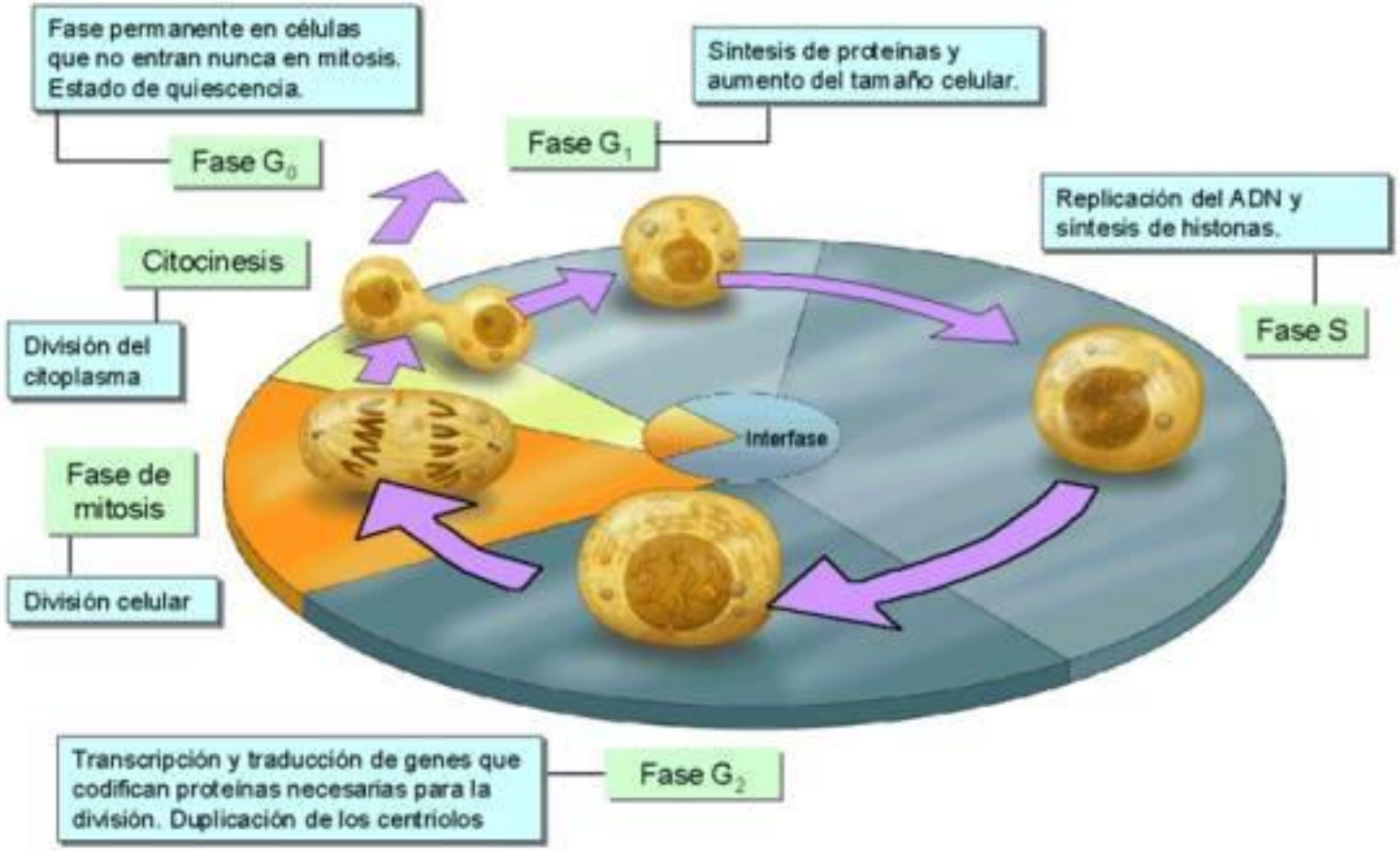
APLICACIÓN DE LA NANOTECNOLOGÍA PARA EL TRATAMIENTO DEL CÁNCER

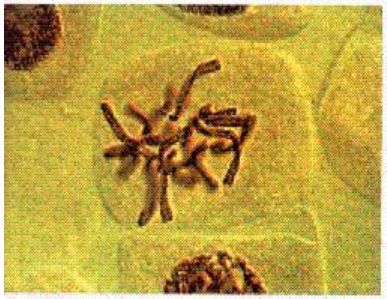
- Las células cancerígenas sobre-expresan antígenos particulares en su superficie.
- Los anticuerpos monoclonales fueron los primeros en descubrirse (1975) como agentes capaces de unirse específicamente a células cancerígenas.

Table 1
Currently available targeted cancer treatments using antibodies [13,14]

Generic name	Trade name	Manufacturer, year approved	Target and indication
Rituximab	Rituxan®	IDEC Pharmaceuticals, 1997	Anti-CD20 antibody or relapsed/refractory CD-20 positive B-call non-Hodgkin's lymphoma and low-grade or follicular-type lymphoma
Trastuzumab	Herceptin®	Genentech, 1998	Blocks HER2 receptor for HER-2 positive metastatic breast cancer
Gemtuzumabozogamicin	Mylotarg®	Wyeth Pharmaceuticals, 2000	Anti-CD33 antibody for relapsed/refractory acute myelogenous leukemia
Alemtuzumab	Campath®	Berlex Laboratories, 2001	Anti-CD52 antibody for B-call chronic lymphocytic leukemia
Ibritumomab tiuxetan	Zevalin®	IDEC Pharmaceuticals, 2002	Anti-CD20 antibody for Rituximab-failed non-Hodgkins lymphoma
Gefitinib	Iressa	AstraZeneca, 2003	Blocks epidermal growth factor receptors and tyrosine kinase activity for advanced non-small cell lung cancer

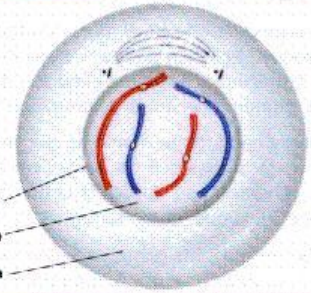
LA MITAD DEL PROBLEMA...

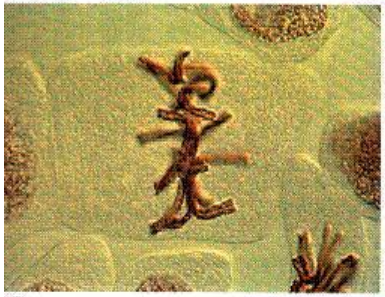

Fase permanente en células que no entran nunca en mitosis. Estado de quiescencia.
Fase G_0
Sintesis de proteinas y aumento del tamaño celular.
Fase G_1
Replicación del ADN y síntesis de histonas.
Fase S
Citocinesis
División del citoplasma
Interfase
Fase de mitosis
División celular
Transcripción y traducción de genes que codifican proteinas necesarias para la división. Duplicación de los centriolos
Fase G_2



PROFASE

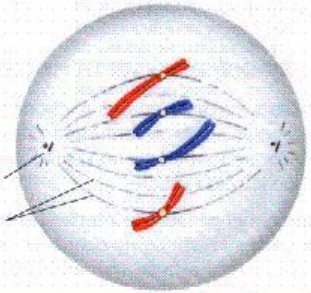
La cromatina se condensa y los cromosomas se hacen visibles; están formados por dos cromátidas unidas por el centrómero. Los centriolos se van separando y se forman los microtúbulos del huso, que permiten el movimiento y el reparto de los cromosomas durante la mitosis.

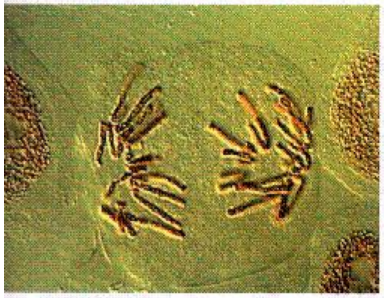




METAFASE

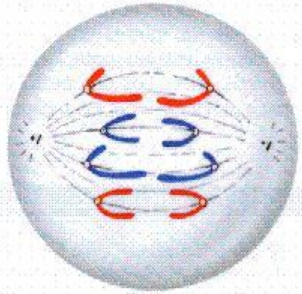
La membrana nuclear desaparece y los cromosomas se disponen en el centro del huso. Es la fase en la que mejor se distinguen las características de los cromosomas.





