# 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**

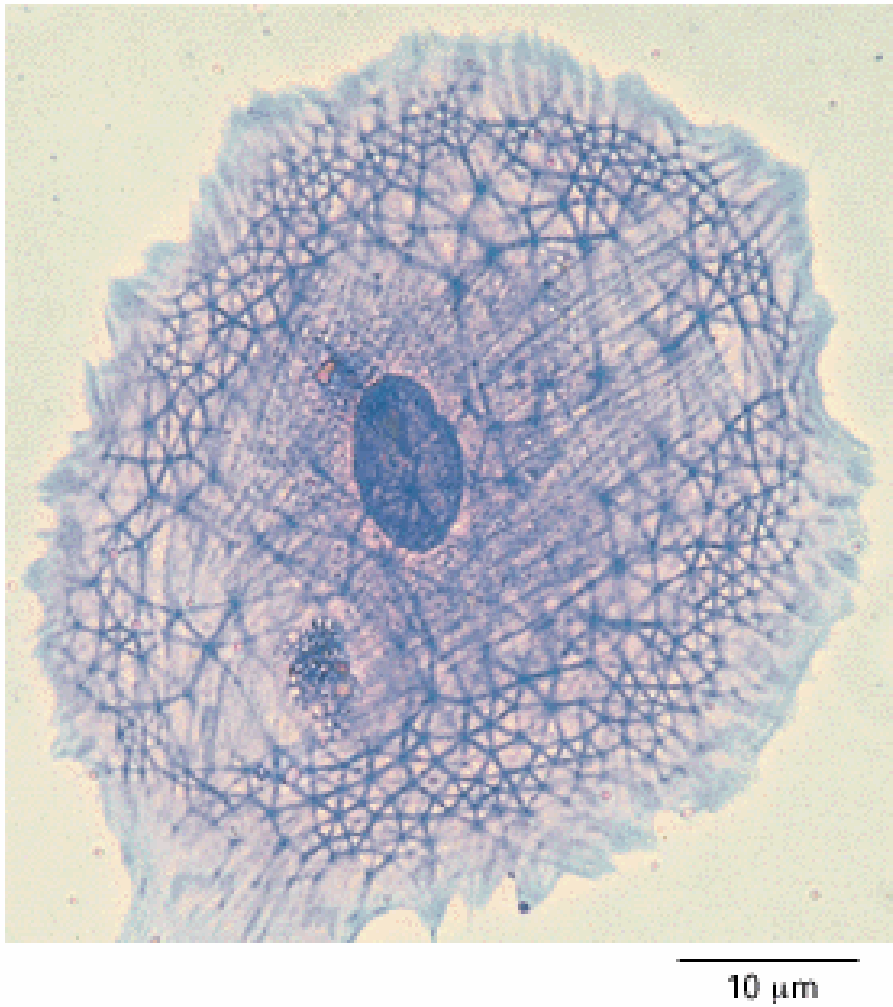
# MAQUINARIA ASOCIADA A ACCIONES INTRACELULARES TALES COMO:

- **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

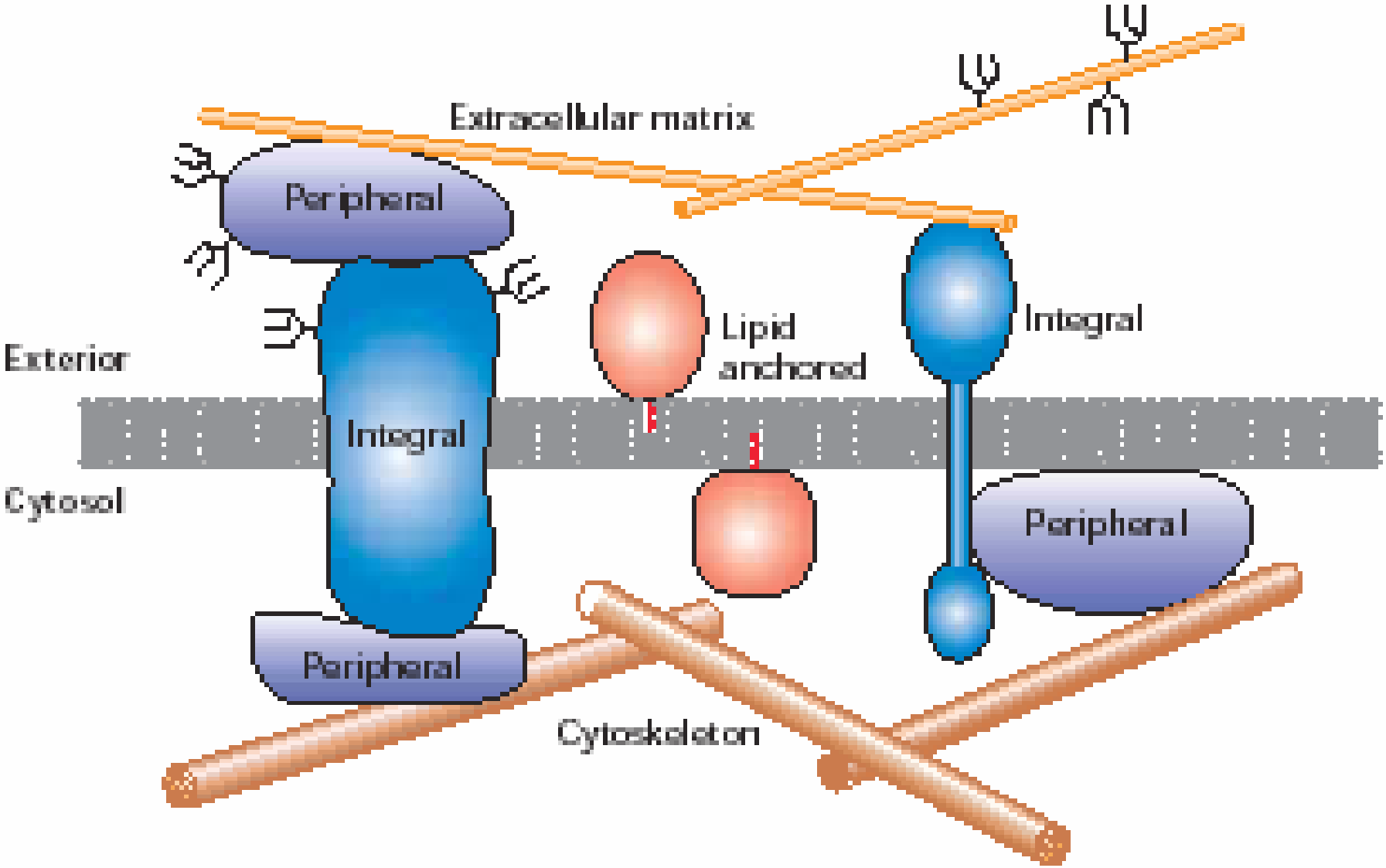
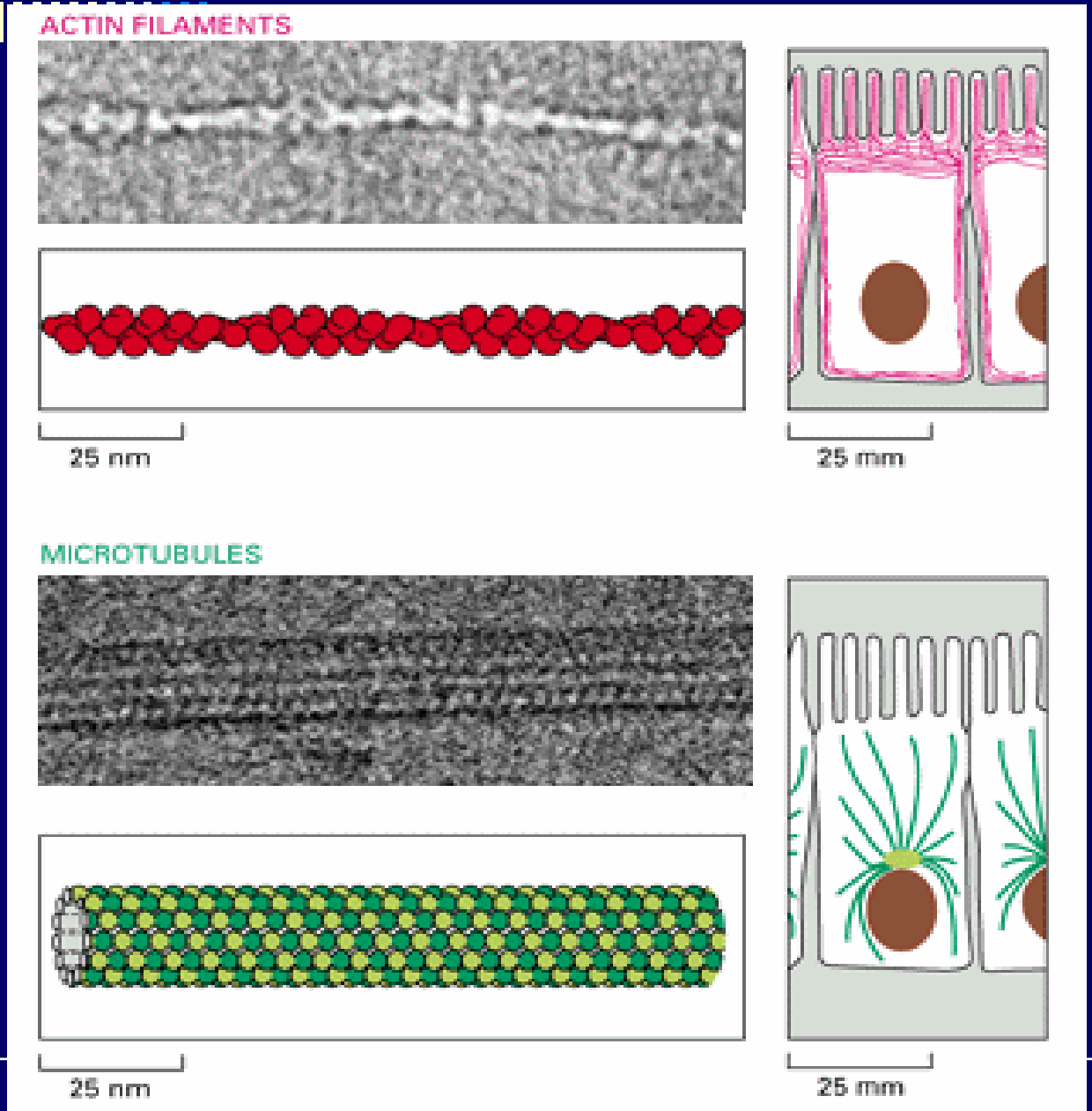


**TABLE 5-4** Protein Subunits in Cytoskeletal Filaments

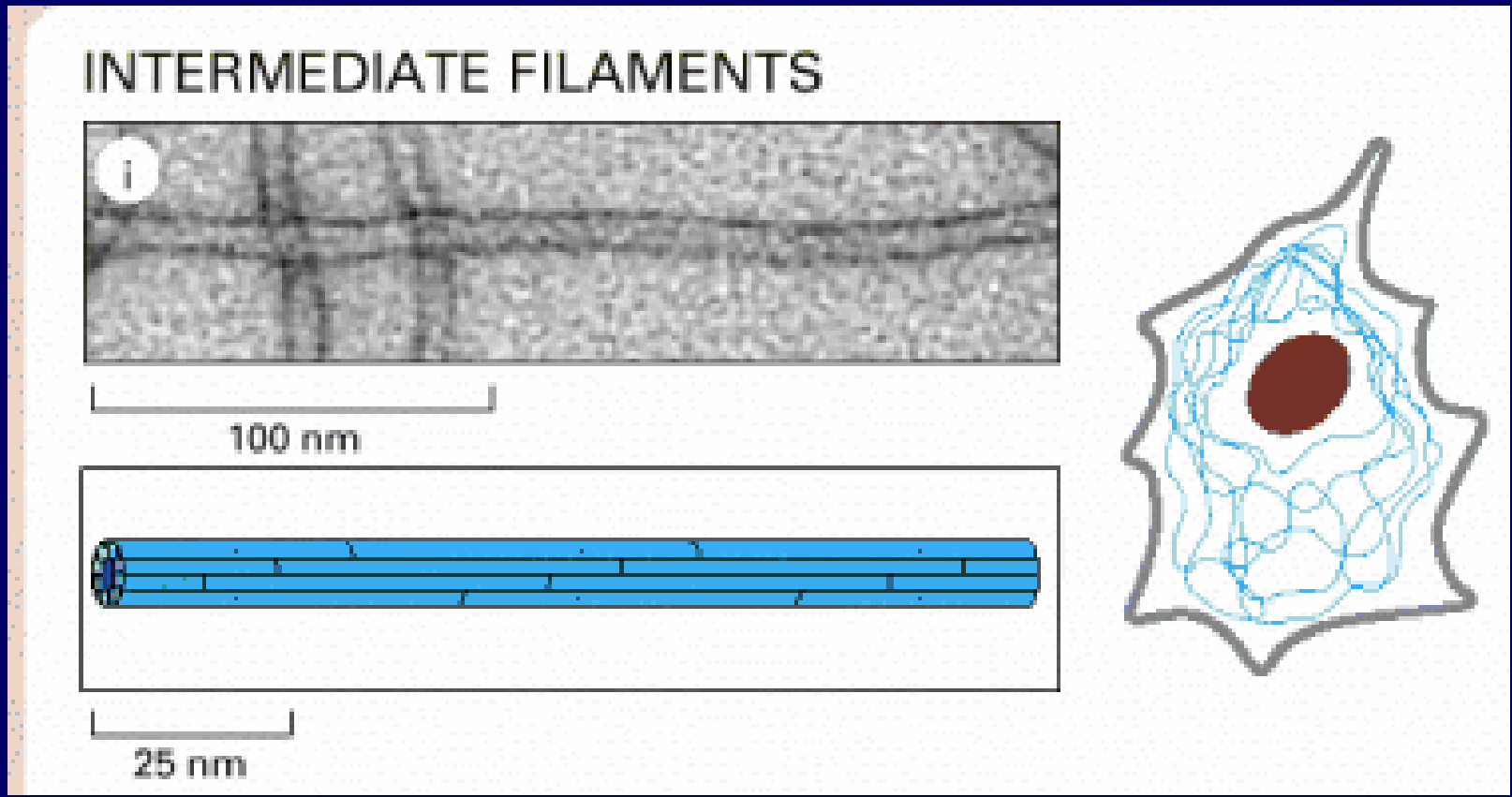
| Protein Subunits | MW | Expression | Function |
|---|---|---|---|
| MICROFILAMENTS | | | |
| Actin | 42,000 | Fungi, plant, animal | Structural support, motility |
| MreB | 36,000 | Rod-shaped bacteria | Width control |
| MICROTUBULES | | | |
| Tubulin (α and β) | 58,000 | Fungi, plant, animal | Structural 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 |



