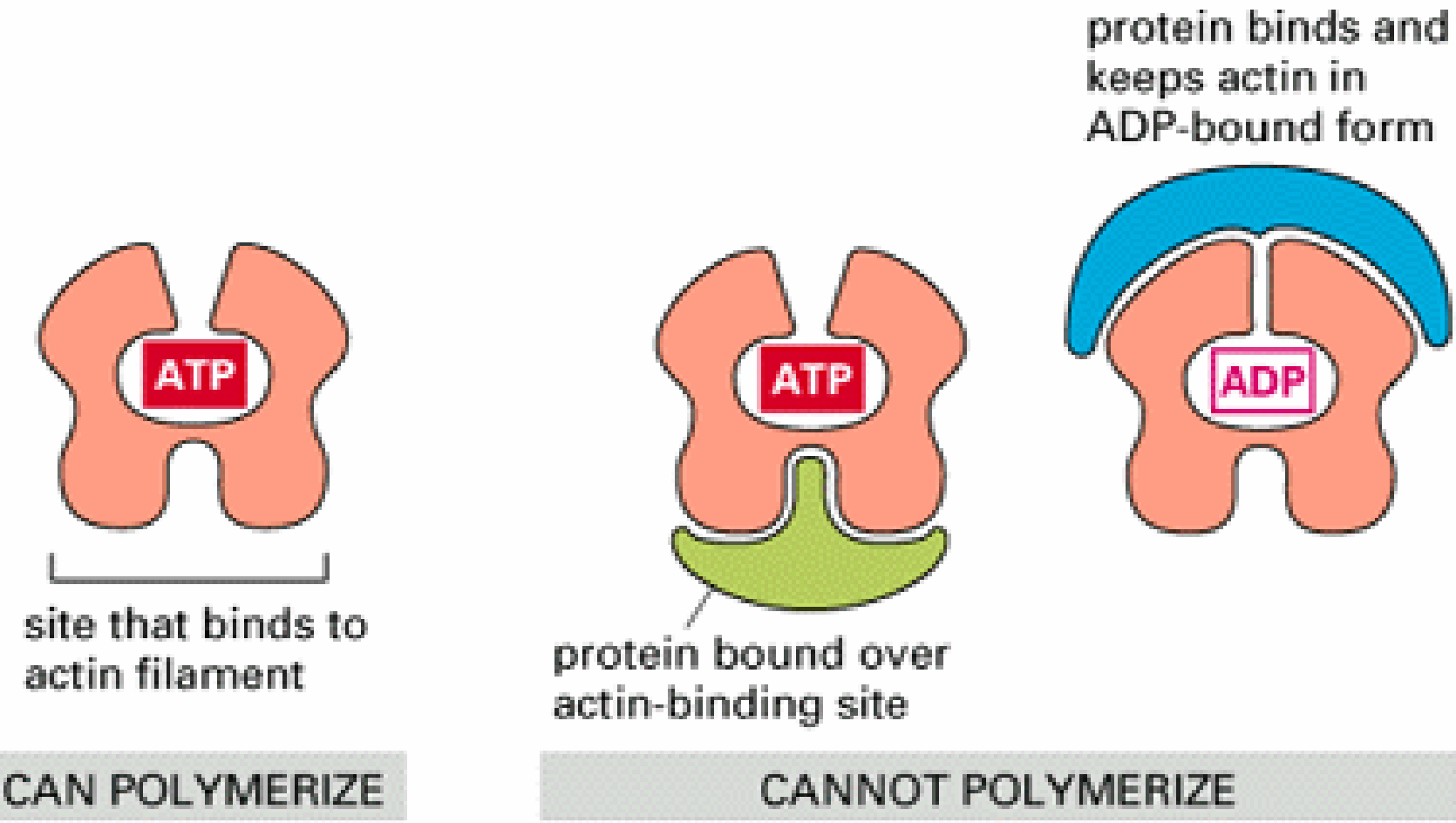
MODELOS ESTRUCTURALES DE ACTINA Y FILAMENTOS DE ACTINA



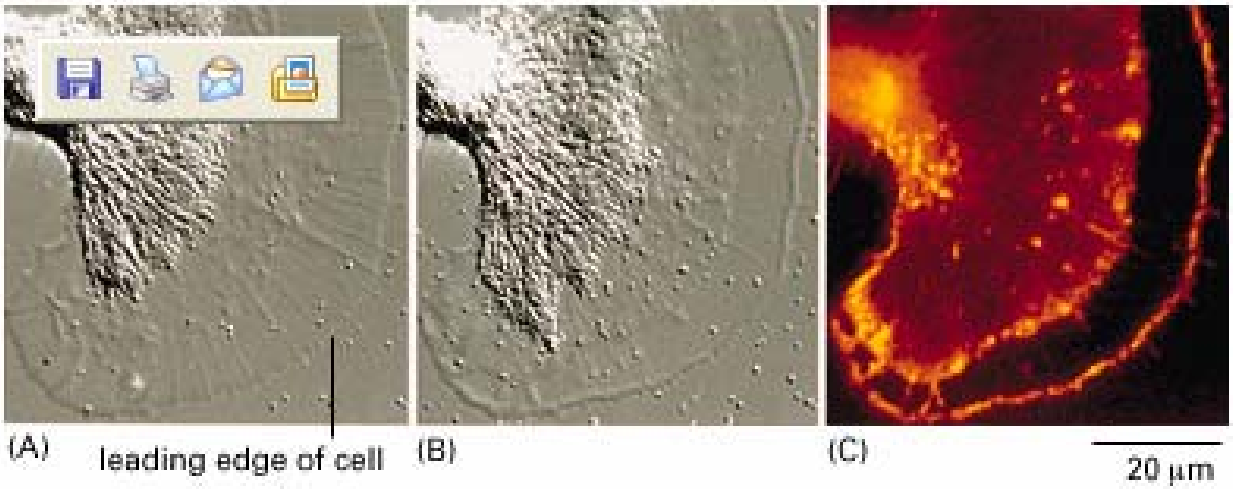
ATRAPAMIENTO DE ATP o ADP EN UN FILAMENTO DE ACTINA y SU RELACION CON POLIMERIZACION DEPOLIMERIZACION