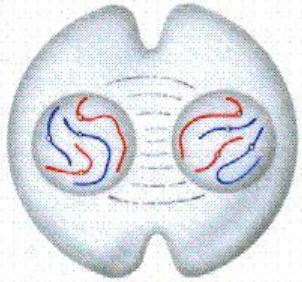
ANAFASE

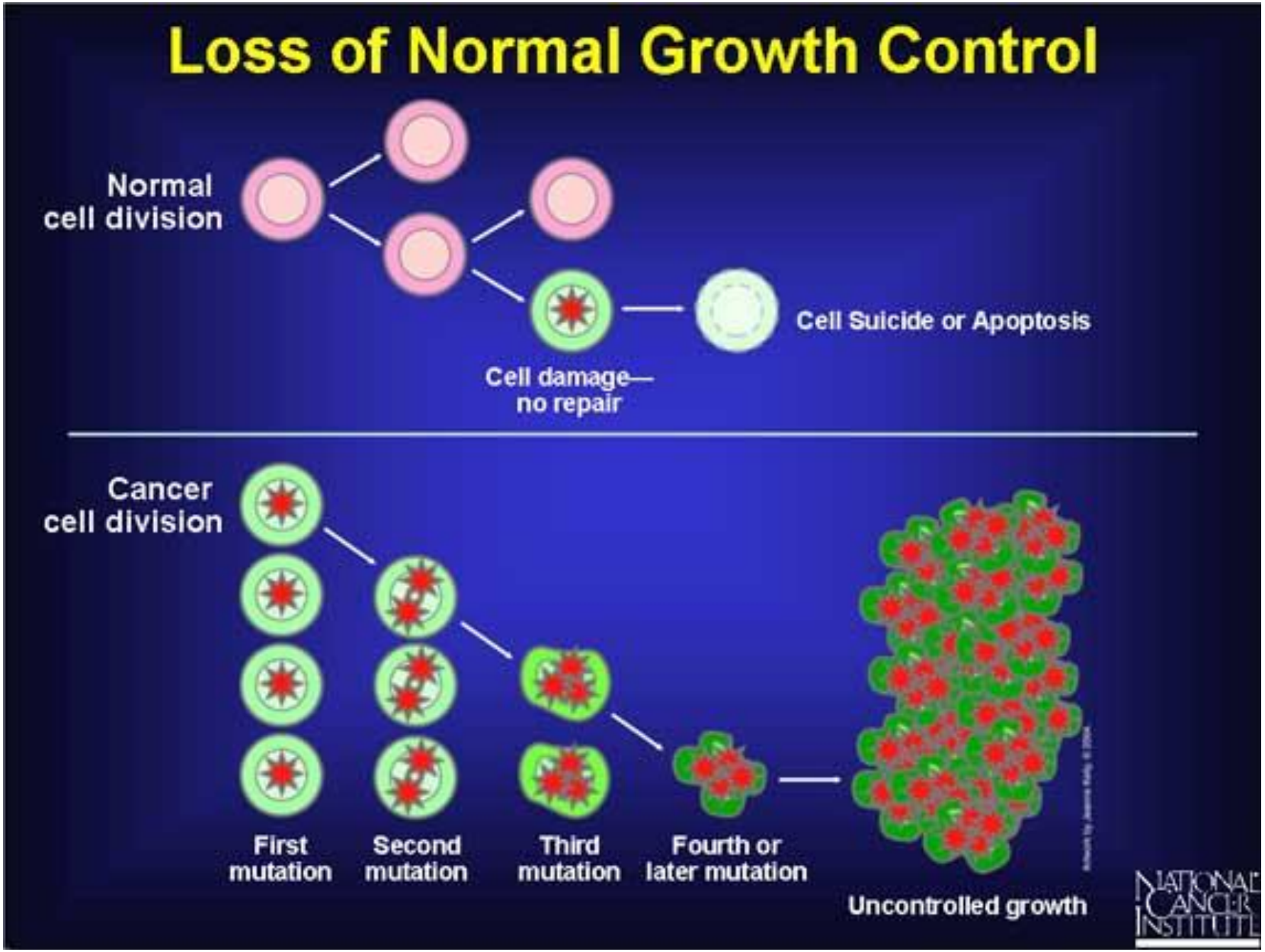
El centrómero de cada cromosoma se divide, los microtúbulos se contraen y arrastran a las cromátidas hacia los dos polos de la célula.