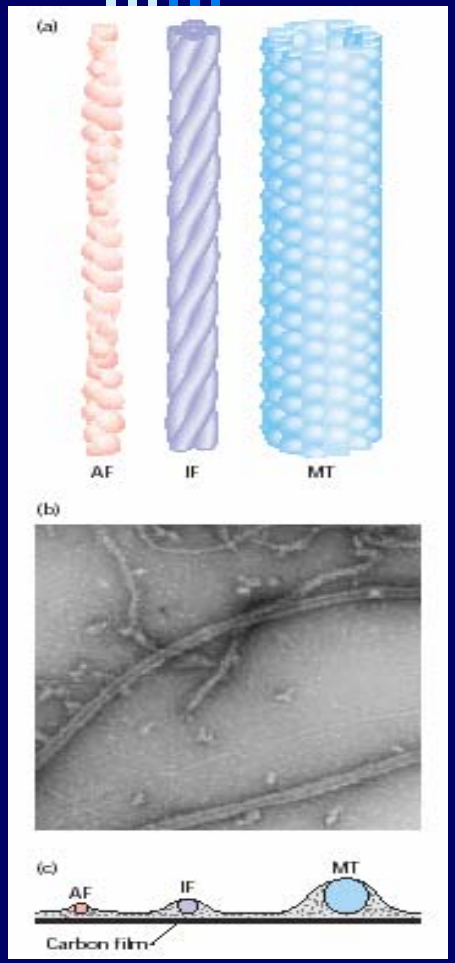

FILAMENTOS DE ACTINA

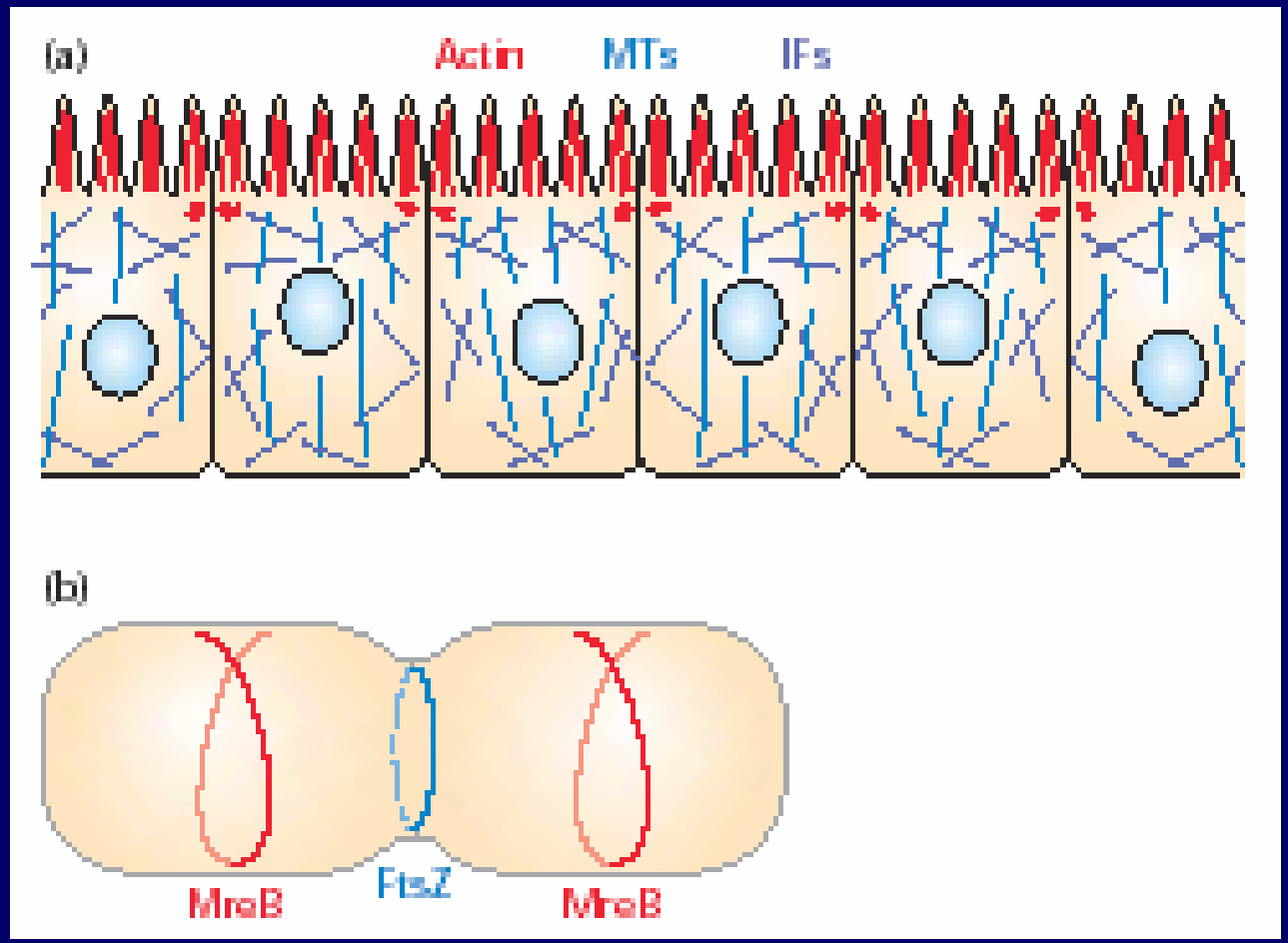
MICROTUBULOS

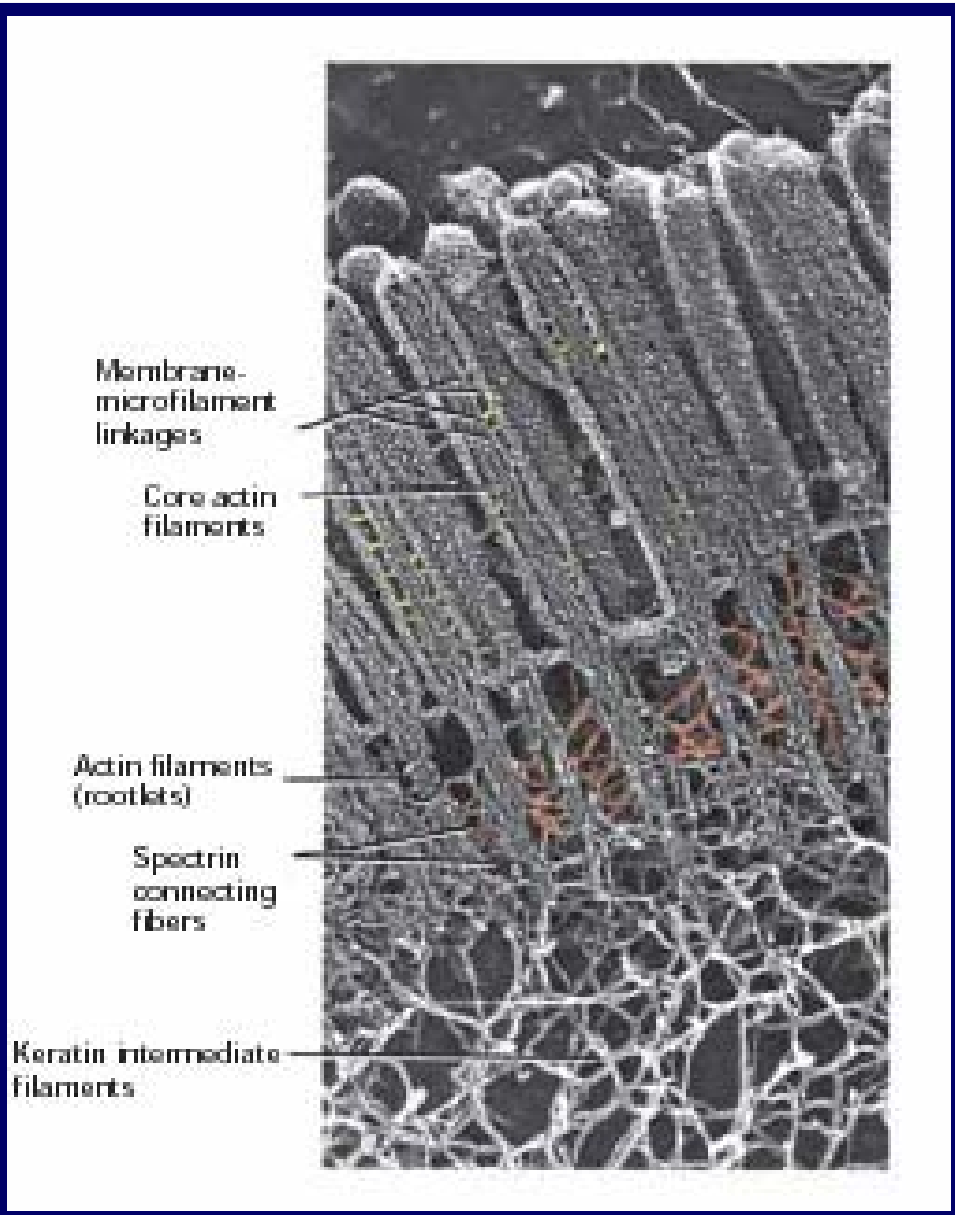
# FILAMENTOS INTERMEDIOS.” ROPE-LIKE” ESTRUCTURAS DE ALREDEDOR DE 10nm. STRESS MECANICO



# Distribución de componentes del citoesqueleto en células Eucarioticas y en Bacterias

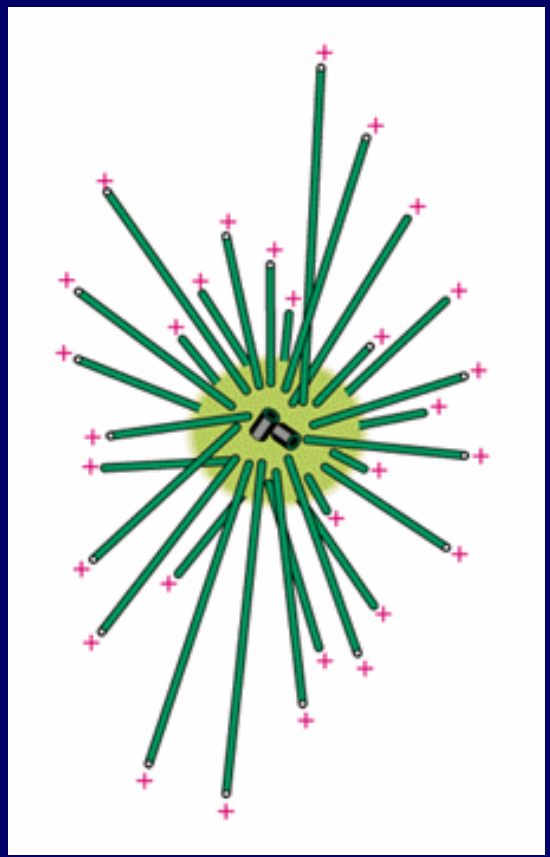


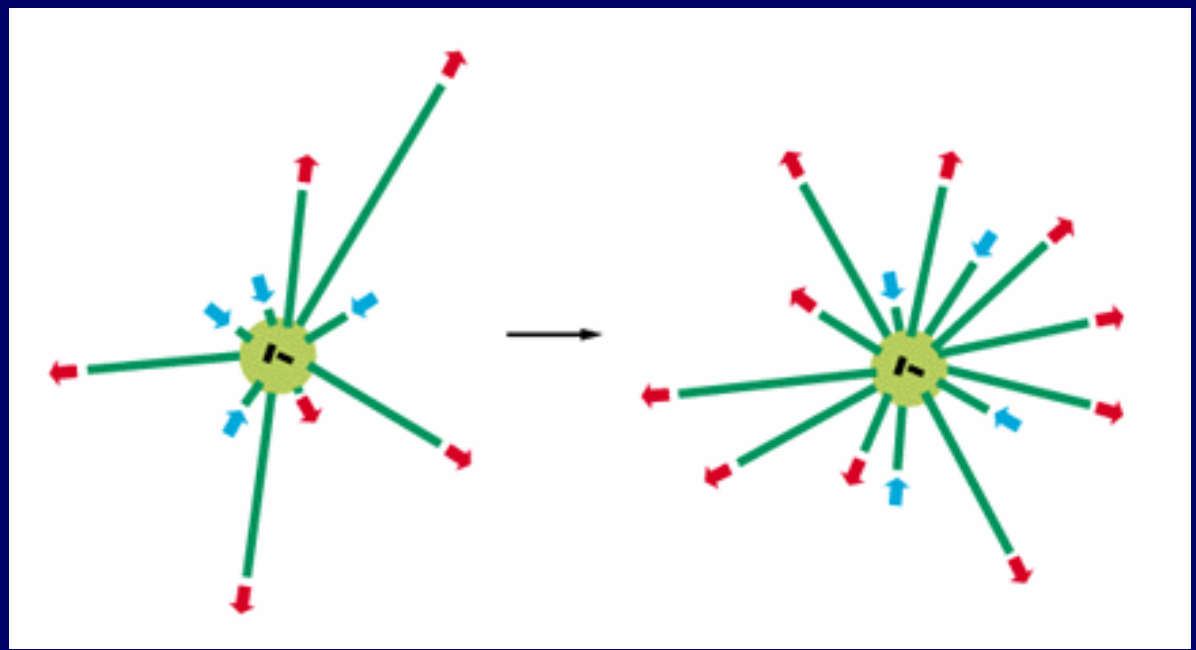





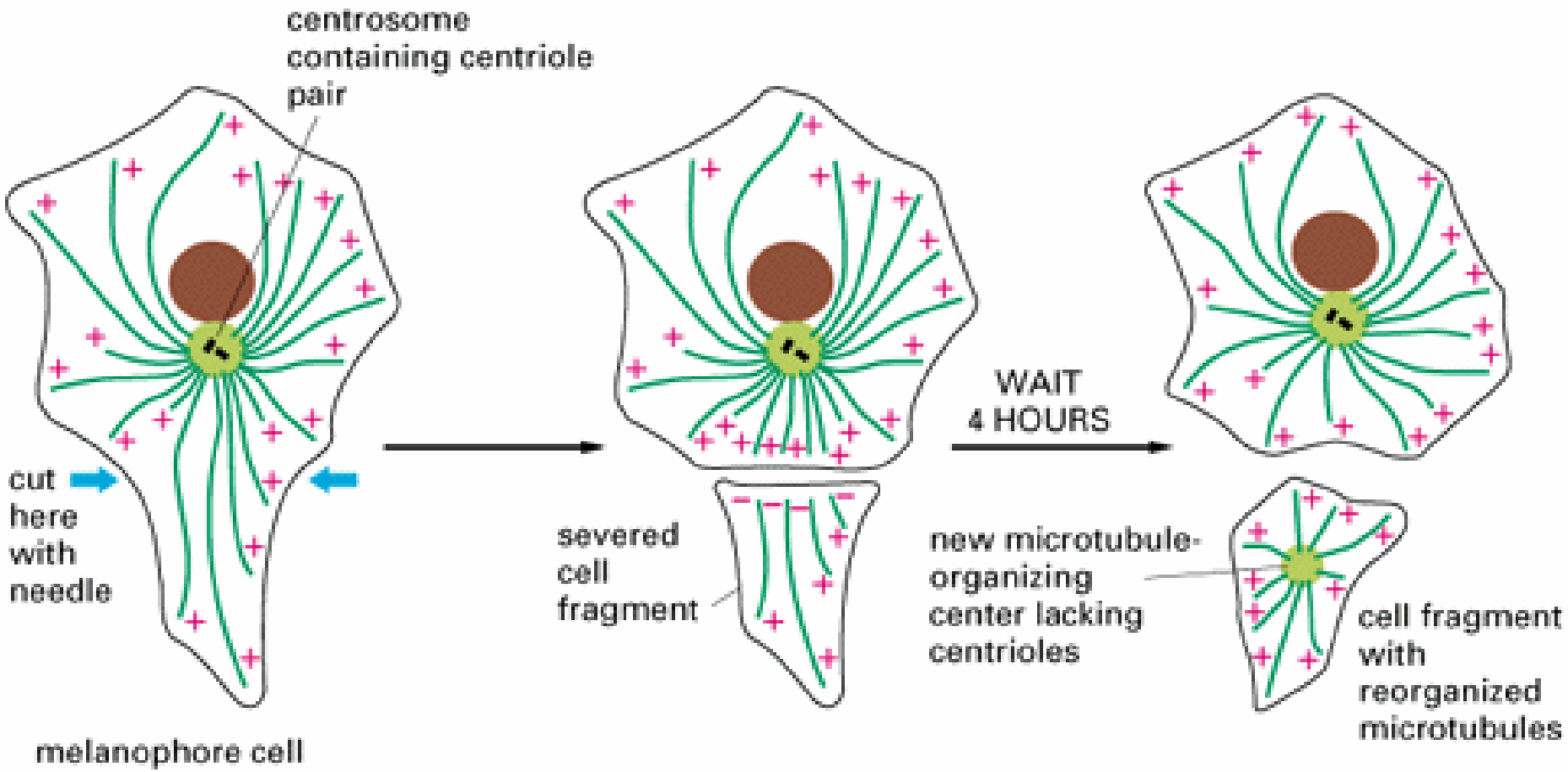

# TEM DE LA PARTE APICAL DE UNA CELULA EPITELIAL INTESTINAL SOMETIDA A TRATAMIENTO CON DETERGENTE

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

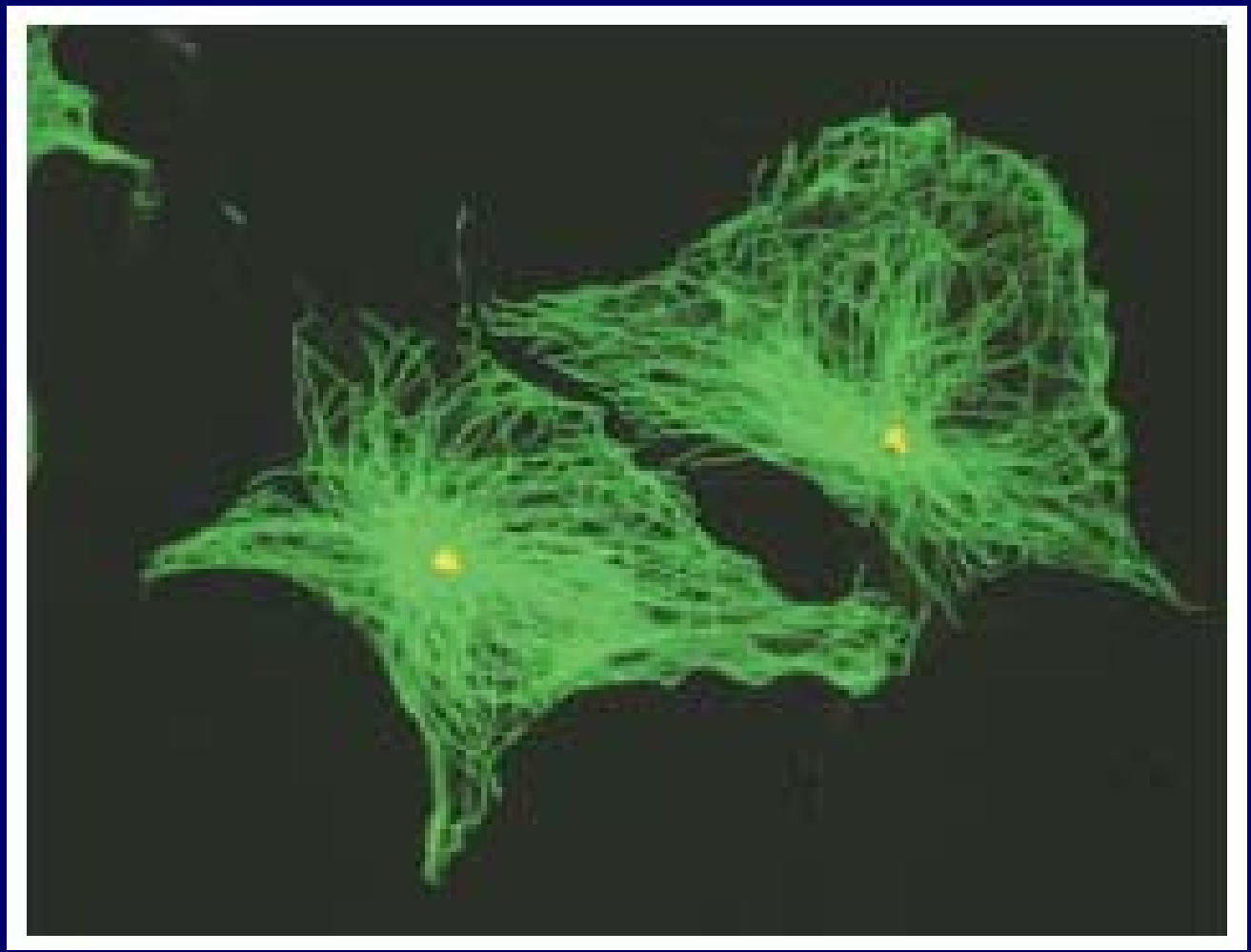




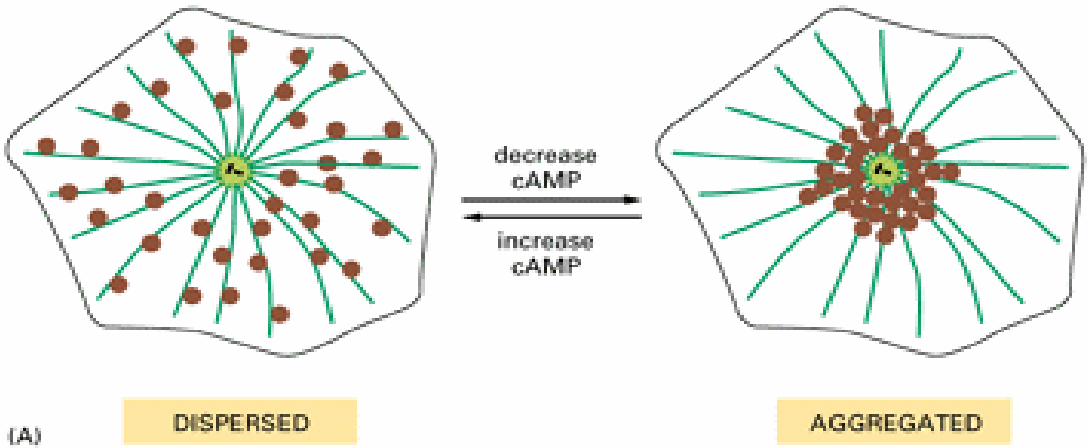
# MICROTUBULOS ENCUENTRAN EL CENTRO DE LA CELULA

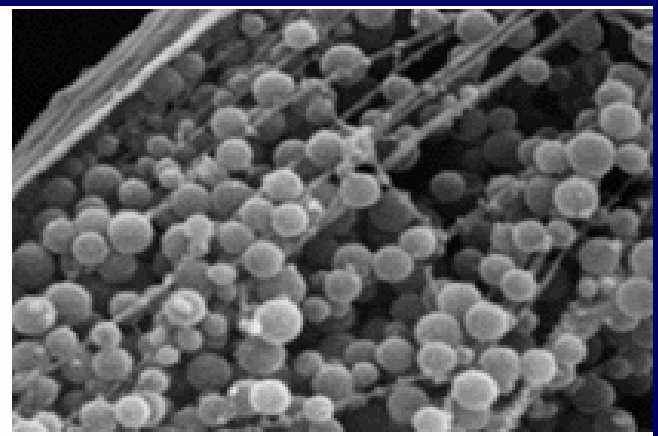


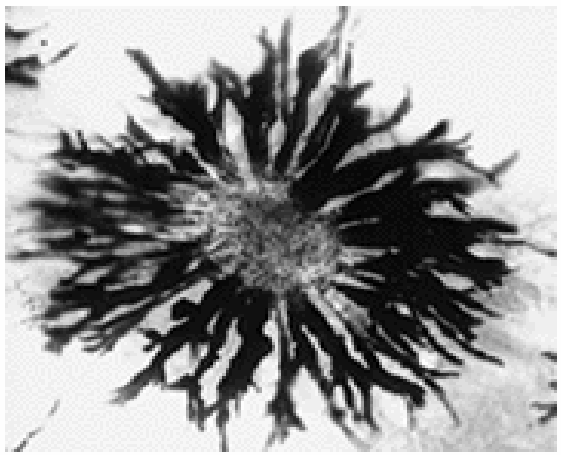
# MTOC Y MICROTUBULES DE UNA CELULA OVARICA DE HAMSTER. ESTUDIOS DE INMUNOFLUORESCENCIA