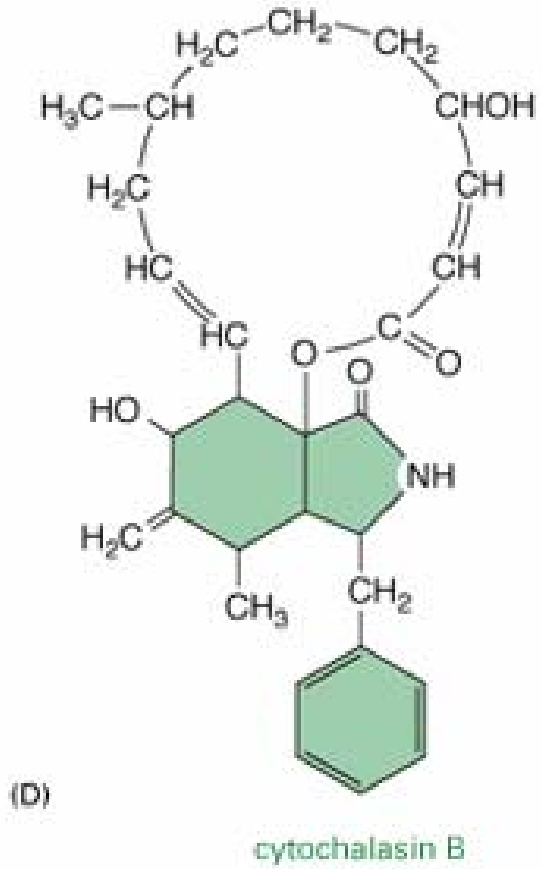


DOS POSIBLES MECANISMOS POR LOS CUALES UNA PROTEINA DE UNION A MONOMEROS DE ACTINA PODRIA INHIBIR SU POLIMERIZACION

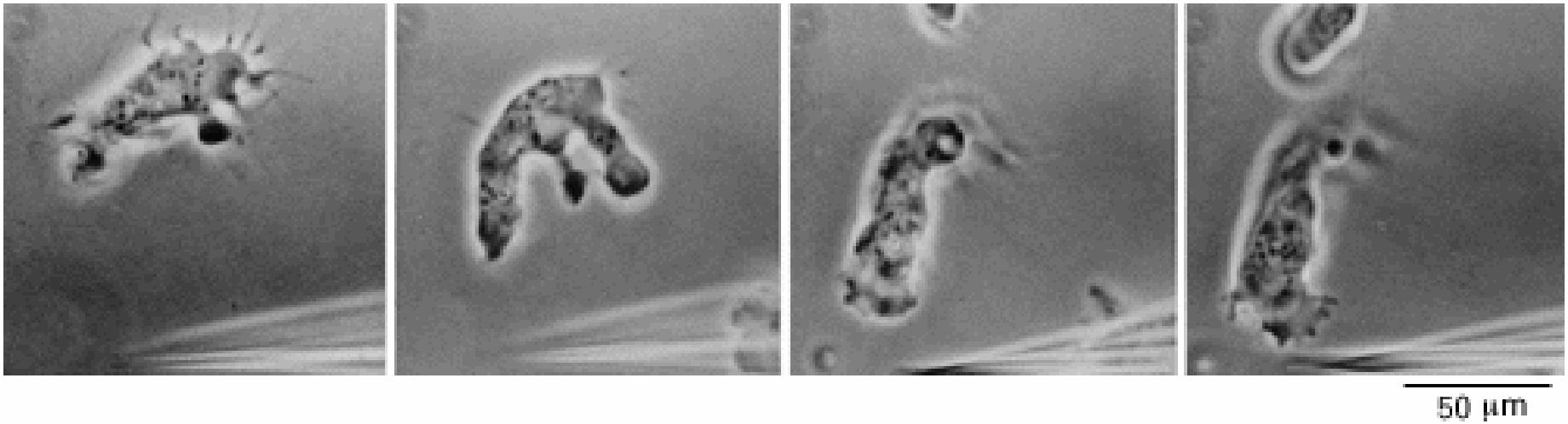
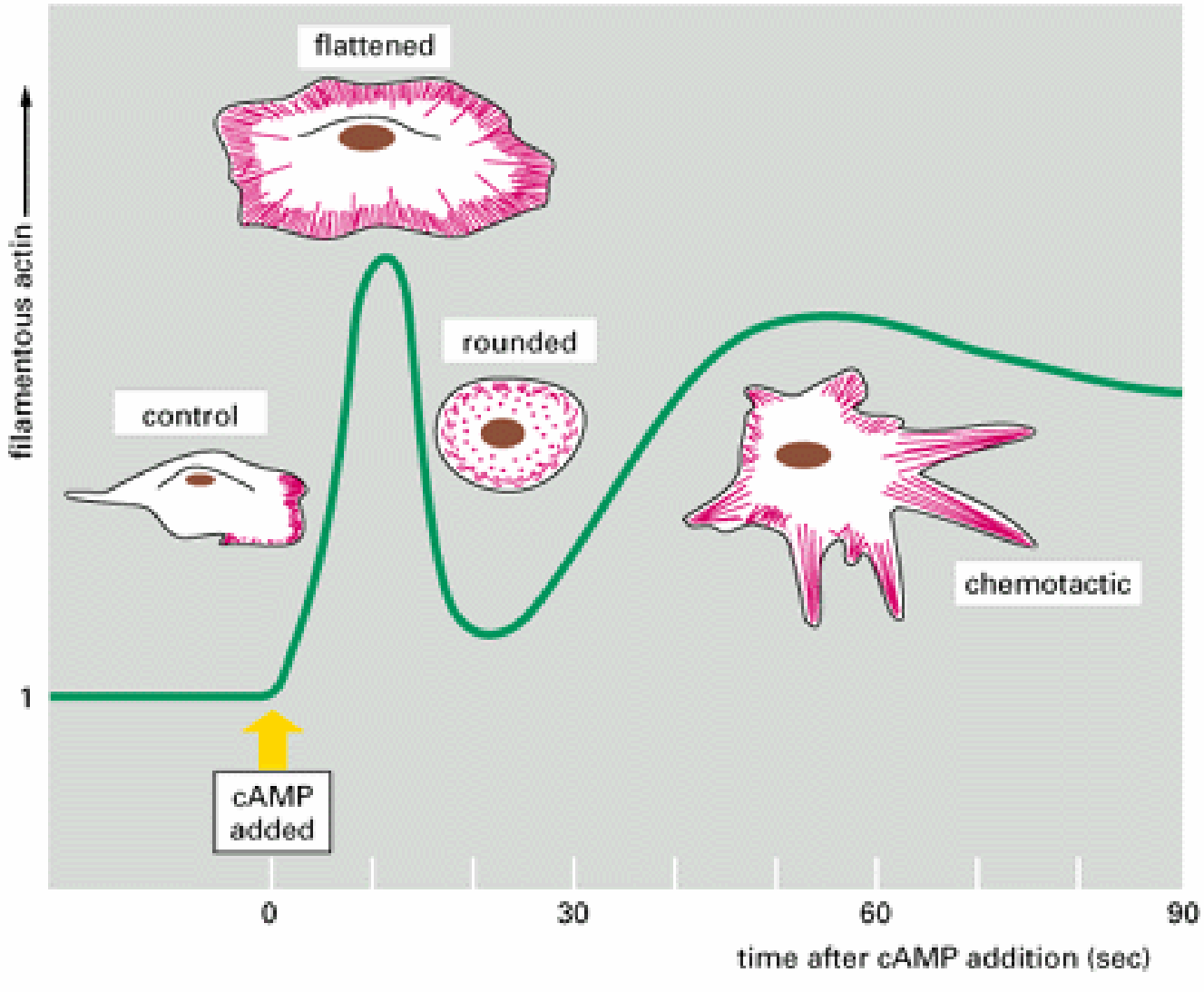


EFECTO DE CITOCALASINA B SOBRE EL BORDE ANTERIOR DE UNA CELULA EN MOVIMIENTO EN CULTIVO





RESPUESTA QUIMIOTACTICA A AMPc EN UN TIPO DE AMEBAS



EFECTO DE AMPc SOBRE EL CORTEX DE ACTINA DE UN TIPO DE AMEBAS