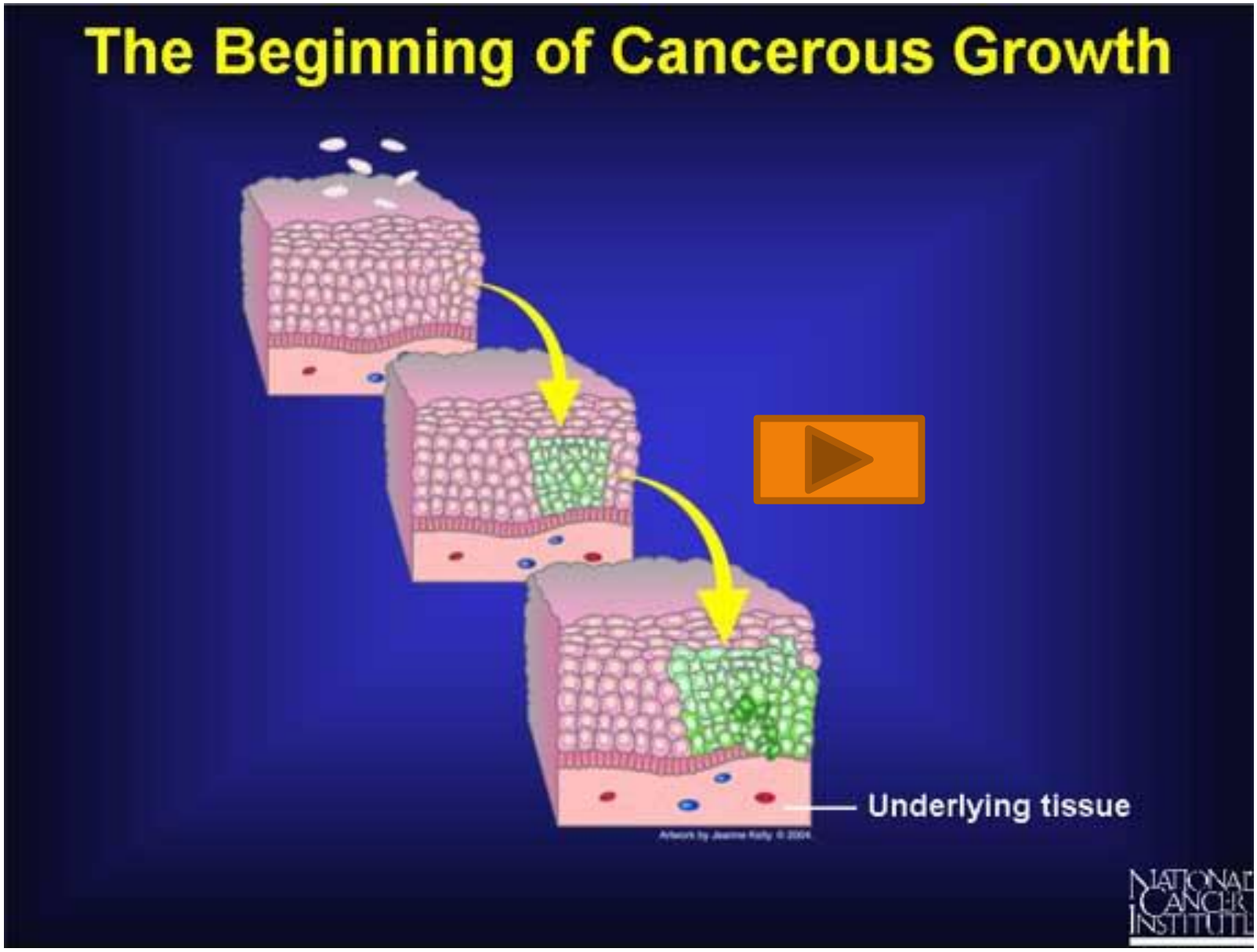


TELOFASE

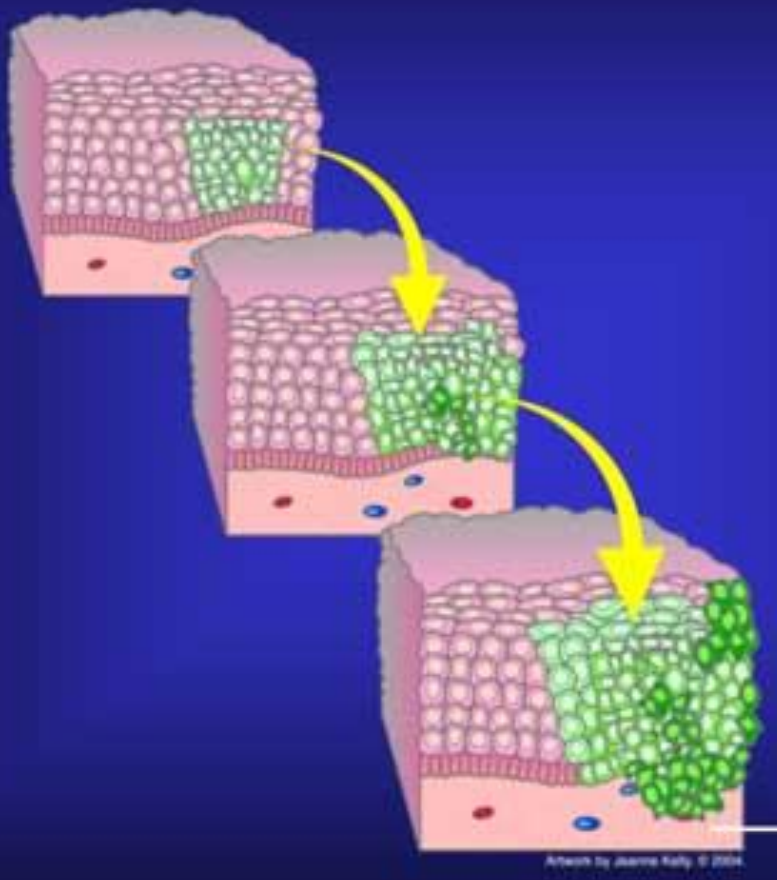
Las cromátidas se separan completamente, poco a poco dejan de ser visibles, se forma la membrana nuclear y desaparece el huso. Al final de esta etapa, el ADN se descondensa y las cromátidas dejan de ser visibles.



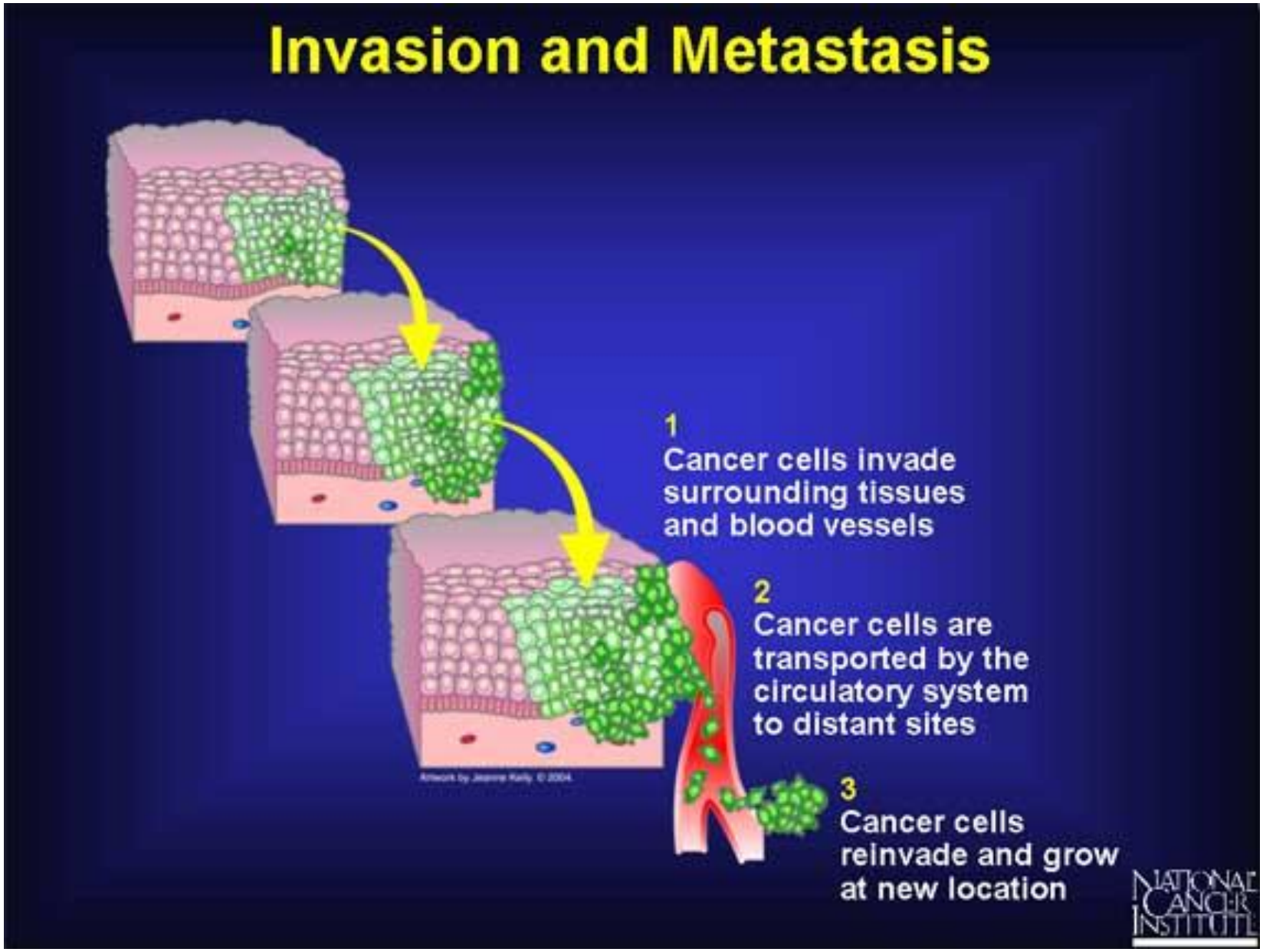

Loss of Normal Growth Control
Normal cell division
Cell Suicide or Apoptosis
Cell damage— no repair
Cancer cell division
First mutation
Second mutation
Third mutation
Fourth or later mutation
Uncontrolled growth
NATIONAL CANCER INSTITUTE