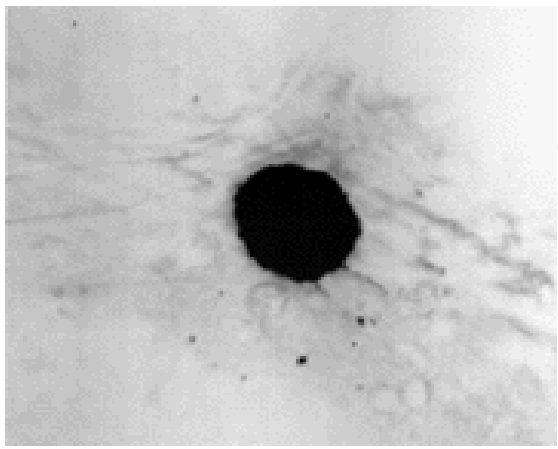


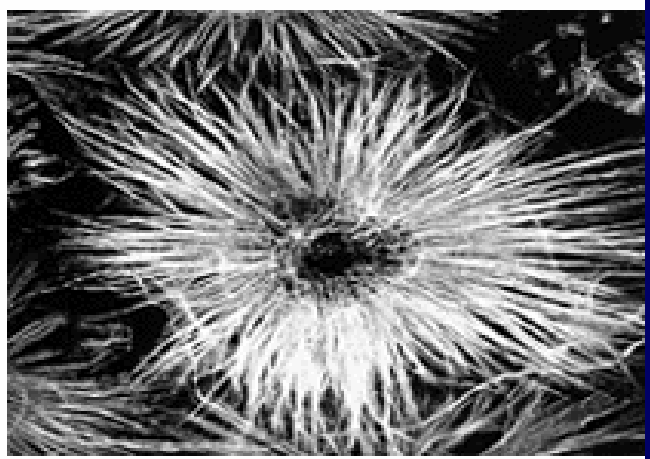
# CELULAS PIGMENTADAS EN PECES



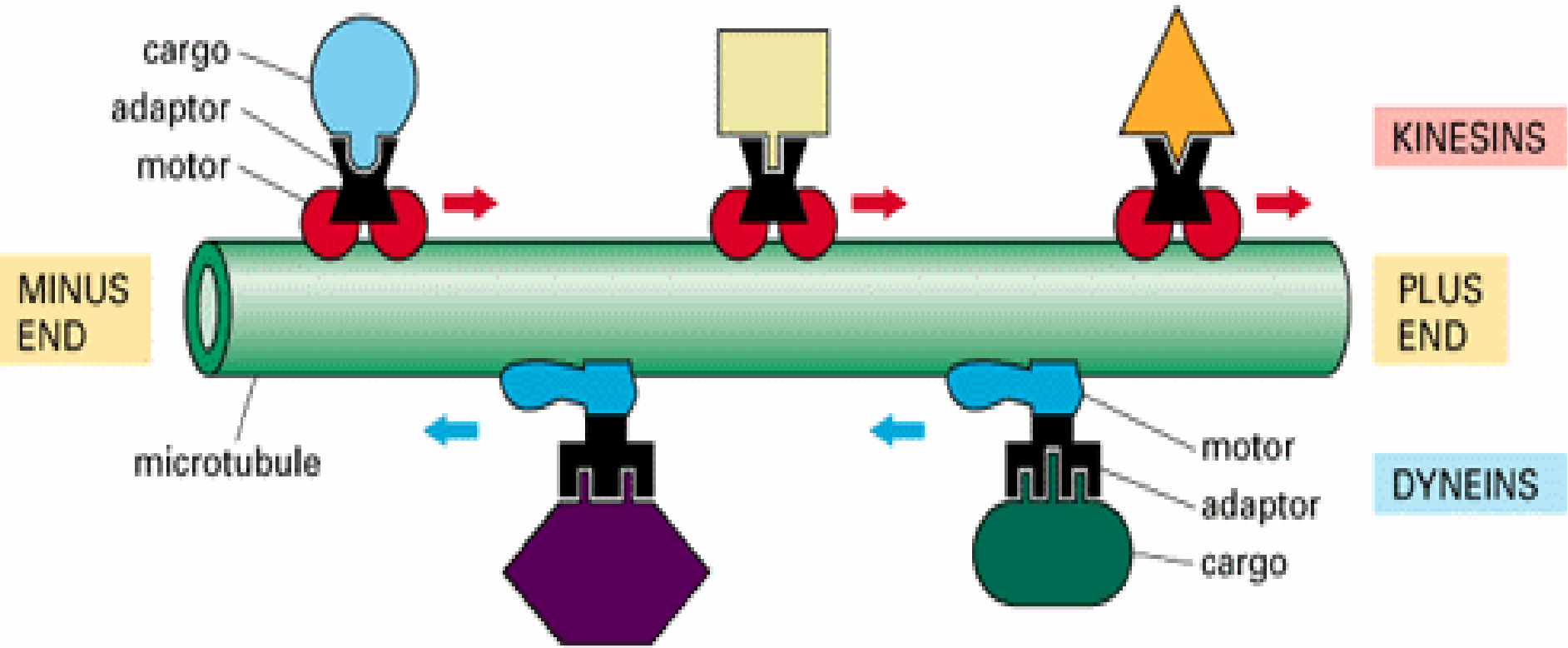



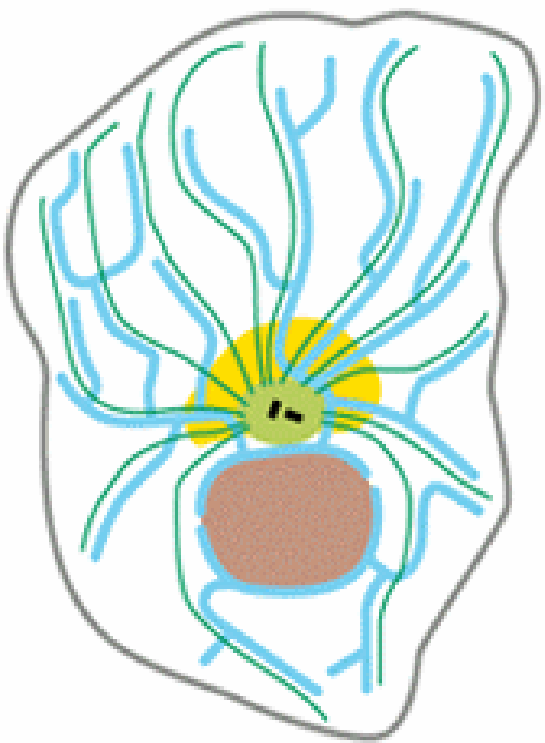



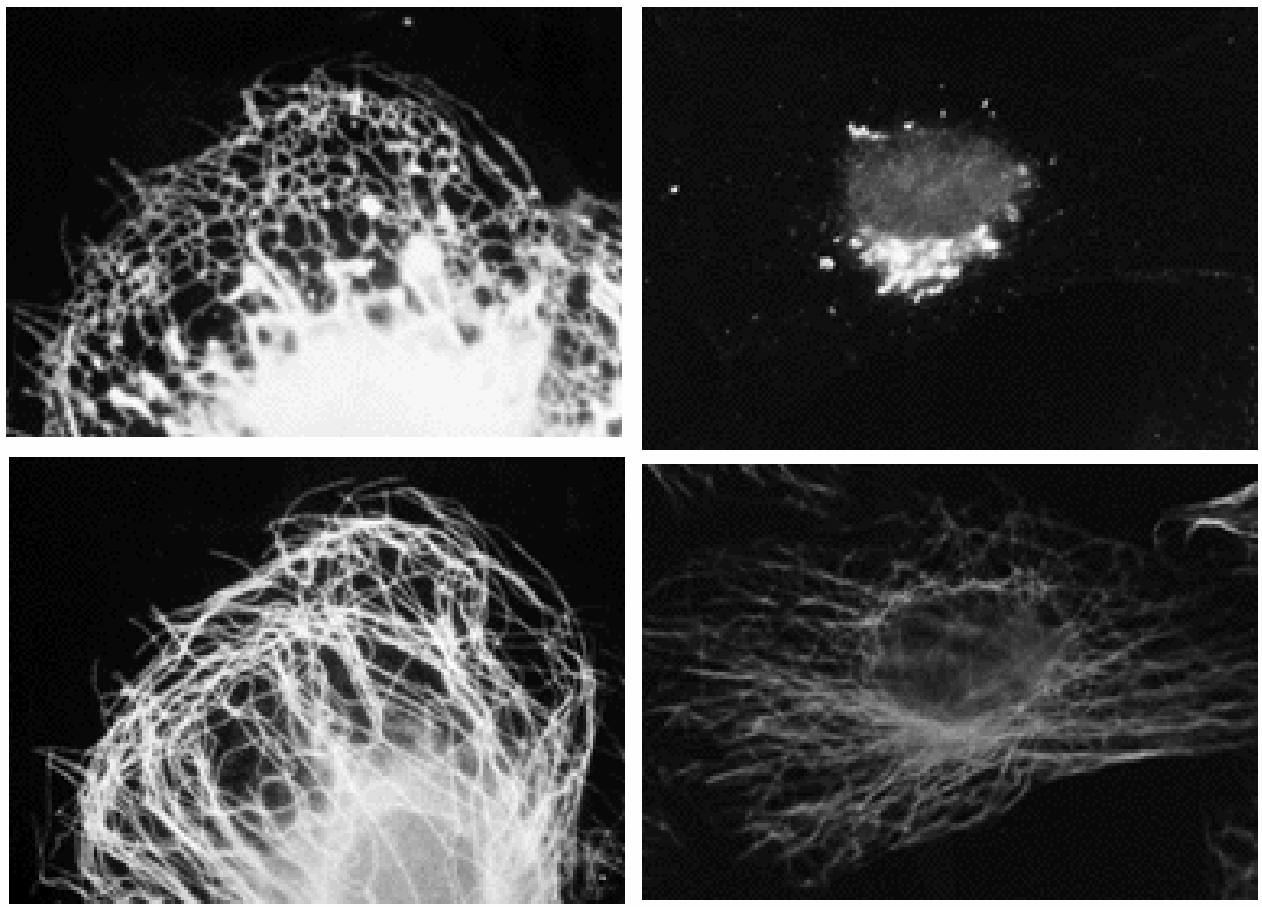
# PROTEINAS MOTORAS Y MICROTUBULOS



# ORGANELOS Y MICROTUBULOS. LOCALIZACION

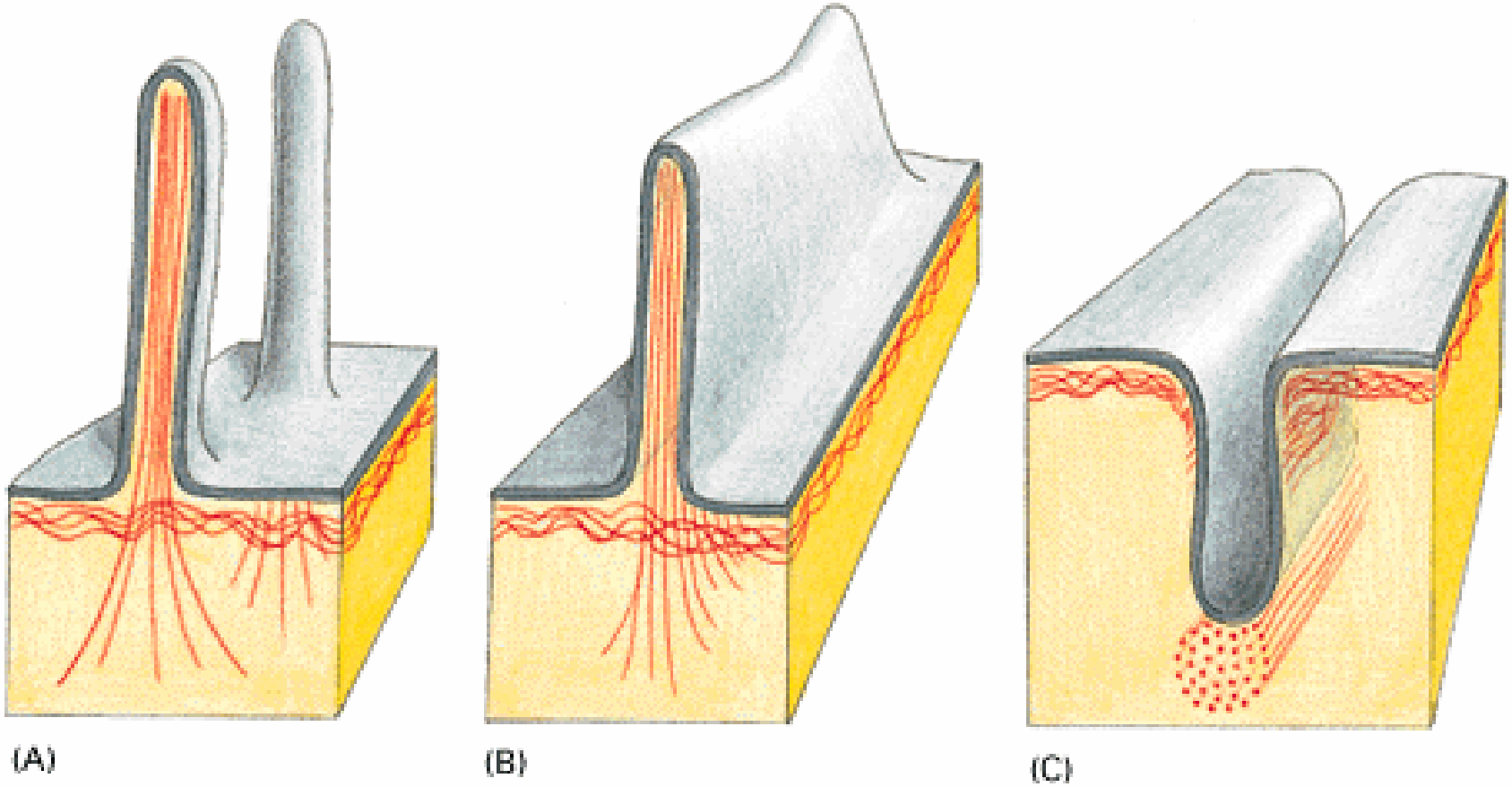


(A)

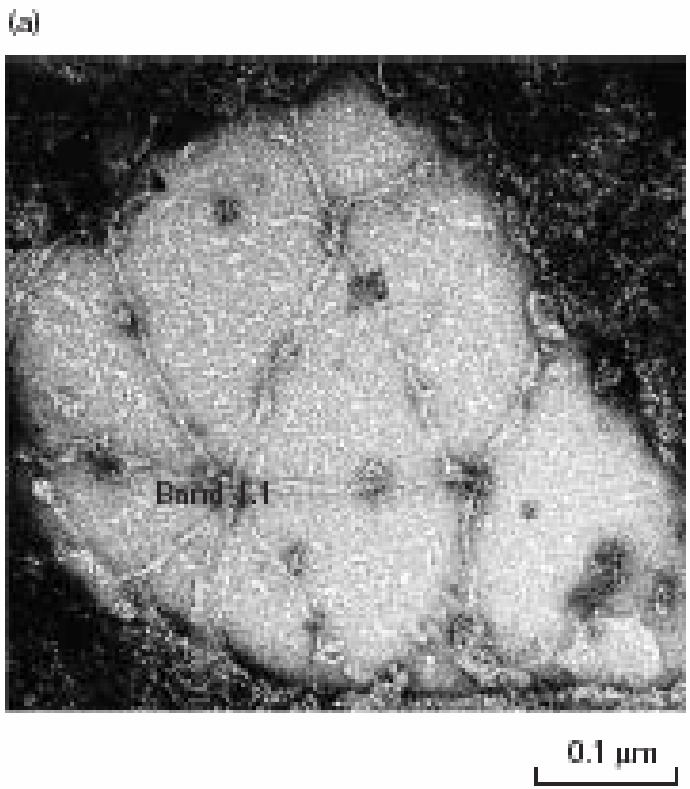


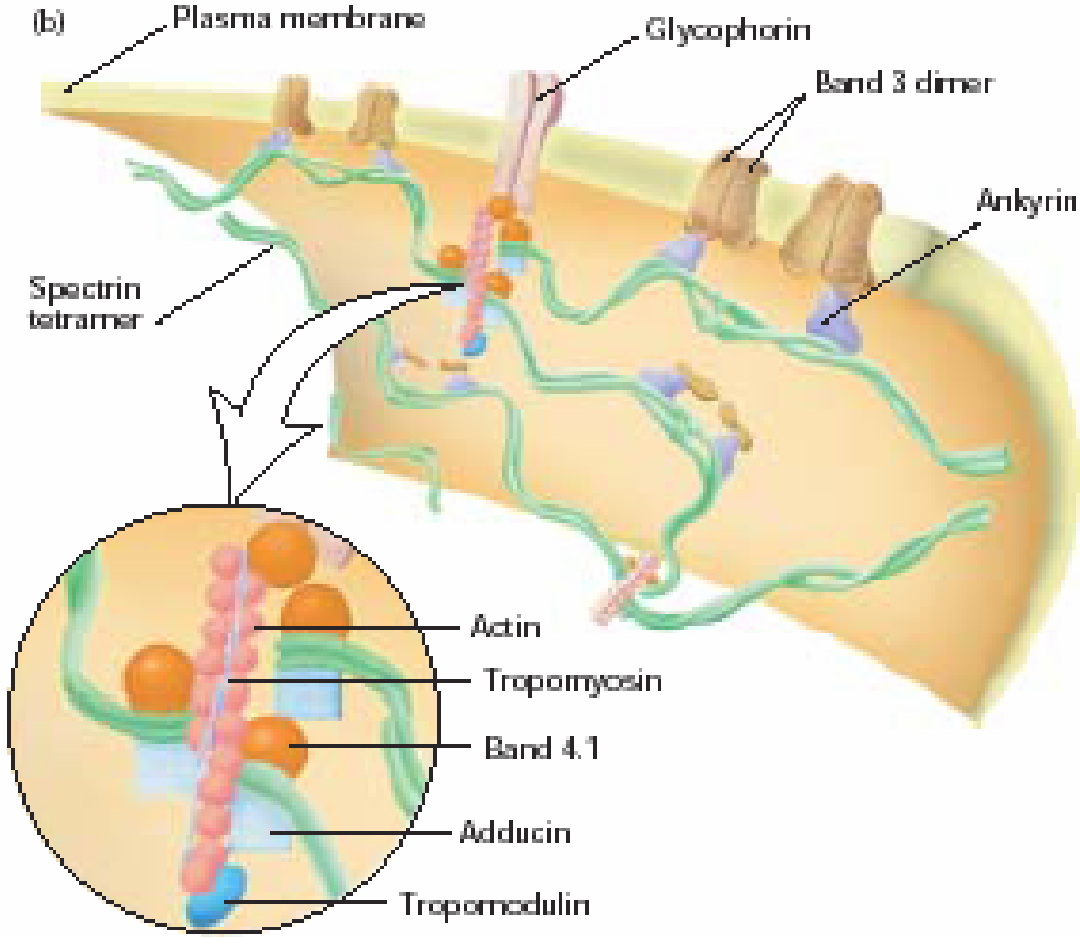
(B) 10 µm (C)