The Beginning of Cancerous Growth
Underlying tissue
NATIONAL CANCER INSTITUTE

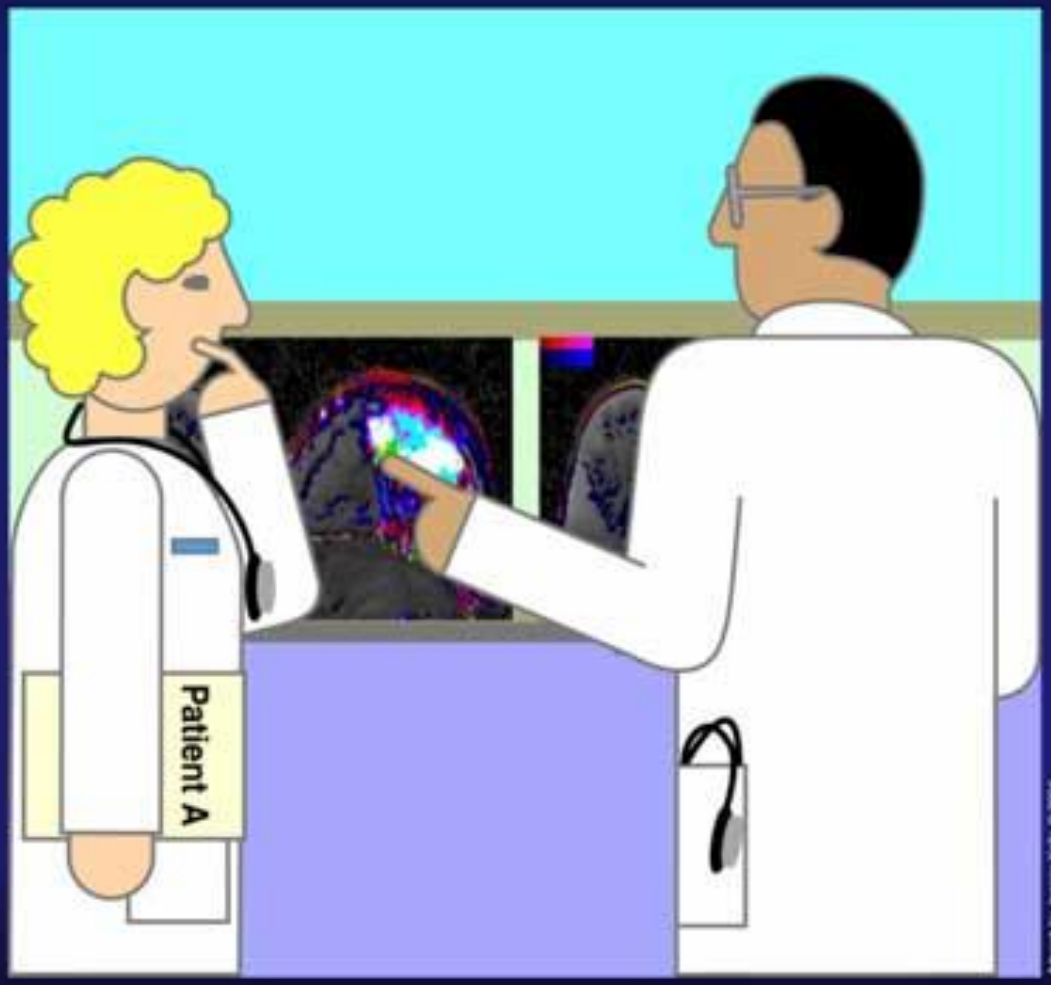
Tumors (Neoplasms)



NATIONAL CANCER INSTITUTE

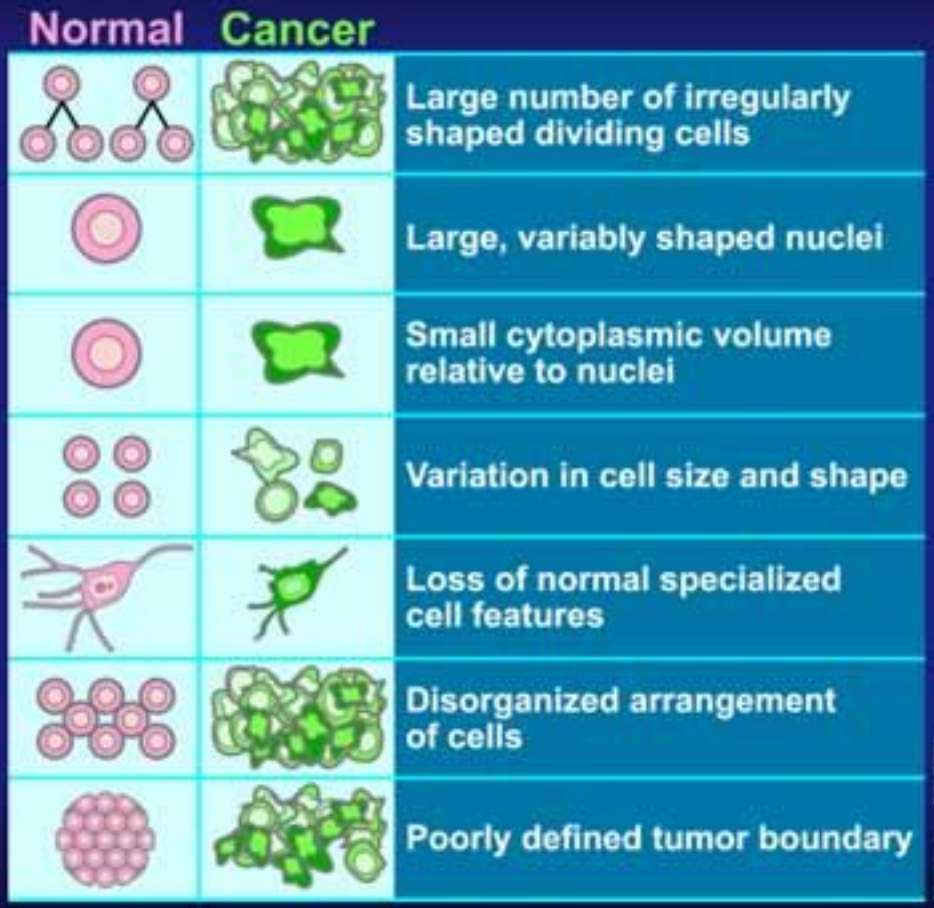

Invasion and Metastasis
1
Cancer cells invade surrounding tissues and blood vessels
2
Cancer cells are transported by the circulatory system to distant sites
3
Cancer cells reinvade and grow at new location
NATIONAL CANCER INSTITUTE