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

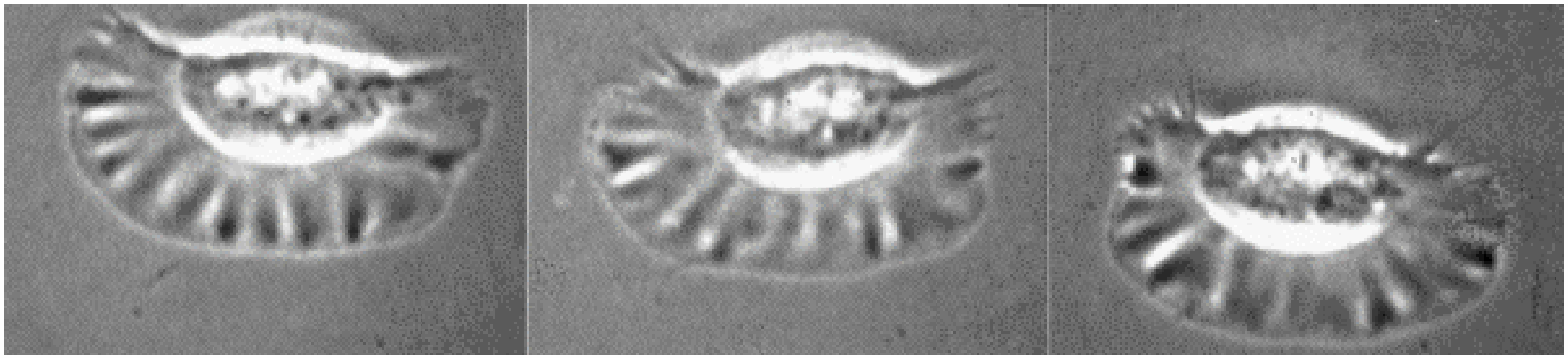


# CITOESQUELETO CORTICAL COMO EL SOPORTE DE LA FORMA Y LA MEMBRANA PLAMATICA DEL ERITROCITO HUMANO

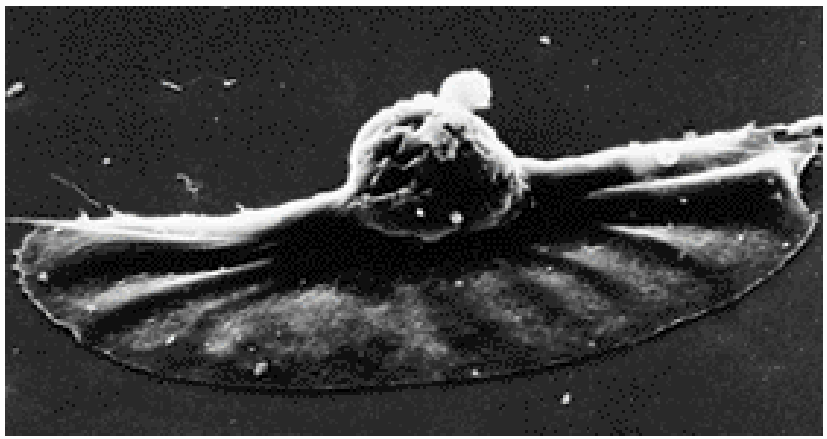


# CELULAS MIGRATORIAS DE LA EPIDERMIS DE PECES

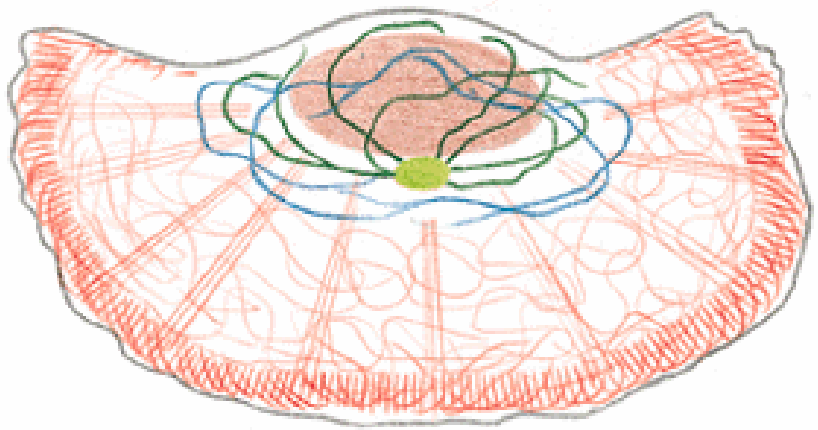


(A)



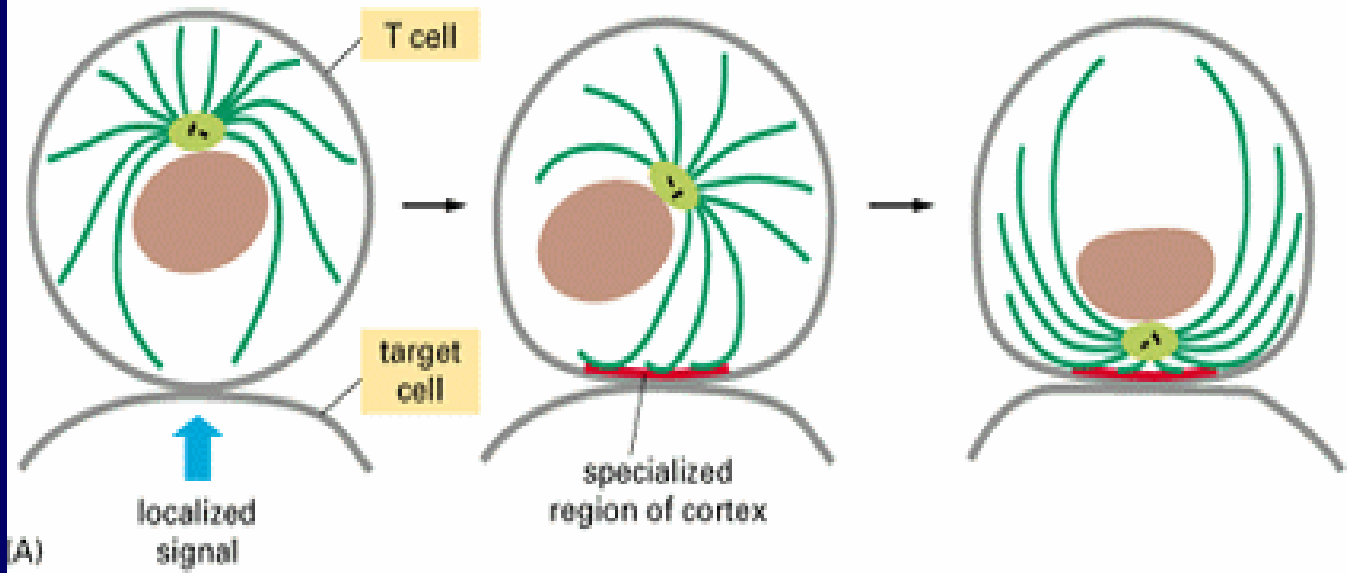
(B)

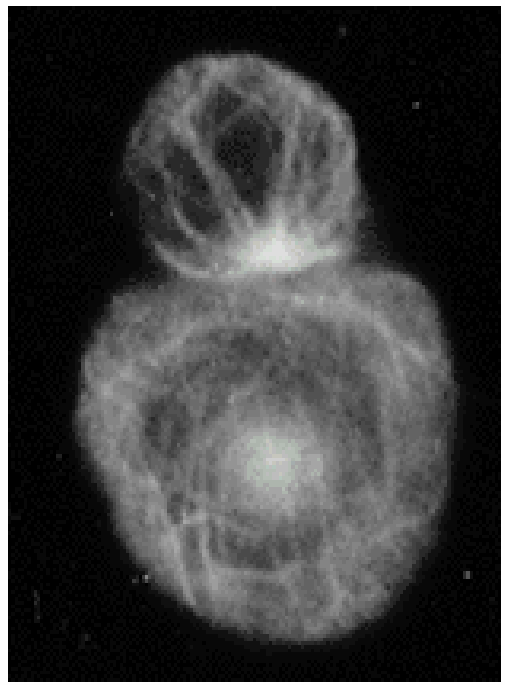
10 µm



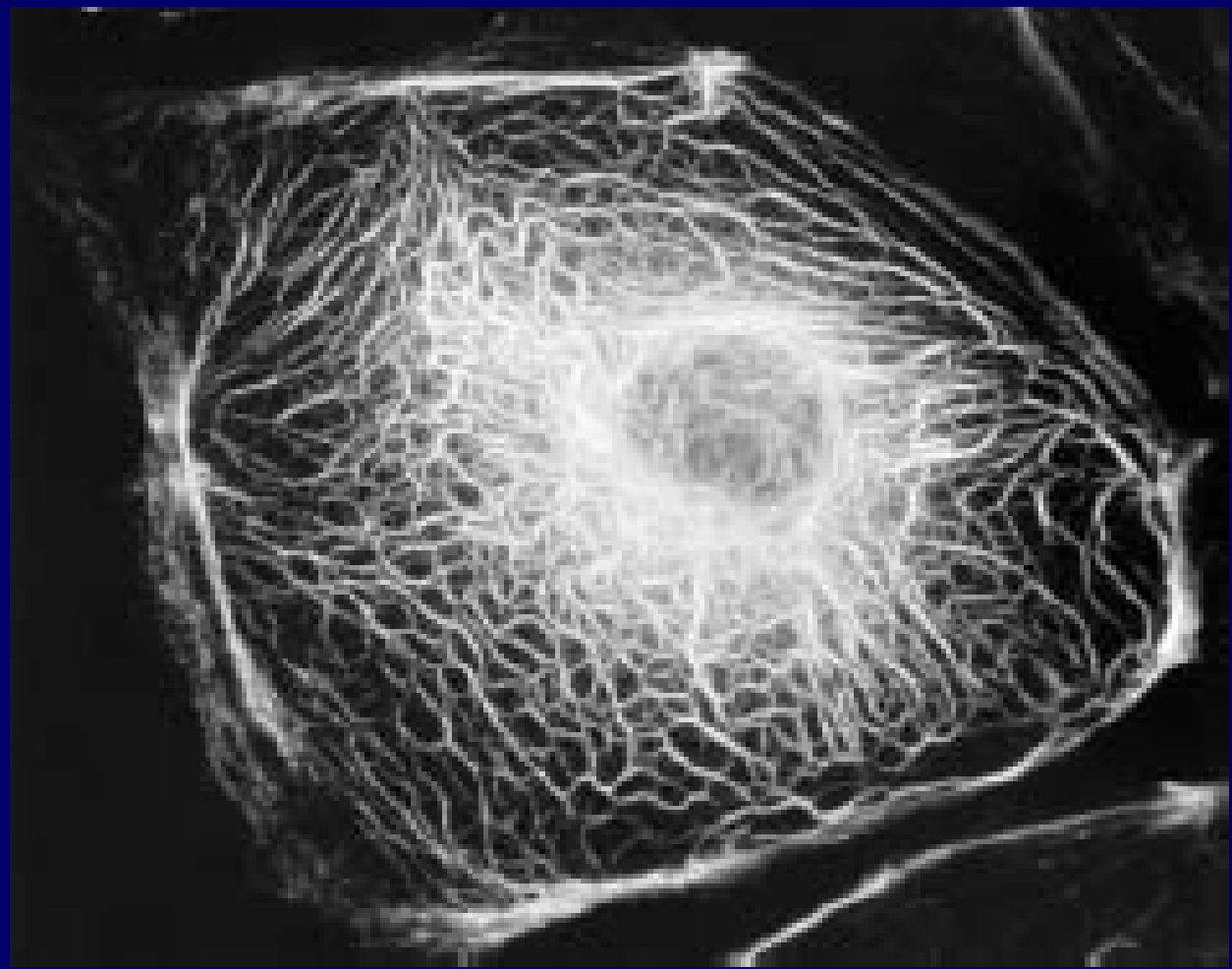
(C)

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

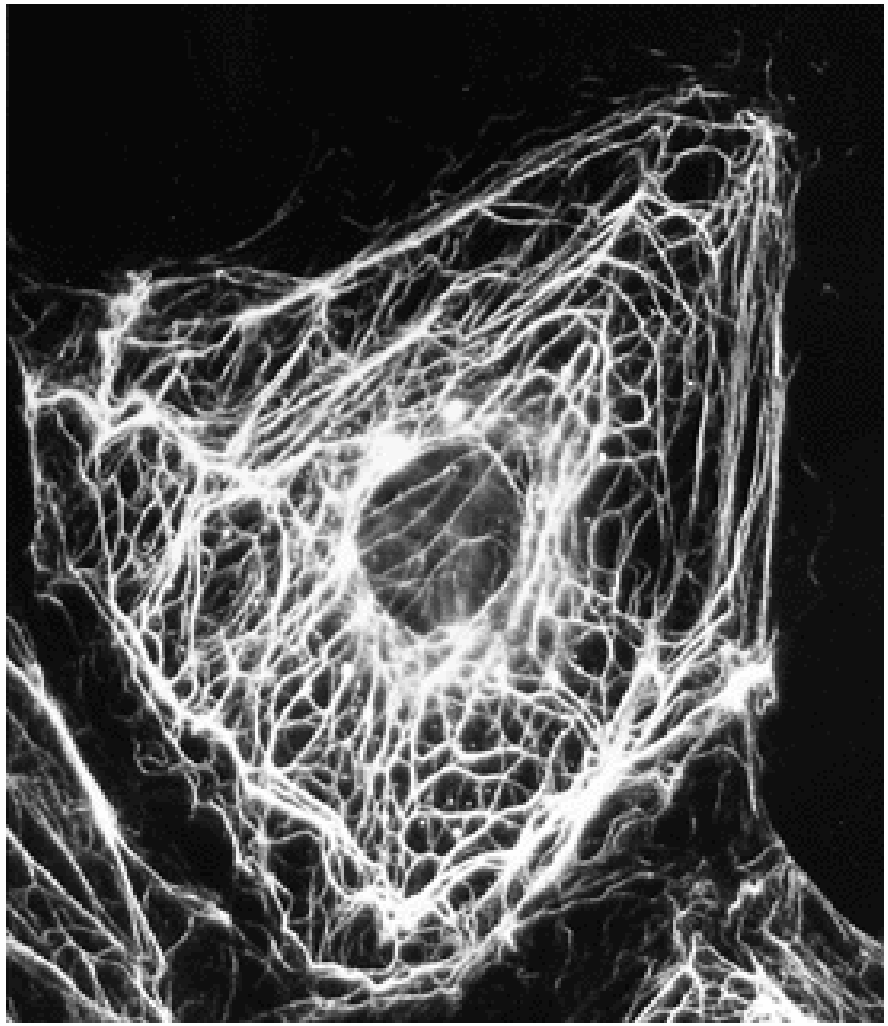


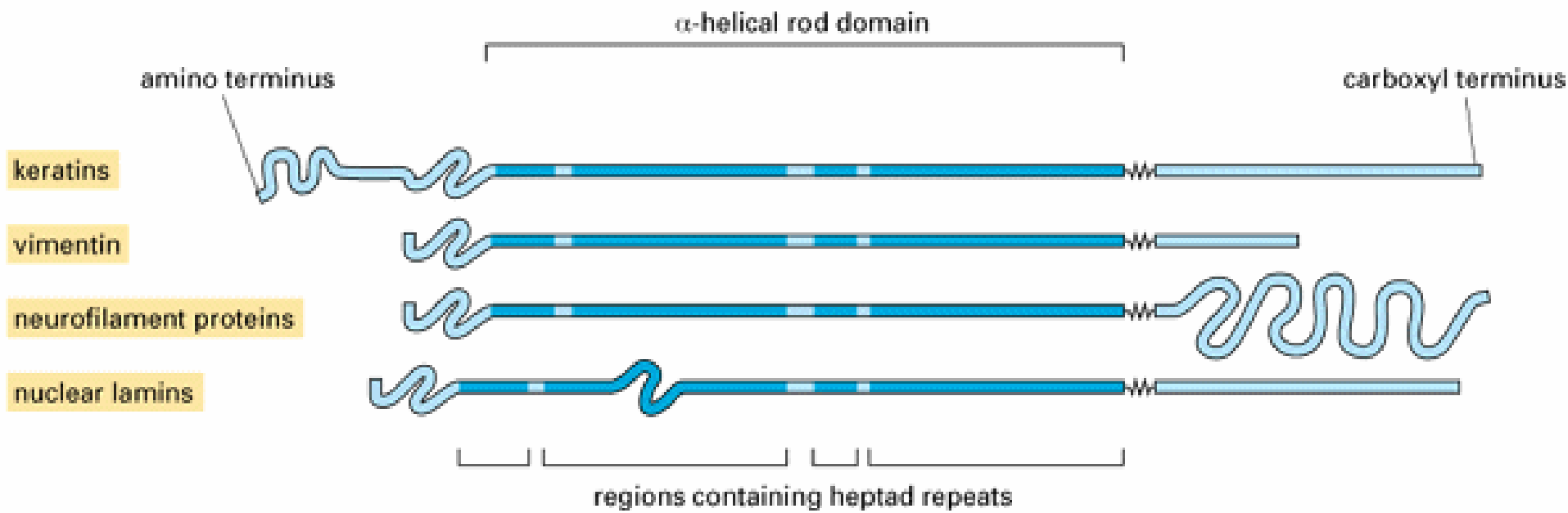
# FIBROBLASTO EN CULTIVO. ESTUDIOS DE INMUNO FLUORESCENCIA PARA REVELAR FILAMENTOS INTERMEDIOS DE KERATINA.



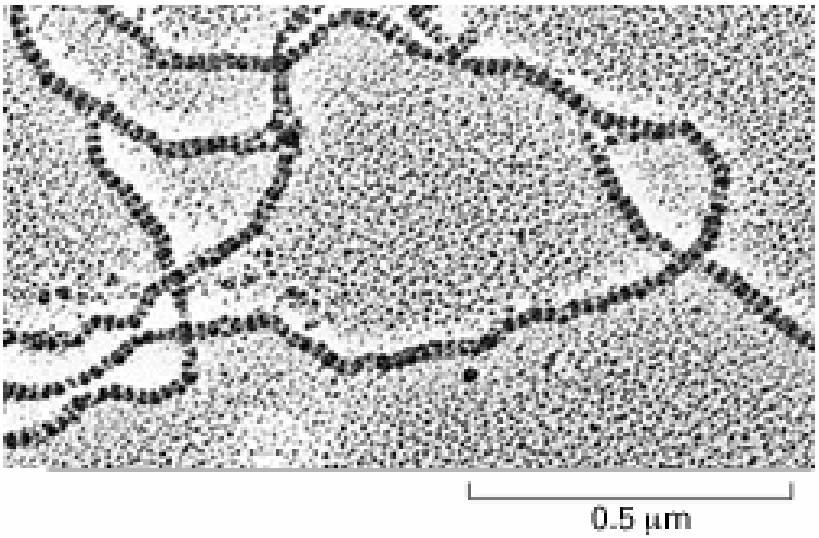
# FILAMENTOS INTERMEDIOS EN EL CITOPLASMA DE UNA CELULA EN CULTIVO

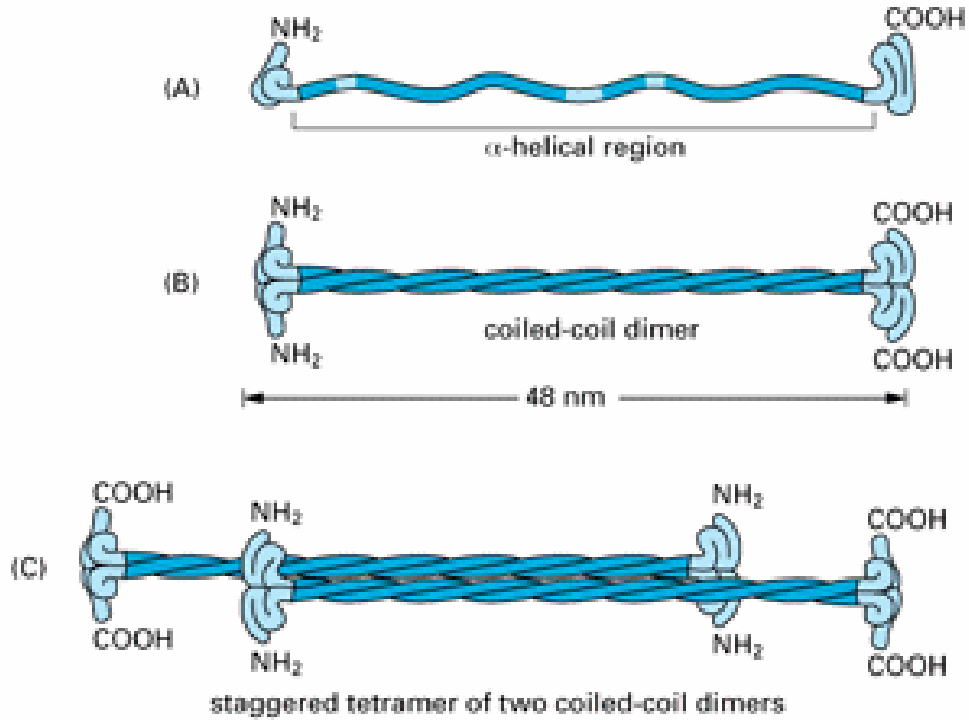


# MONOMEROS PROTEICOS DE FILAMENTOS INTERMEDIOS

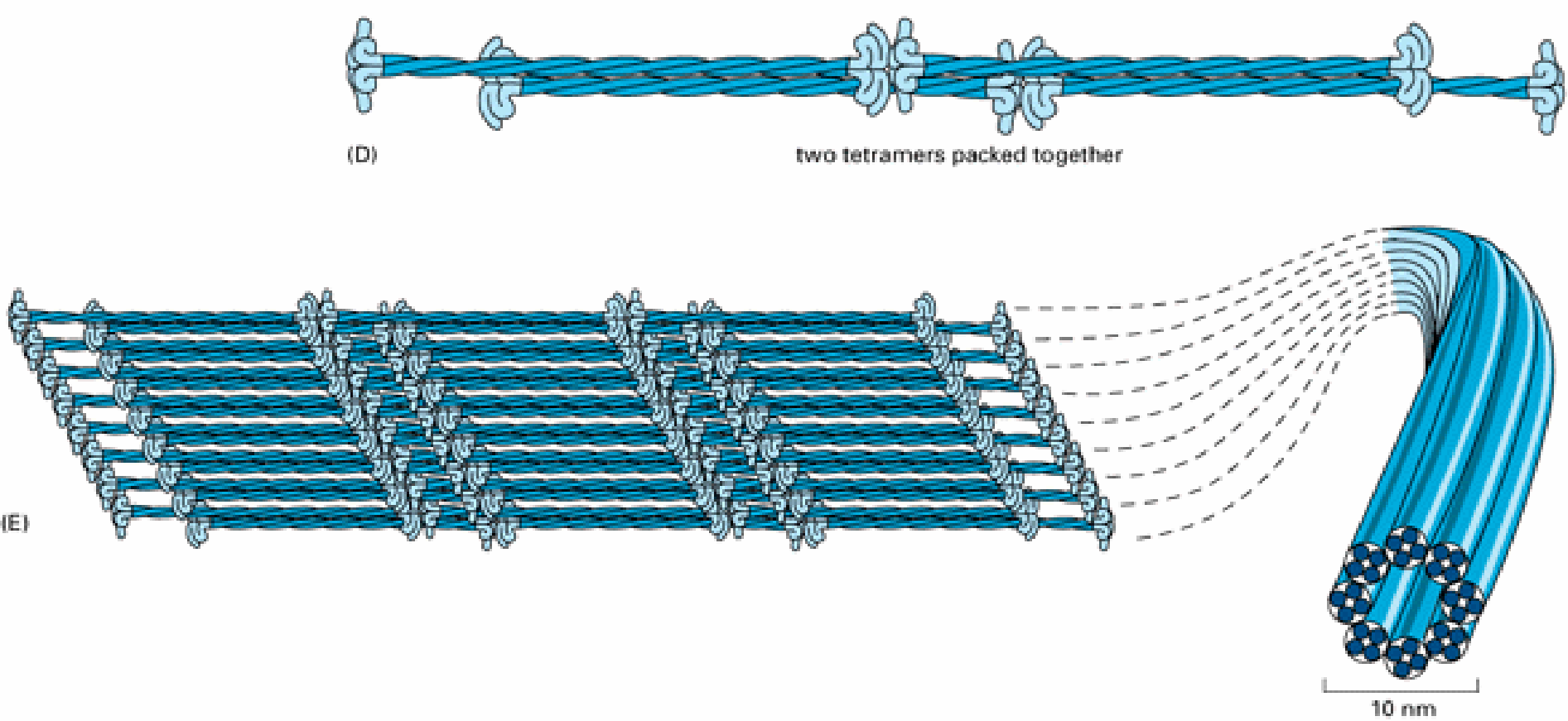


# MODELO PARA LA CONSTRUCCION DE FILAMENTOS INTERMEDIOS



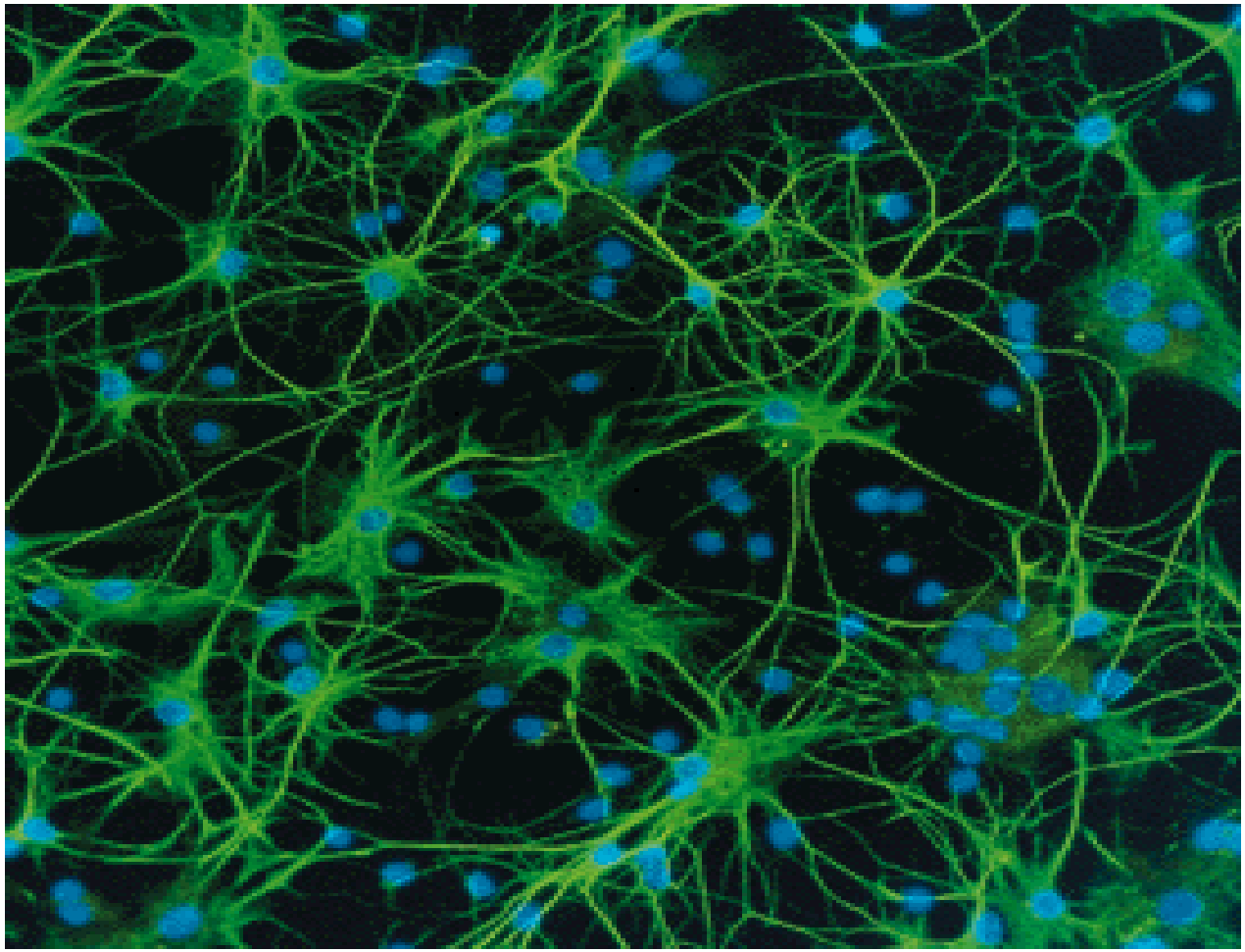
# ARREGLO DE TETRAMEROS EN FORMA HELICOIDAL PARA FORMAR UN FILAMENTO INTERMEDIO "TIPO-CORDEL"



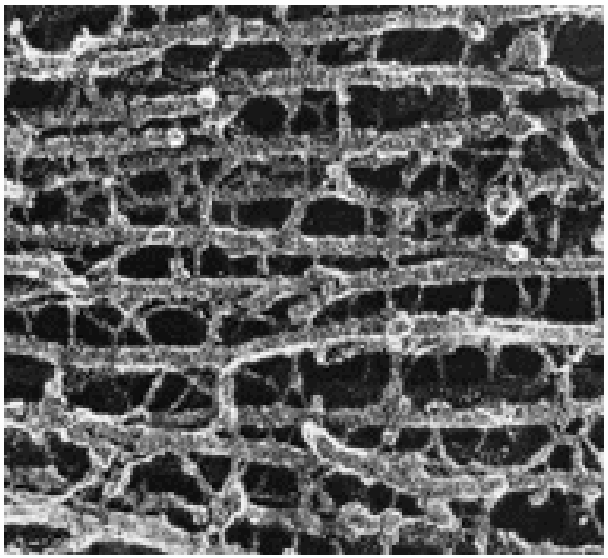
# Table 16-1. Major Types of Intermediate Filament Proteins in Vertebrate Cells

| 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)<br>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 |

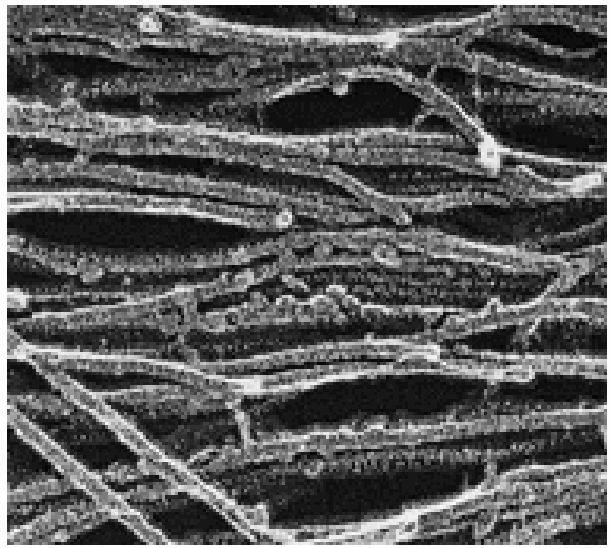
# INMUNOFLUORESCENCIA PARA PROTEINAS FIBRILARES EN ASTROCITOS EN CULTIVO



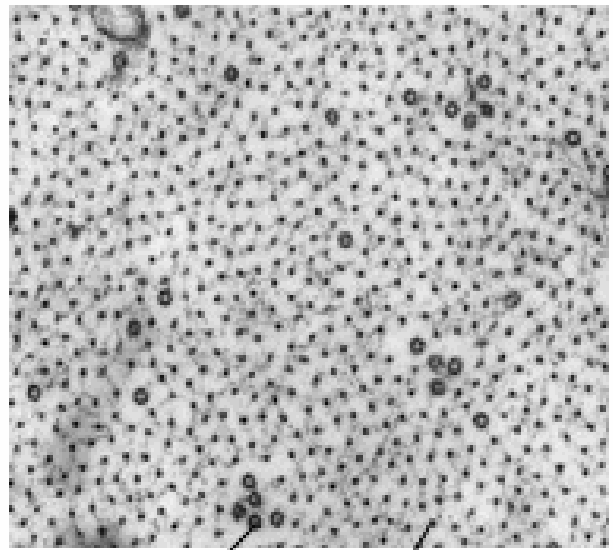
# DOS TIPOS DE FILAMENTOS INTERMEDIOS EN CELULAS DEL SISTEMA NERVIOSO. MICROSCOPIA ELECTRONICA DE TRANSMISION



(A)

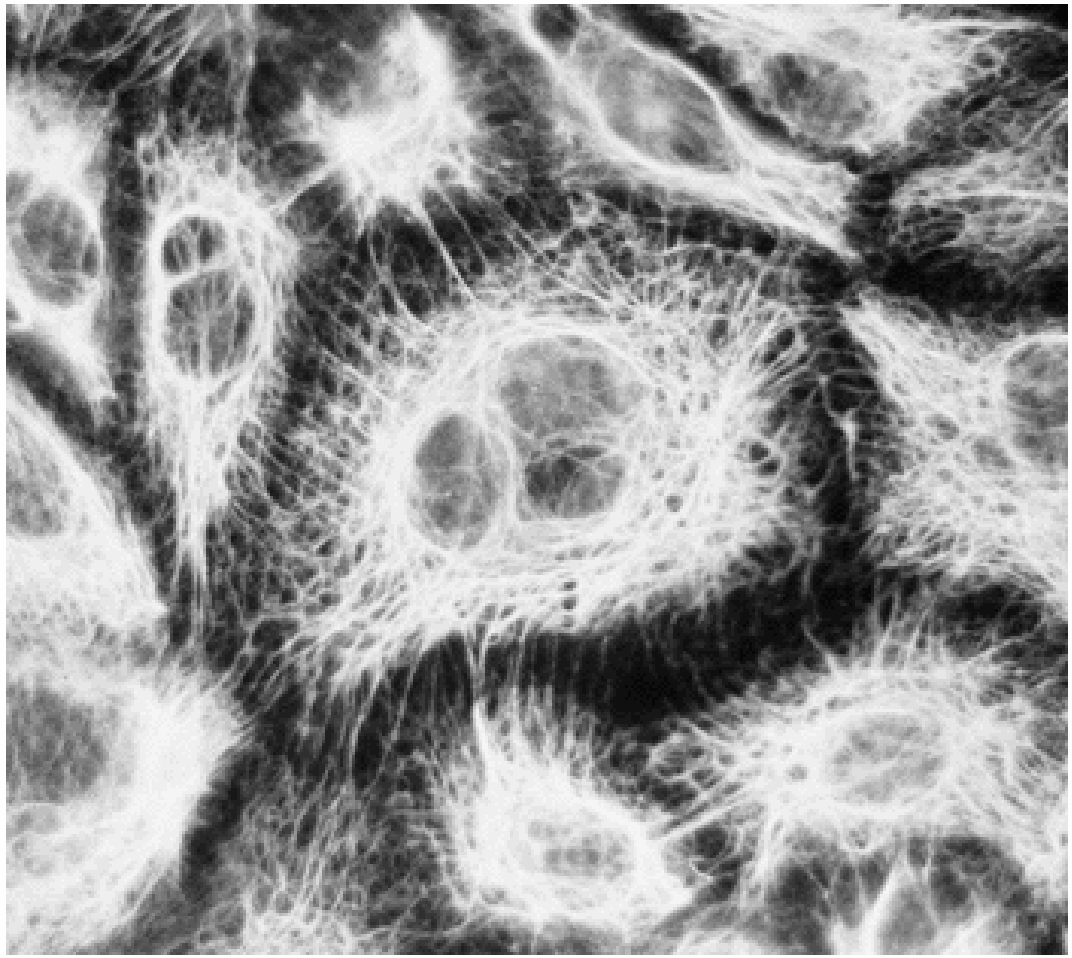



(B)

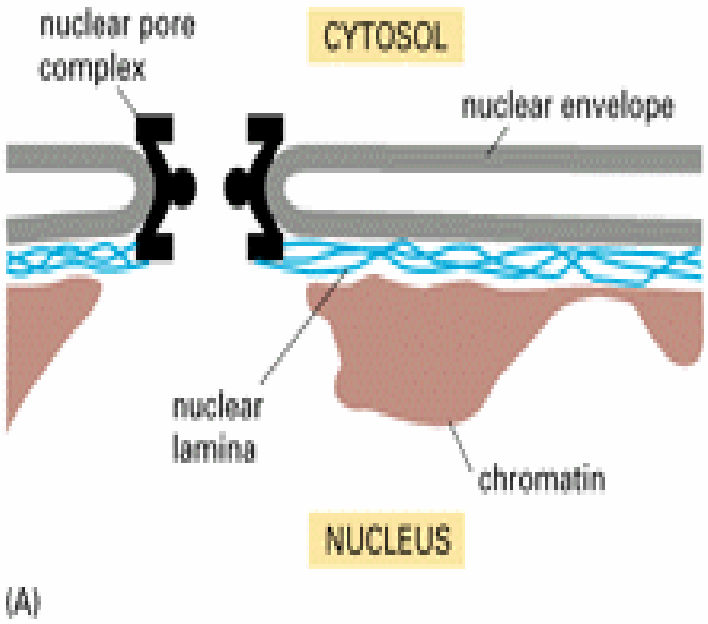


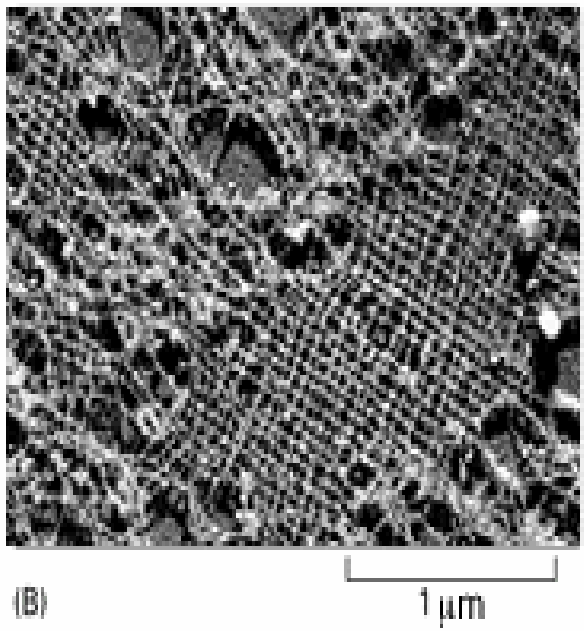

(C)