Cancer Detection and Diagnosis



NATIONAL CANCER INSTITUTE

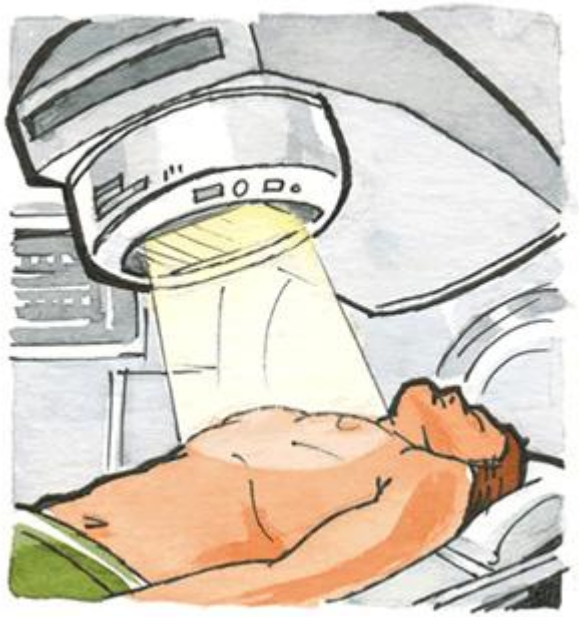
Microscopic Appearance of Cancer Cells



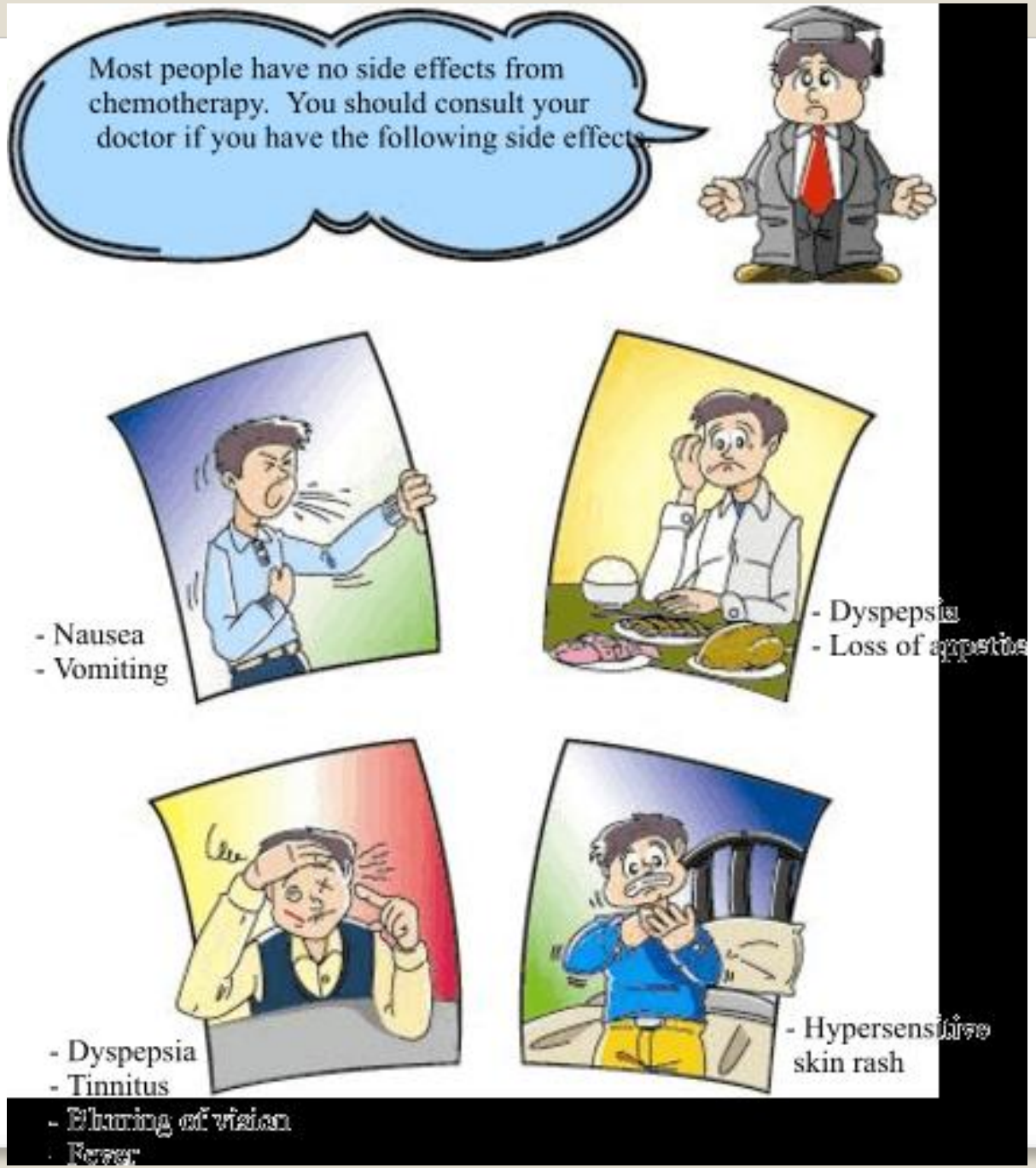
NATIONAL CANCER INSTITUTE

LA OTRA MITAD DEL PROBLEMA…

QUIMIOTERAPIA



RADIOTERAPIA

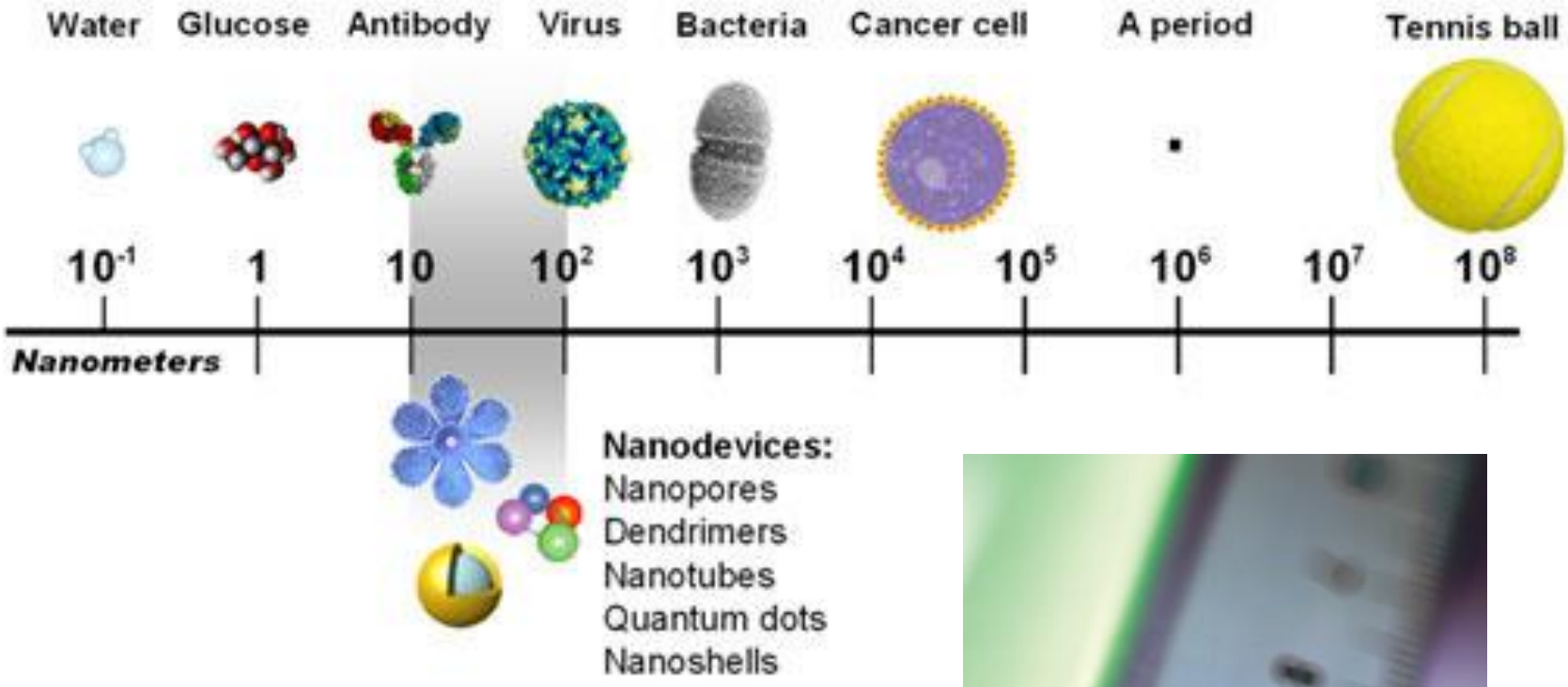

Most people have no side effects from chemotherapy. You should consult your doctor if you have the following side effects.
- Nausea
- Vomiting
- Dyspepsia
- Loss of appetite
- Dyspepsia
- Tinnitus
- Blurring of vision
- Fever
- Hypersensitive skin rash