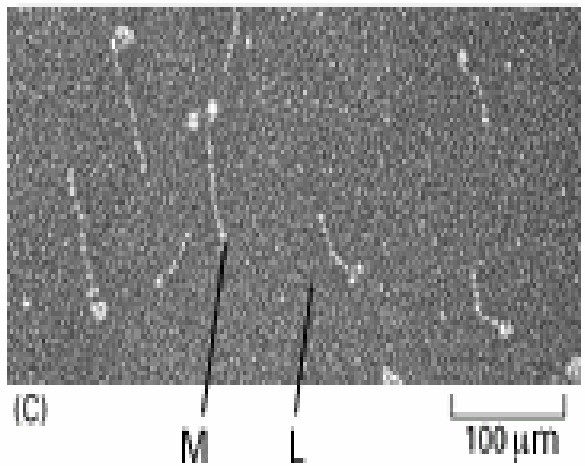
# FILAMENTOS DE KERATINA Y FORMACIÖN DE UNA CAPA DE CELULAS



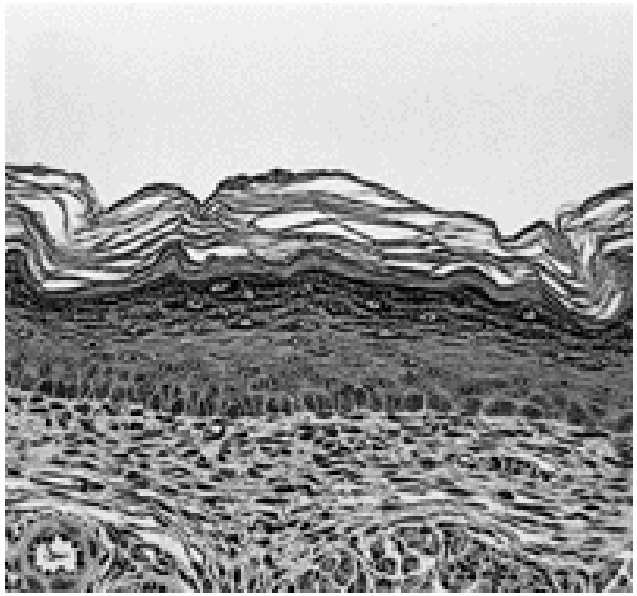
# LA LAMINA NUCLEAR



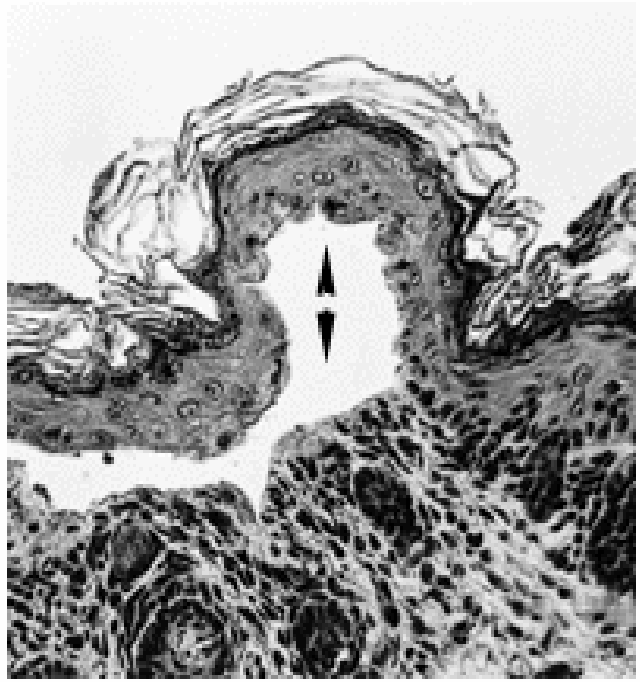



# FILAMENTOS INTERMEDIOS DAN ESTABILIDAD MECANICA A LAS CELULAS ANIMALES

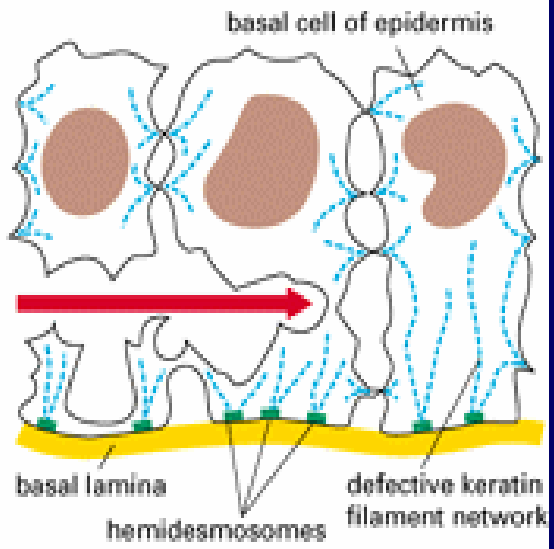


(A)

40 µm

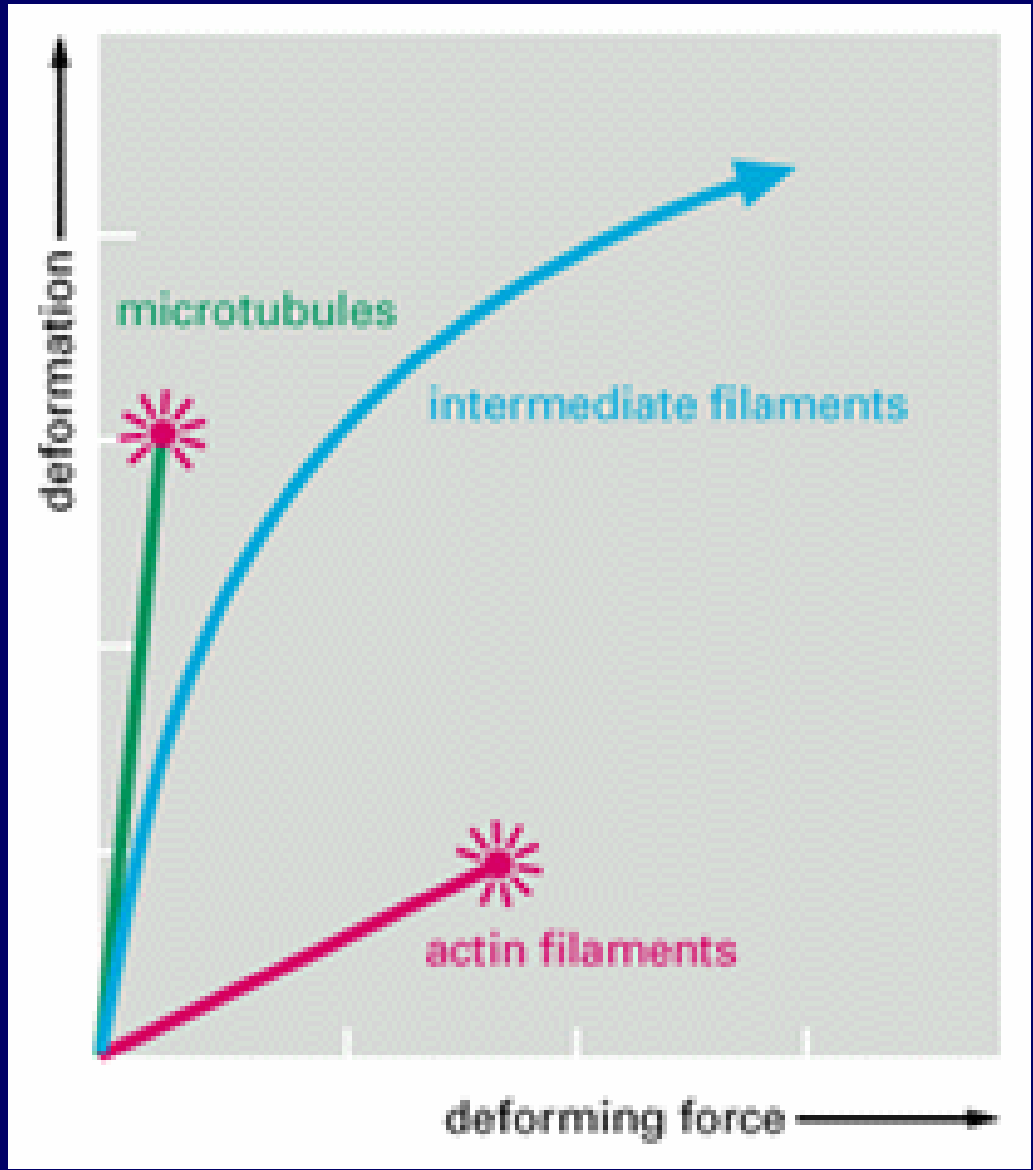


(B)

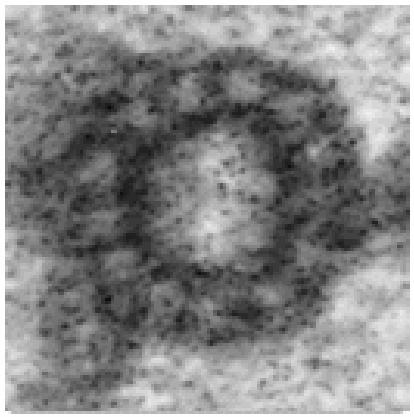


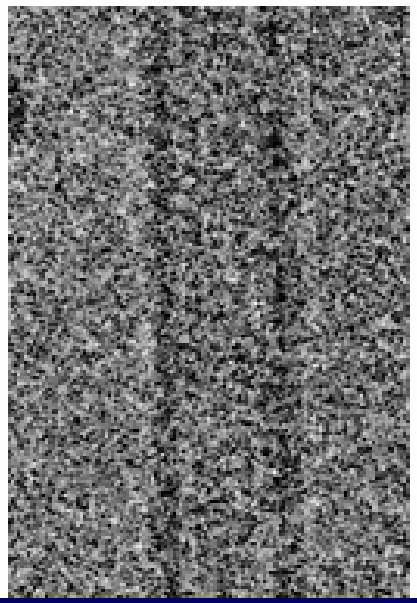

(C)

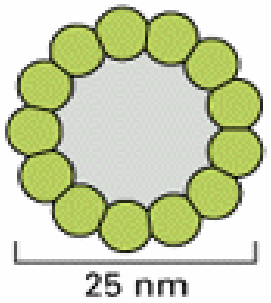
# PROPIEDADES MECANICAS DE POLIMEROS DE ACTINA VIMENTINA Y TUBULINA

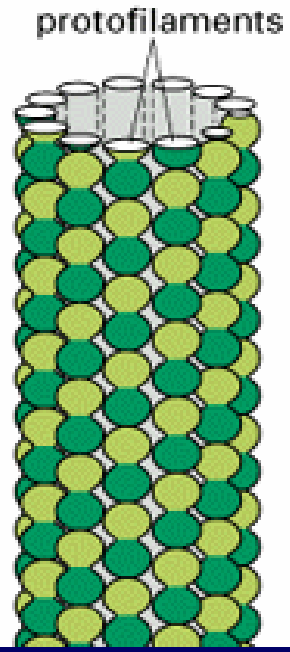


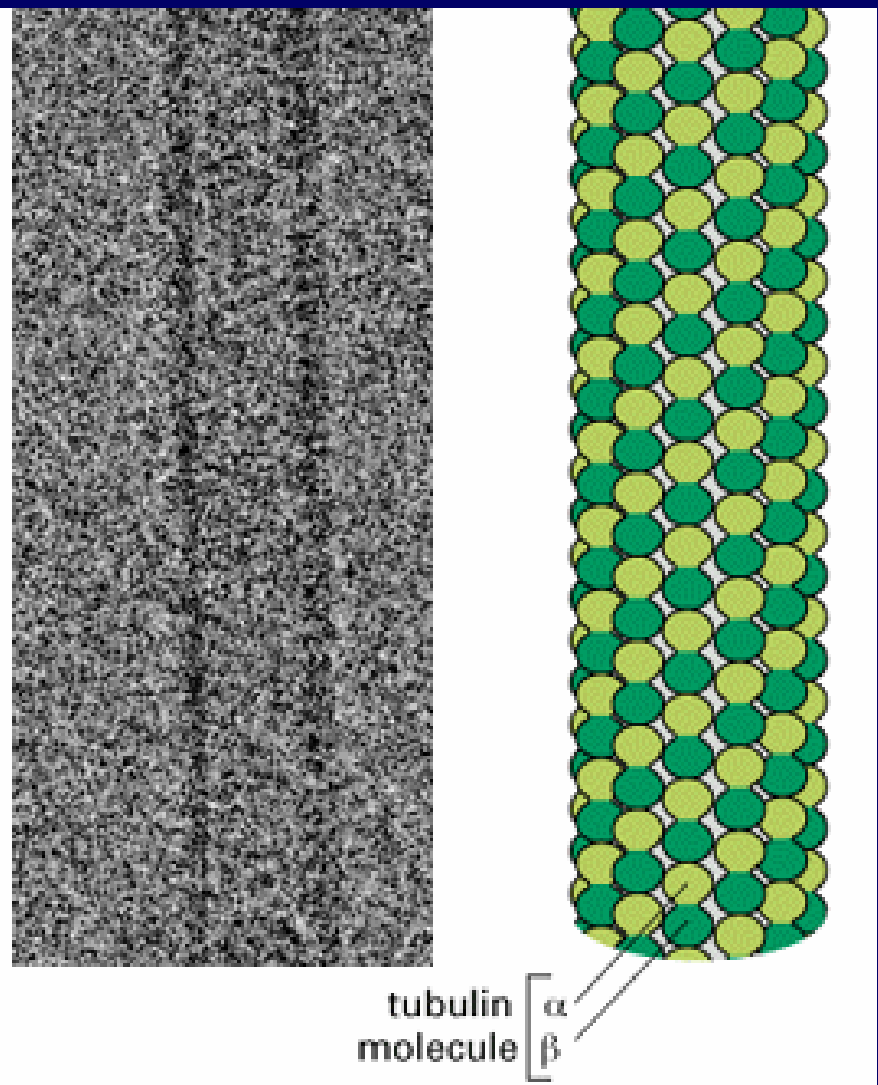
# MICROTUBULOS



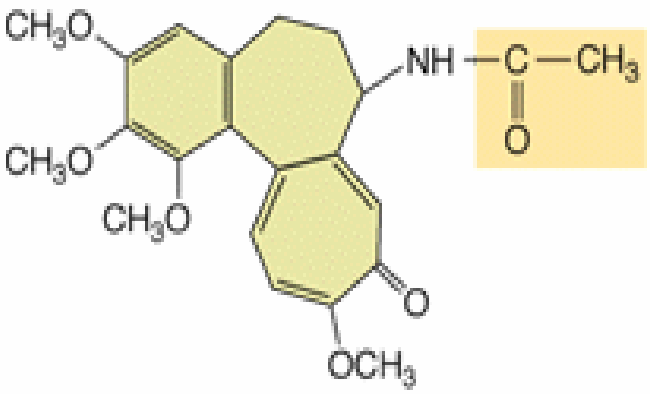



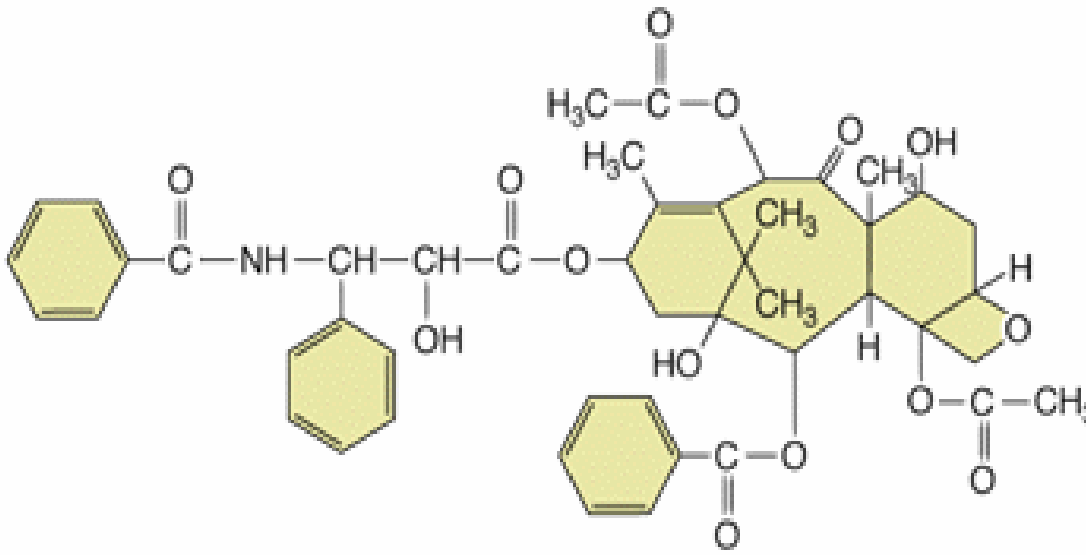



# DROGAS ANTIMITOTICAS



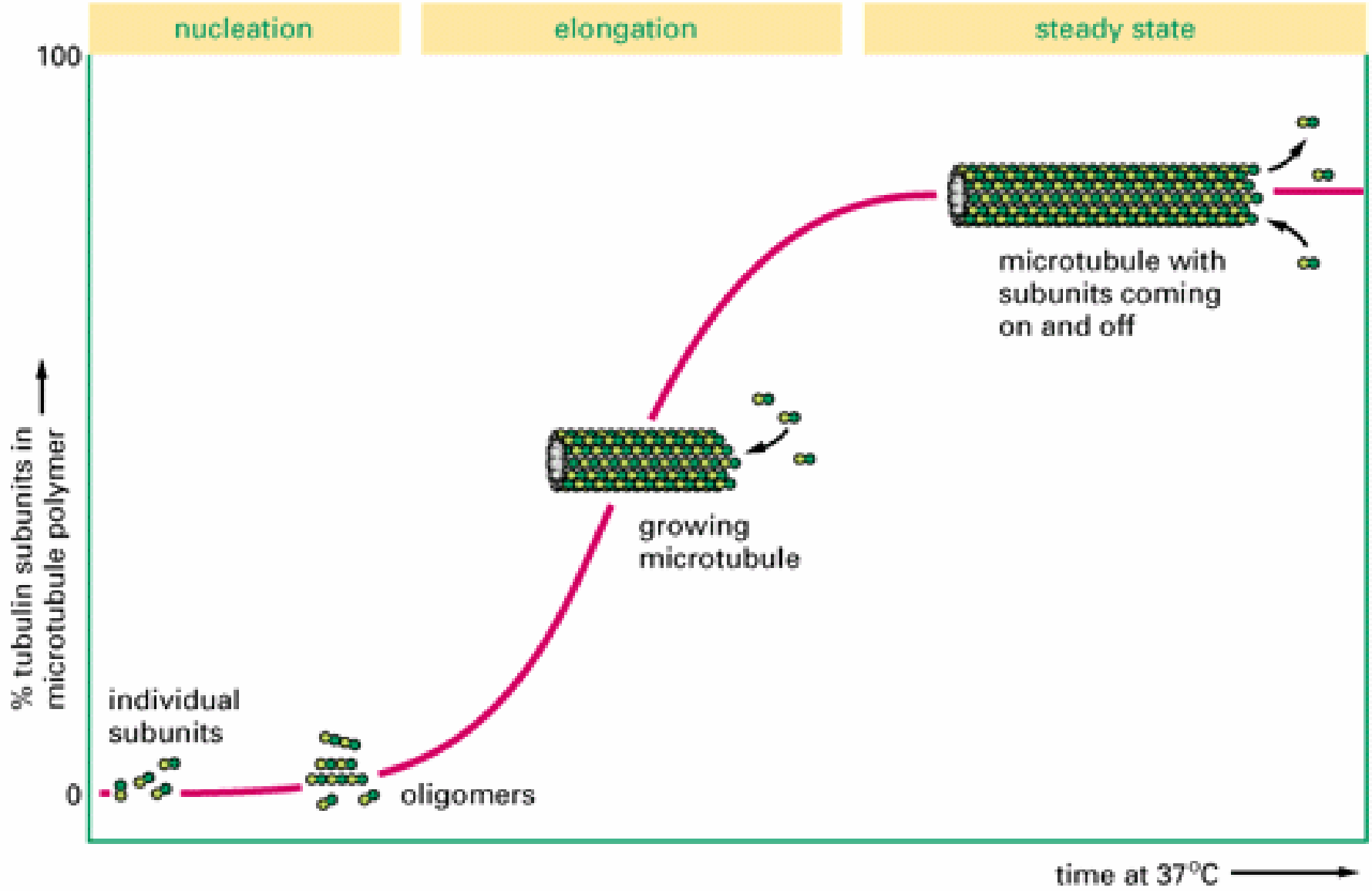

colchicine



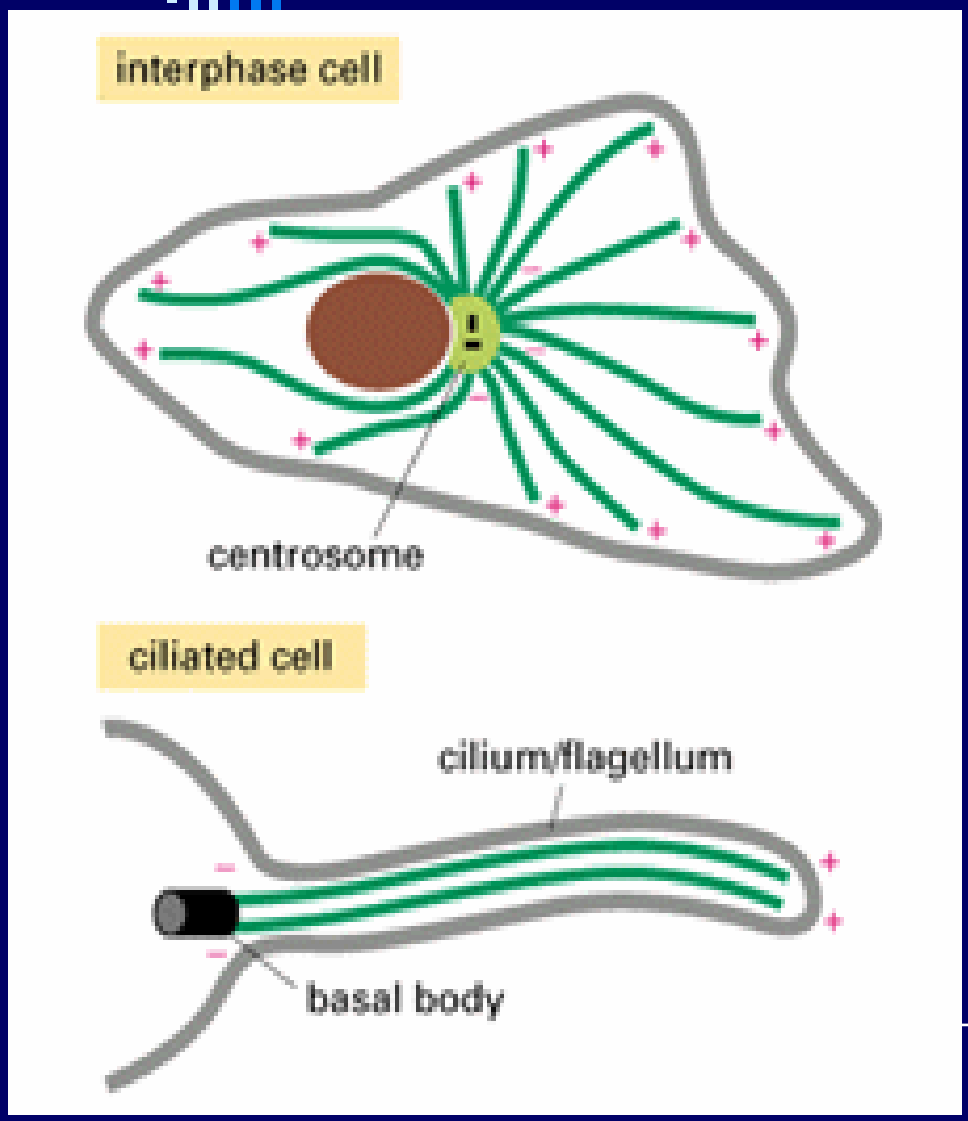

taxol

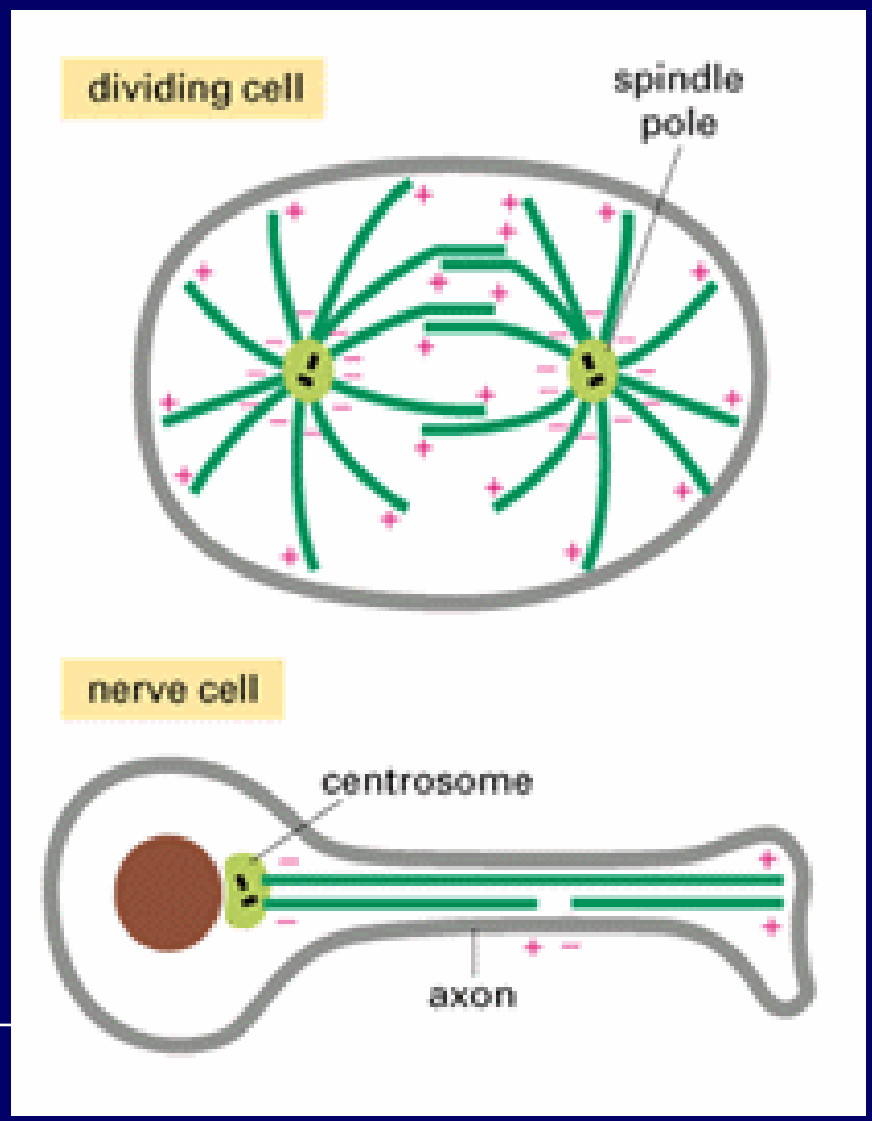
**PERTURBAN POLIMERIZACION-DEPOLARIZACION DE TUBULINA**

# POLIMERIZACION DE TUBULINA PURA

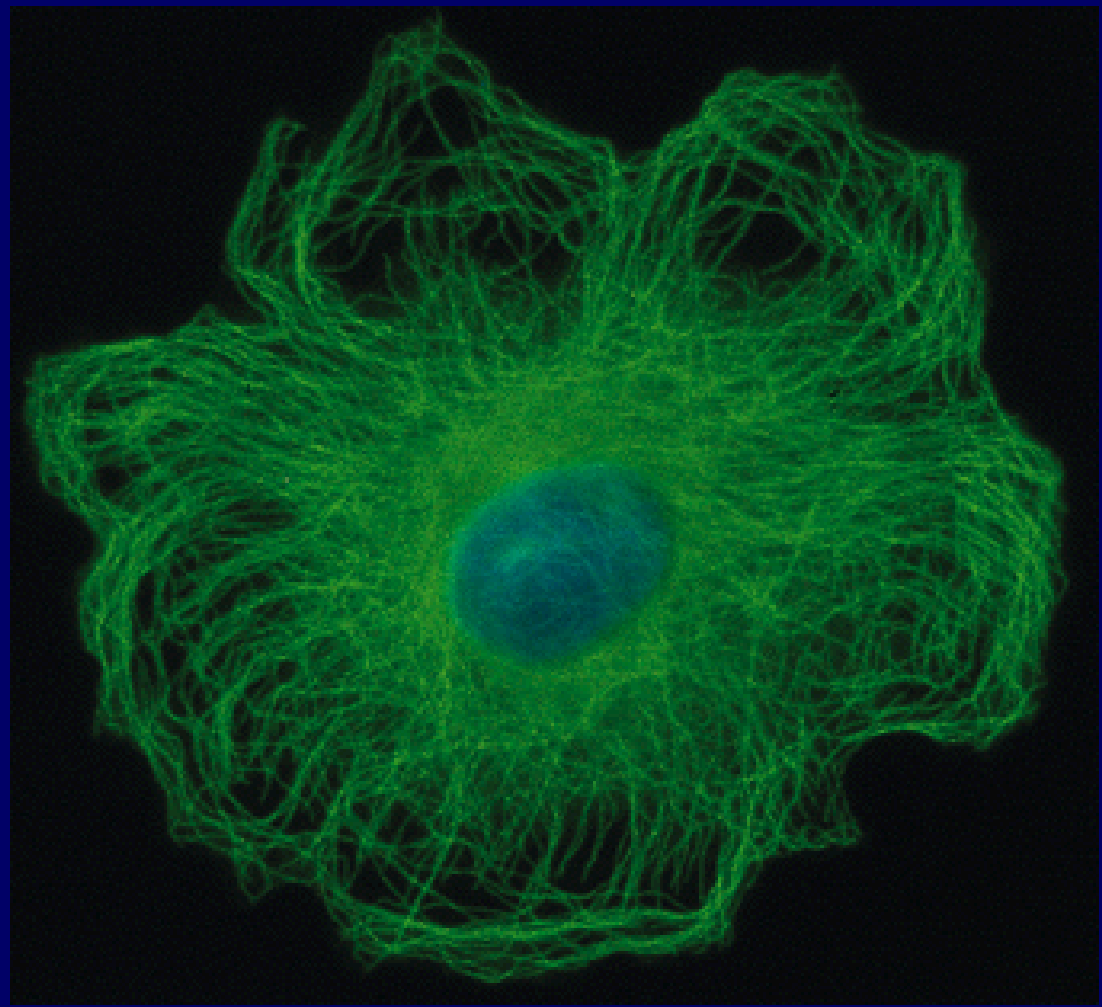


# POLARIDAD DE MICROTUBULOS

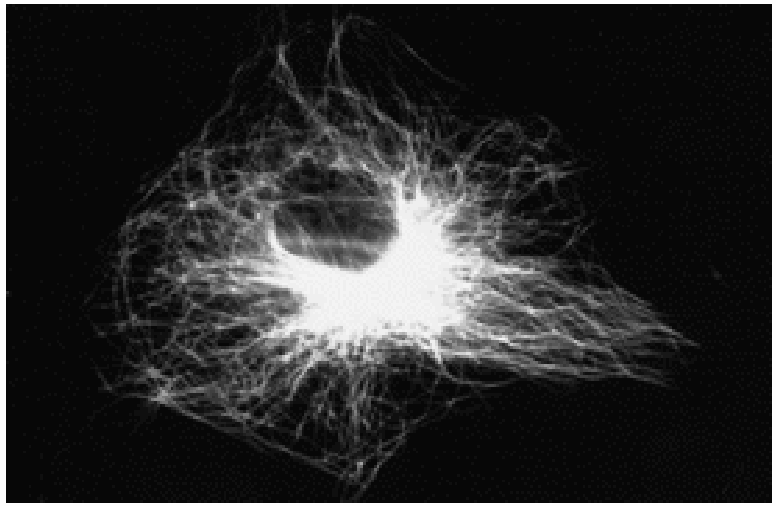


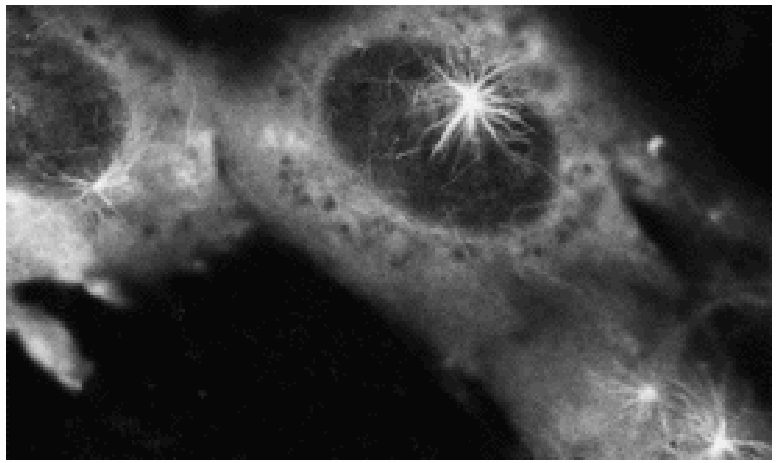
# MICROTUBULOS EN UNA CELULA EN CULTIVO : INTERFASE



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



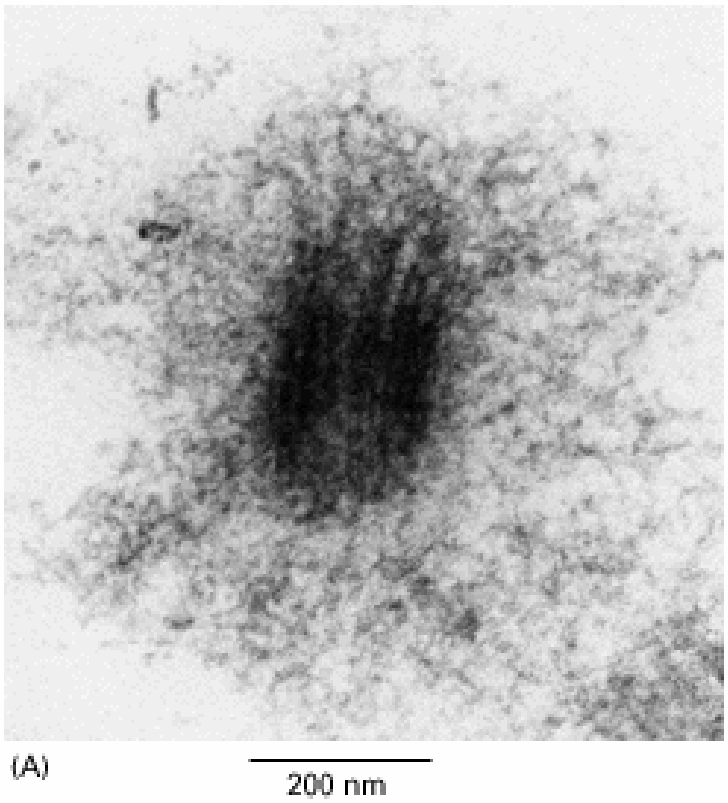
(A)



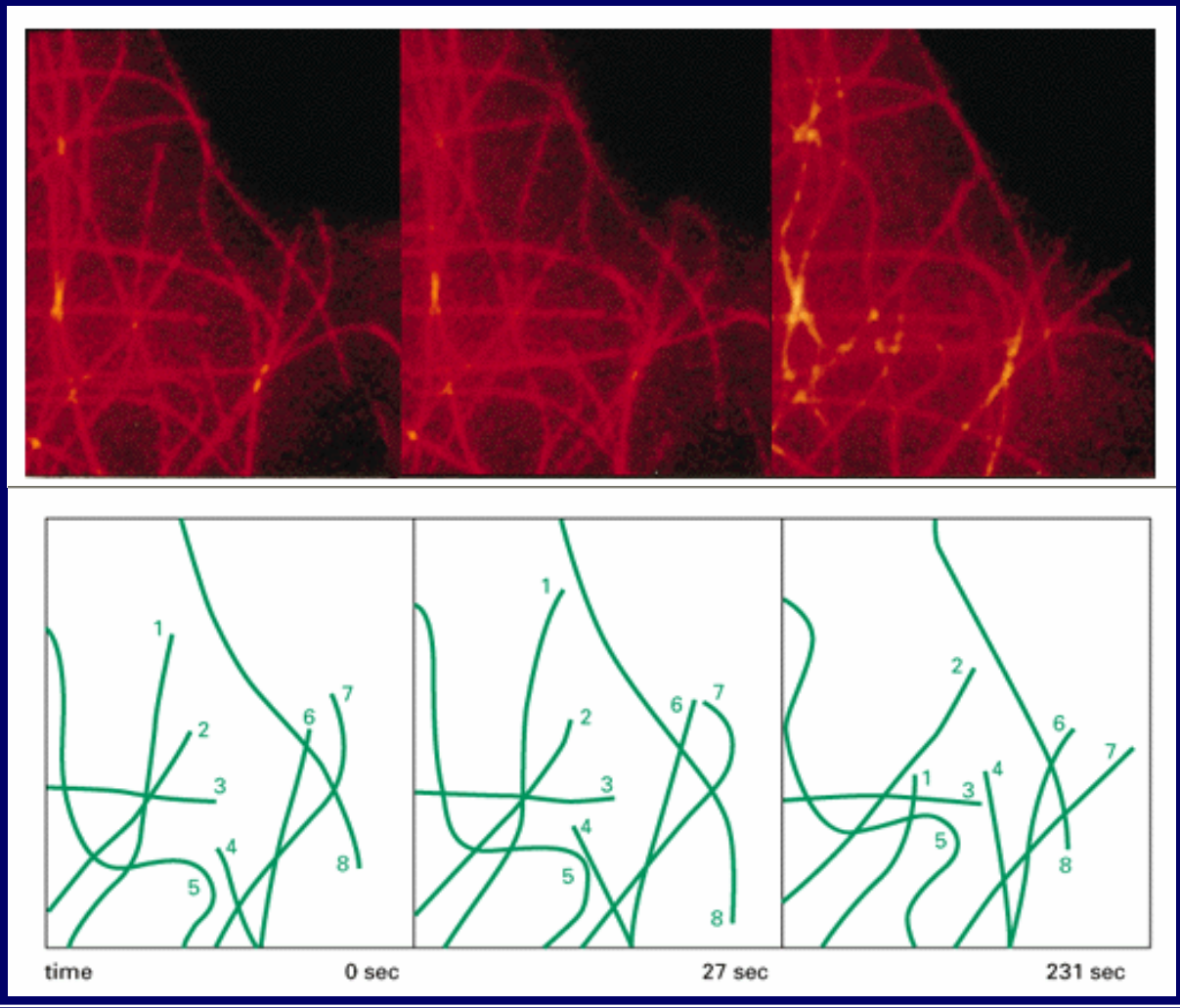
(B)