LAS NECESIDADES…

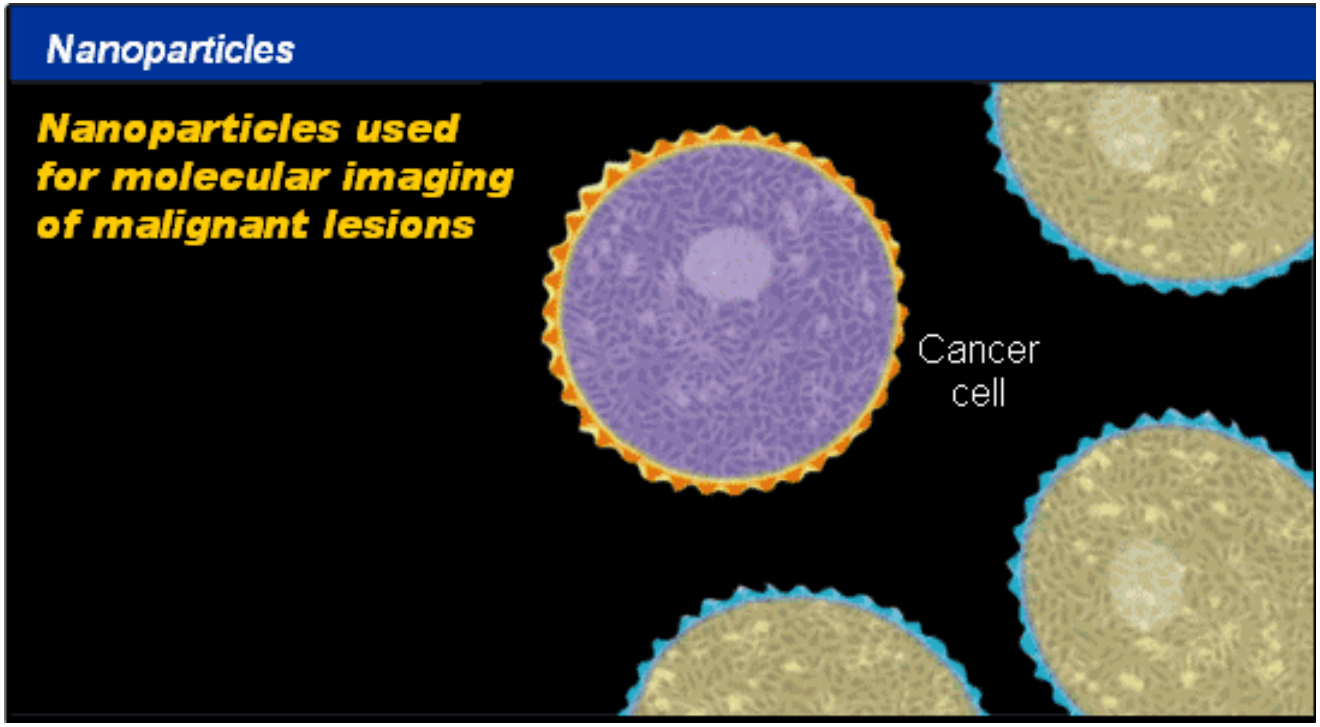
- Métodos de detección temprana

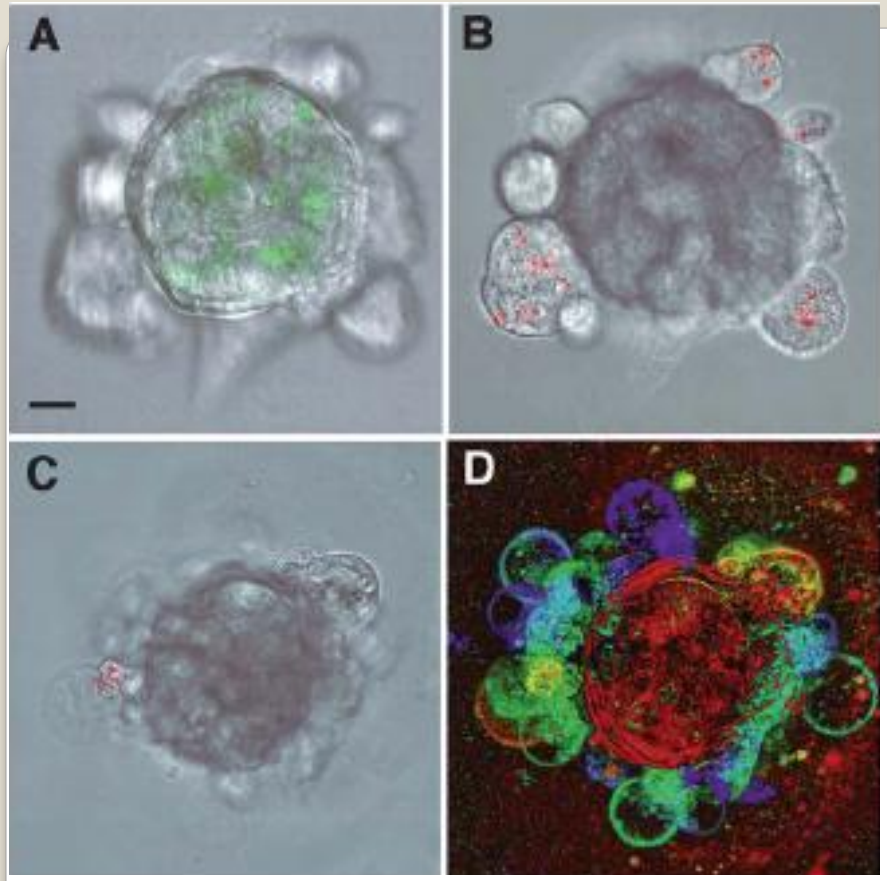
- Alternativas a radio- y quimioterapia

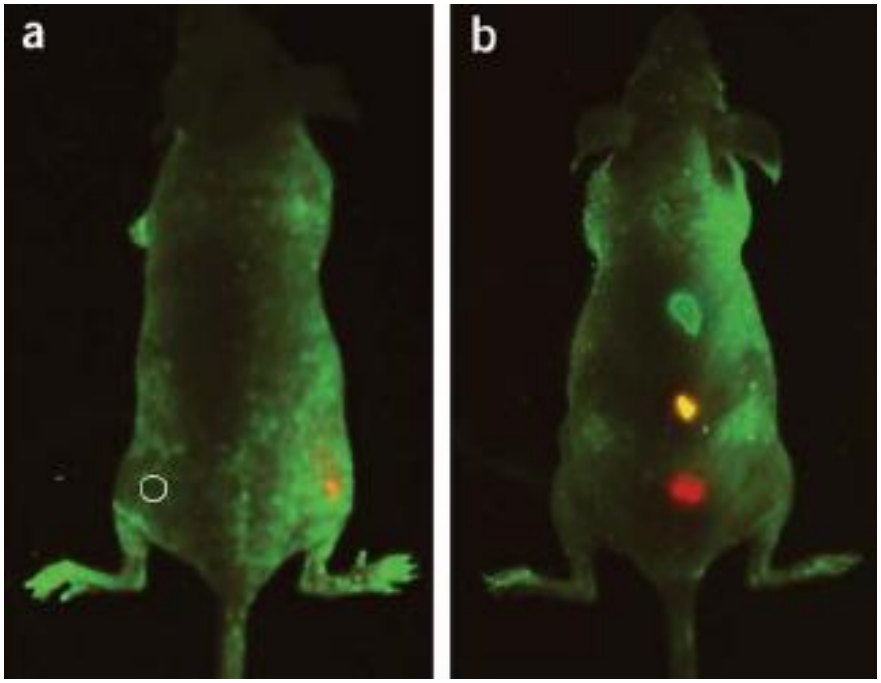
NANOTECNOLOGIA


Water
Glucose
Antibody
Virus
Bacteria
Cancer cell
A period
Tennis ball
10^{-1}
1
10
10^{2}
10^{3}
10^{4}
10^{5}
10^{6}
10^{7}
10^{8}
Nanometers
Nanodevices:
Nanopores
Dendrimers
Nanotubes
Quantum dots
Nanoshells