20 μm

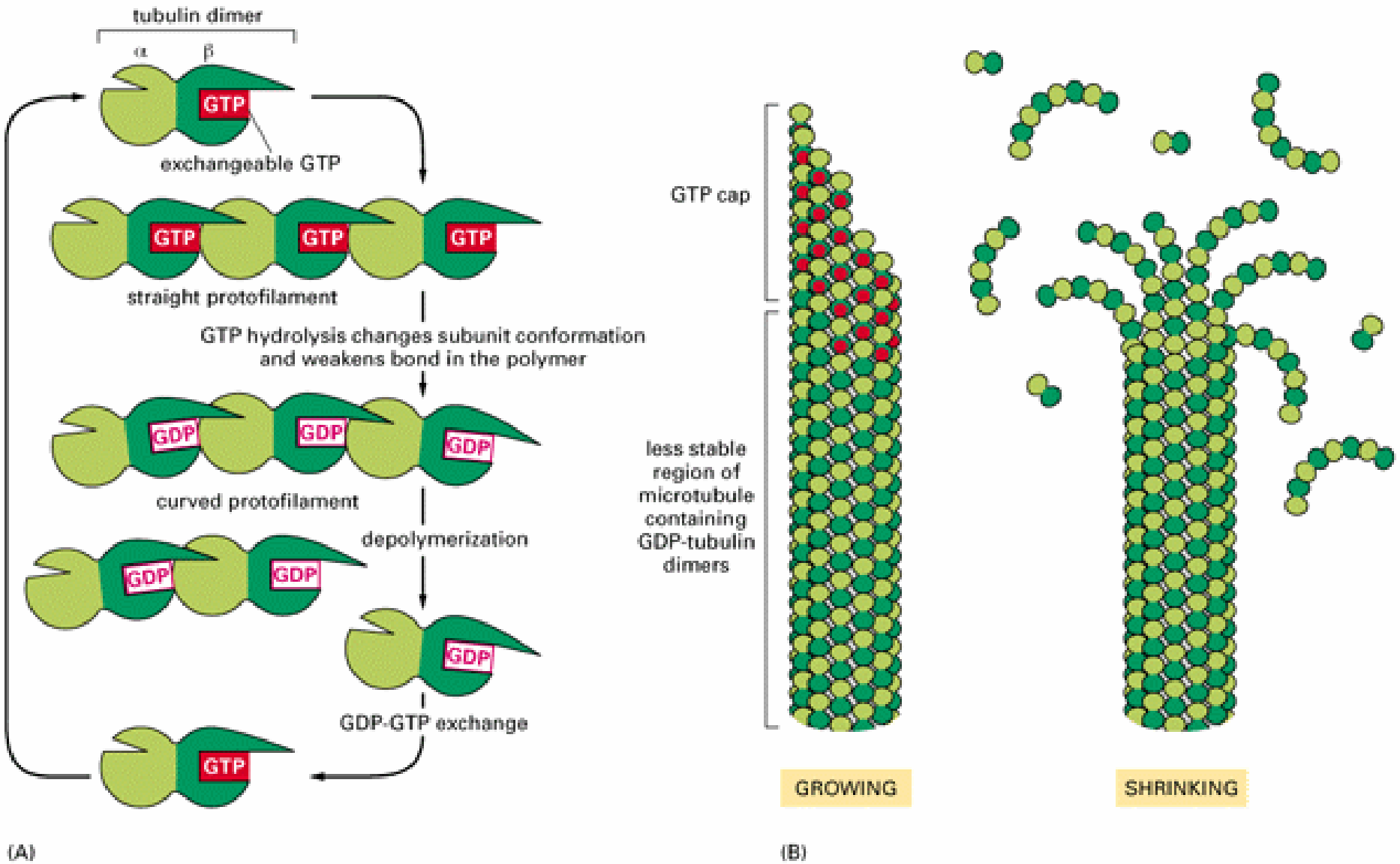
# CENTROSOMA ORGANIZACIÓN EN UNA CELULA EN DIVISION



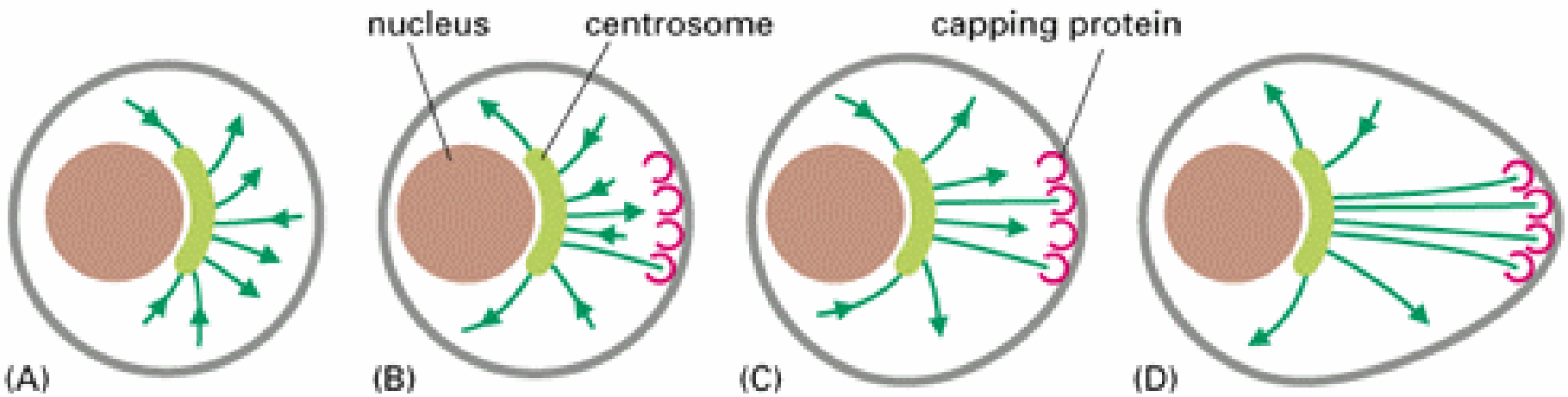
# DINAMICA DE MICROTUBULOS (TUBULINA MARCADA CON RHODAMINA)



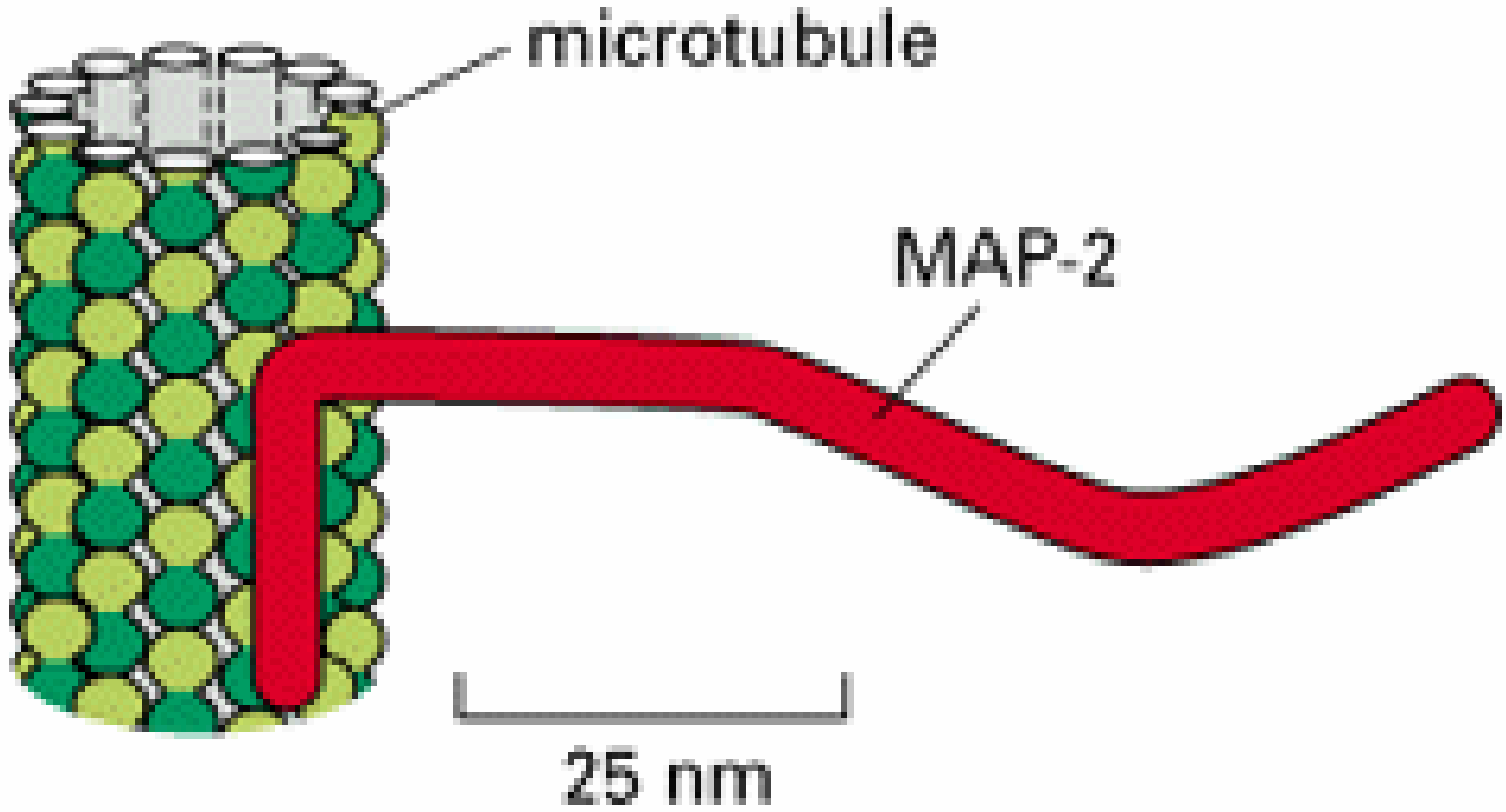
# HIDRÓLISIS DE GTP LUEGO DE LA POLIMERIZACION DESESTABILIZA LA ORGANIZACIÓN DE MICROTUBULOS



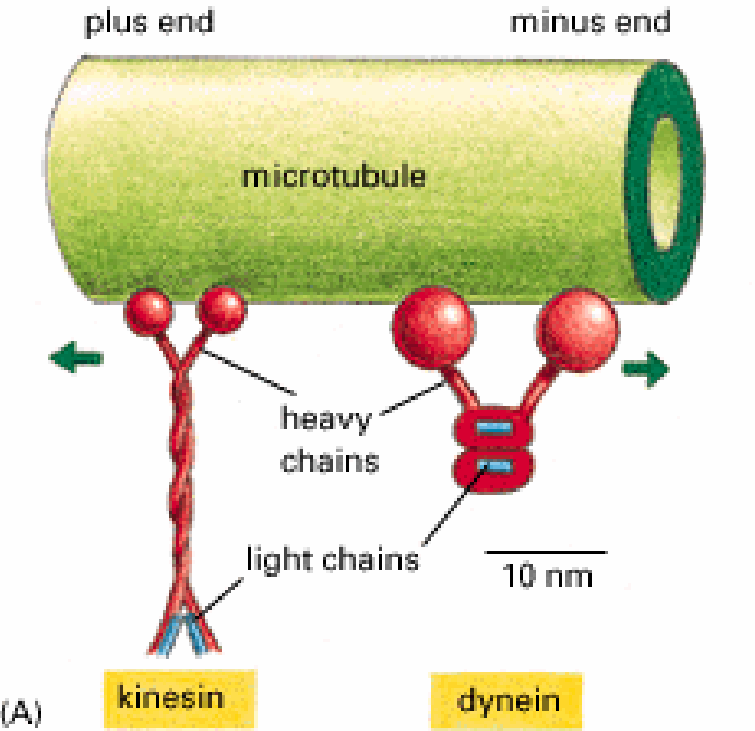
# LA ESTABILIZACION SELECTIVA DE MICROTUBULOS PUEDE POLARIZAR UNA CELULA

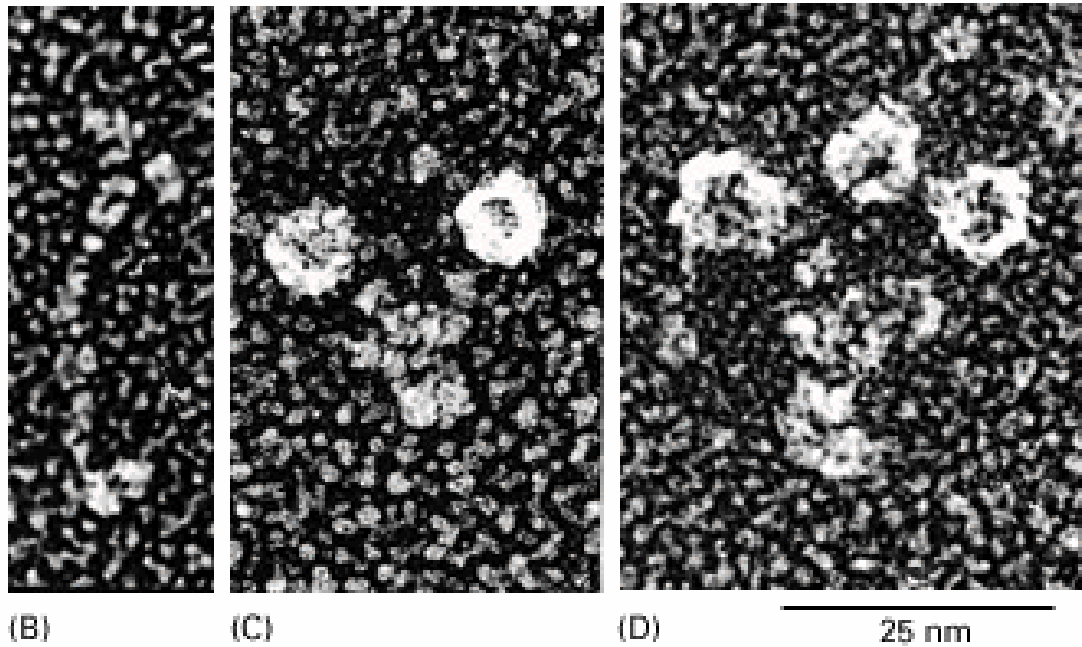
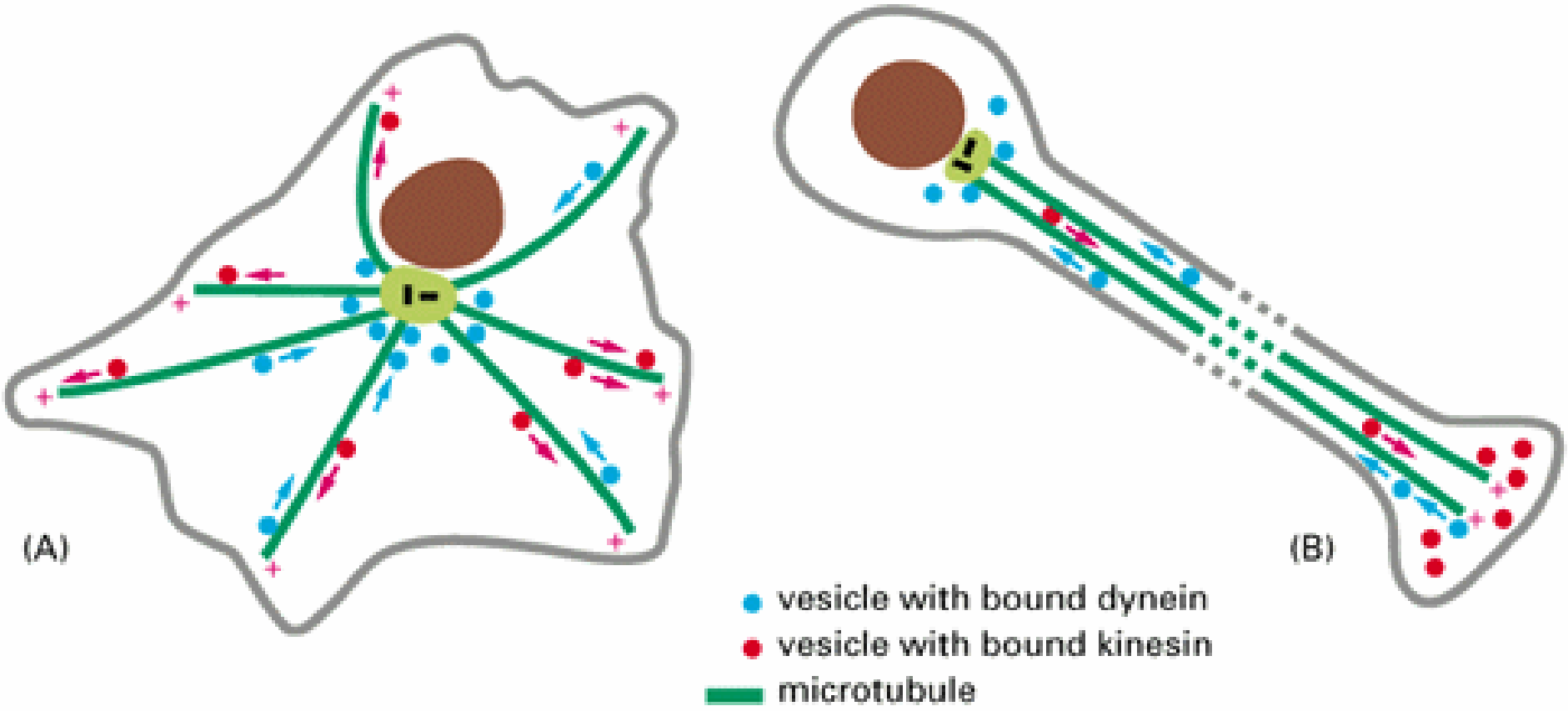


# PROTEINA ASOCIADA A MICROTUBULO MAP-2



# PROTEINAS MOTORAS DE MICROTUBULOS






# TRANSPORTE BIDIRECCIONAL DE VESICULAS INTRACELULARES