10
11

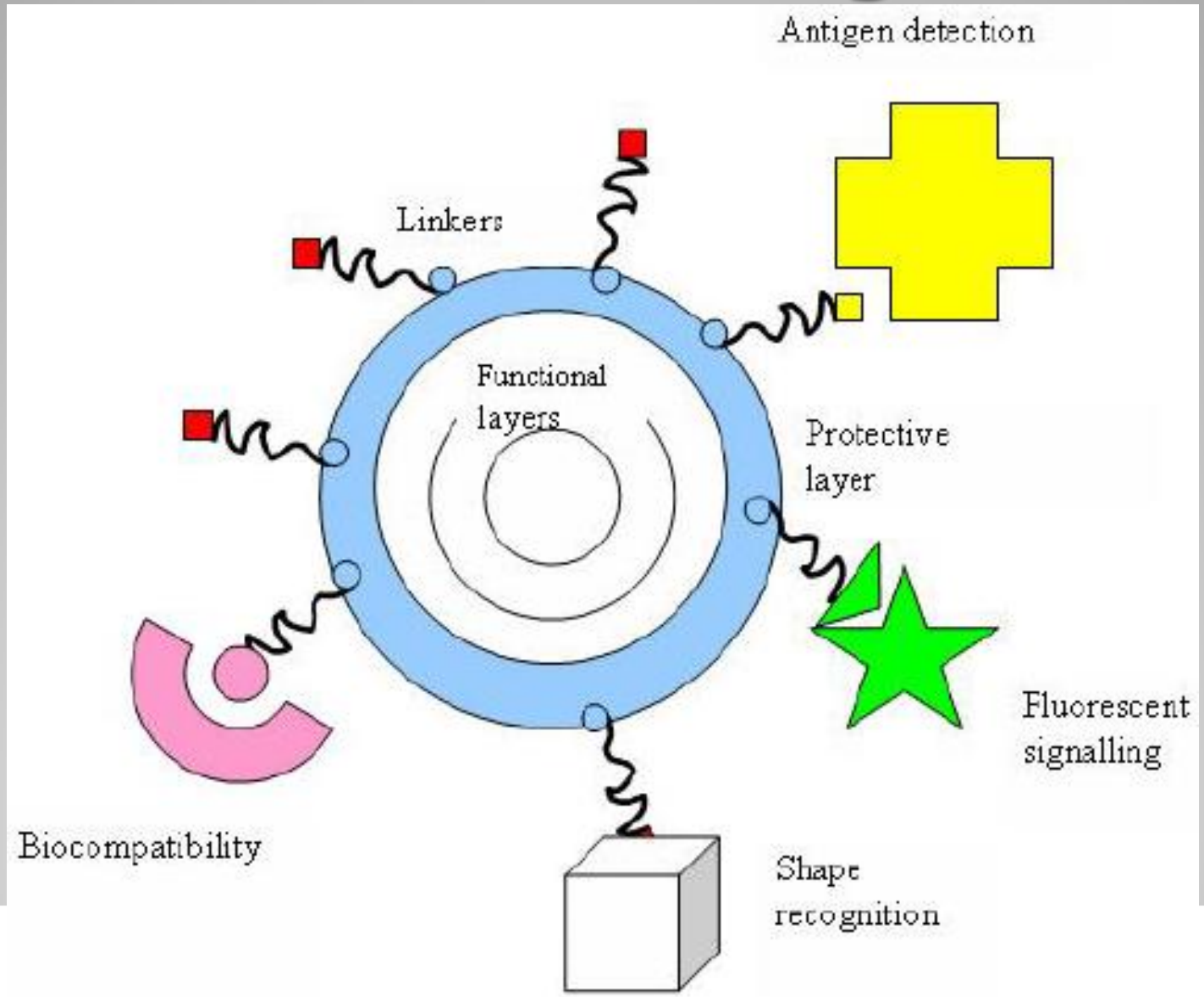

Nanoparticles
Nanoparticles used for molecular imaging of malignant lesions
Cancer cell

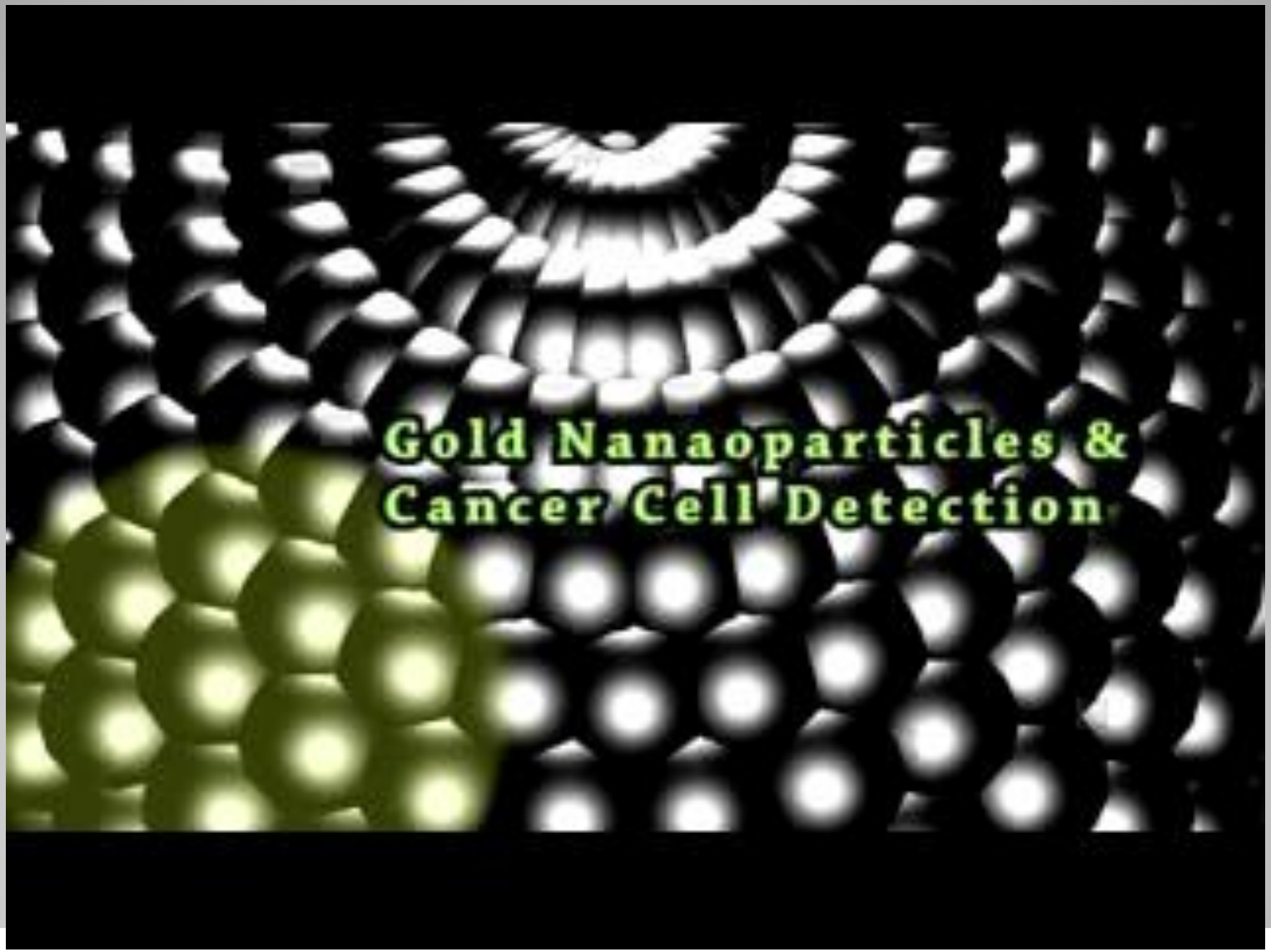




Quantum dots as cellular probes,
A. Paul Alivisatos, Weiwei Gu, and Carolyn Larabell, Annu. Rev. Biomed. Eng. 2005. 7:55–76

Nanobiotecnología:




Gold Nanaoparticles &
Cancer Cell Detection

CONCLUSIONES

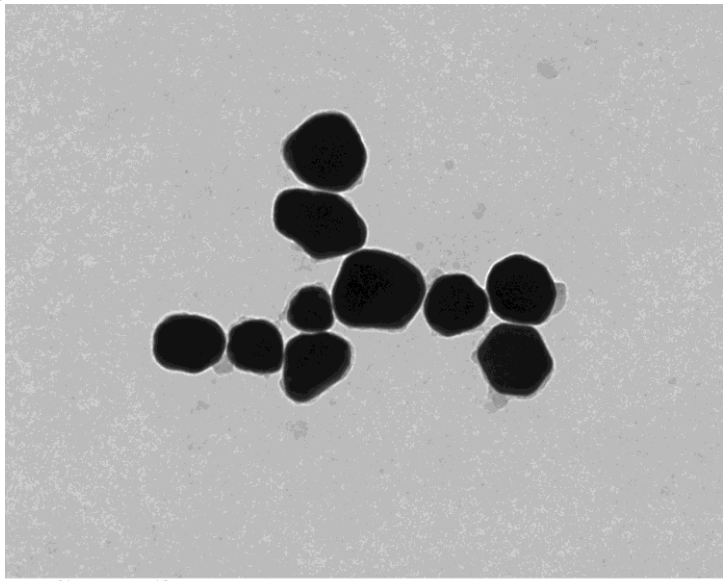
- FALTA MUCHA INVESTIGACIÓN POR HACER
- FACULTAD DE ESTOMATOLOGÍA
- FACULTAD DE CIENCIAS
- UASLP

PREPARACIÓN DE NANOPARTÍCULAS

Peso del reductor más 10 mL de agua desionizada

Inicio de la reacción

Agitación 10 min
Registro de pH



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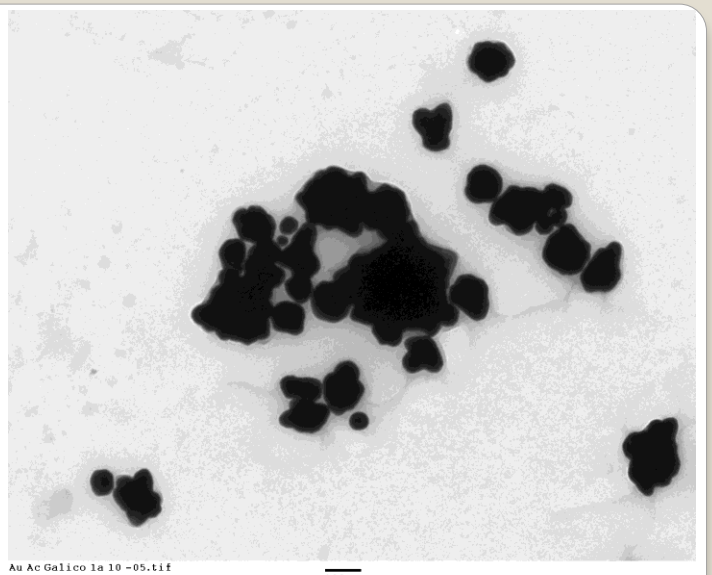
100 nm
HV=100kV
Direct Mag: 20000x
AMT Camera System



Au Ac Galico 1a 10 -05.tif
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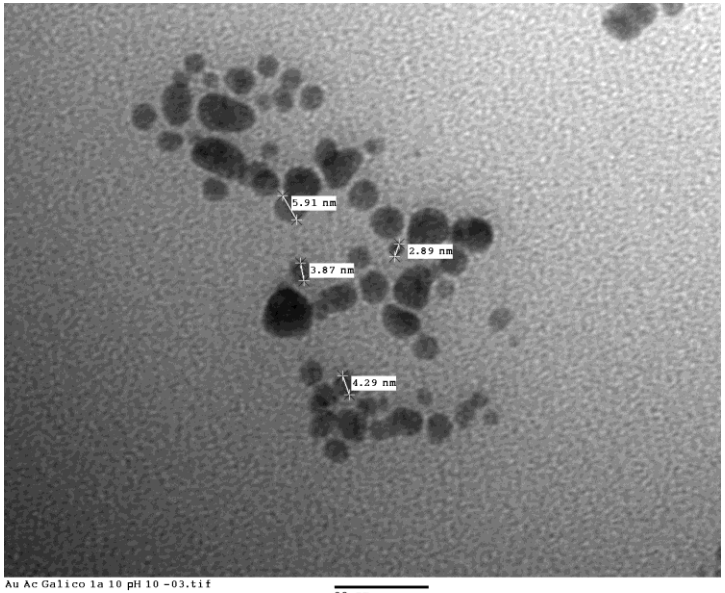
12:10 07/14/09

100 nm
HV=100kV
Direct Mag: 12000x
AMT Camera System



Au Ac Galico 1a 10 pH 10 -03.tif
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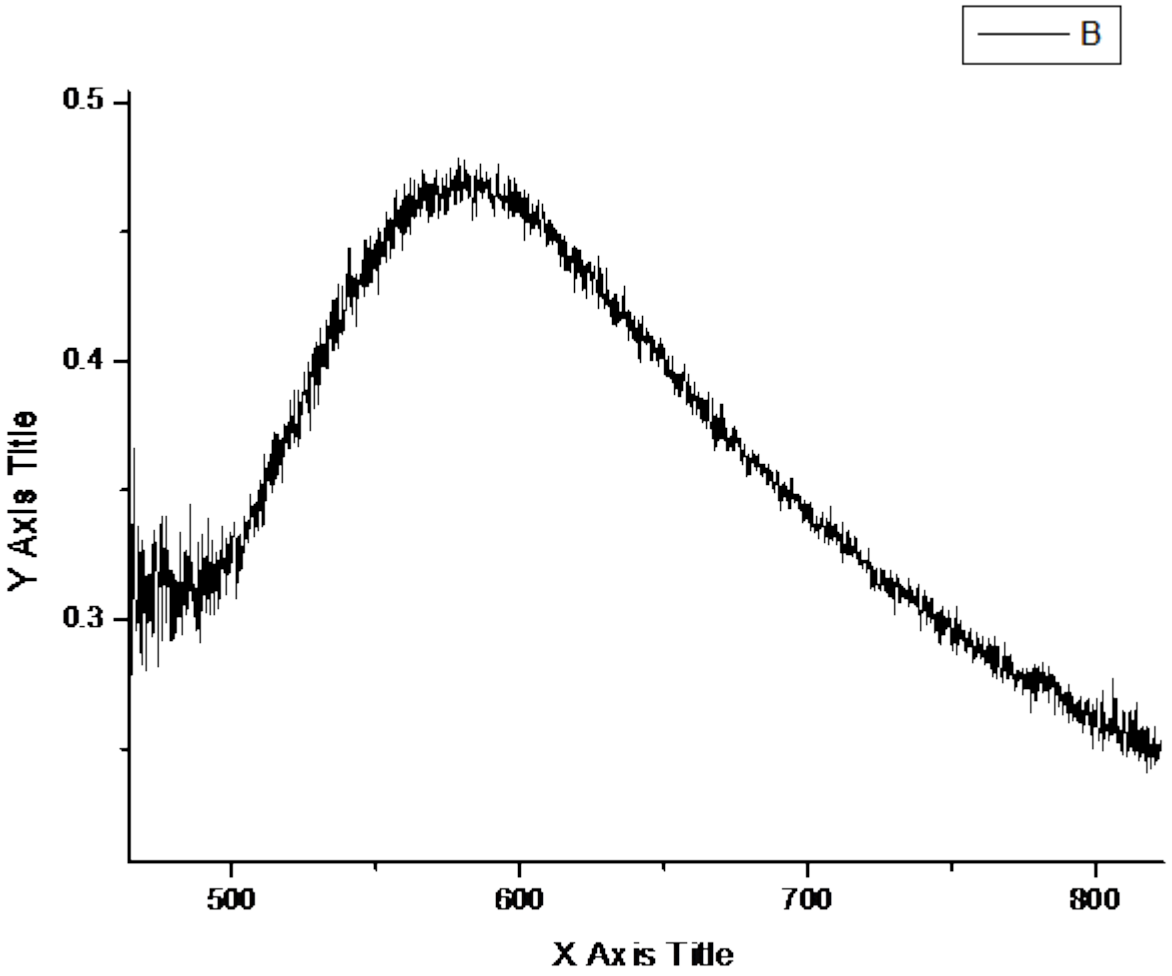
11:29 07/14/09

20 nm
HV=100kV
Direct Mag: 150000x
AMT Camera System


B
0.5
0.4
0.3
Y Axis Title
500
600
700
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Cultivo celular

PREGUNTAS...