Understanding Cancer Tutorial Information for Teachers

Understanding Cancer Tutorial

- This tutorial was adapted from the ***Understanding Cancer: Cancer Tutorial*** available at http://www.cancer.gov/cancertopics/understandingcancer/cancer
- There are two forms for this PPT:
  - Teacher Presentation version (with a script)
  - Student Handout version (if printing, specify black/white on print menu)

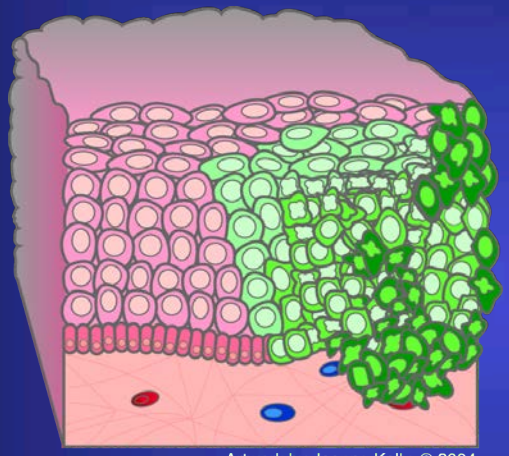
NATIONAL CANCER INSTITUTE

Understanding Cancer Tutorial Information for Teachers

- The National Cancer Institute has produced a series of cancer related PowerPoint tutorials. These are available as downloadable format at http://www.cancer.gov/cancertopics/understandingcancer.
- Each PowerPoint in this series includes a teacher script. Once these have been downloaded, you may modify the slide show and print student handouts.

NATIONAL CANCER INSTITUTE

Understanding Cancer
Teacher Information



Artwork by Jeanne Kelly. © 2004.

Developed by:
Lewis J. Kleinsmith, Ph.D.
Donna Kerrigan, M.S.
Jeanne Kelly
Brian Hollen

Discusses and illustrates what cancer is, explains the link between genes and cancer, and discusses what is known about the causes, detection, and diagnosis of the disease.

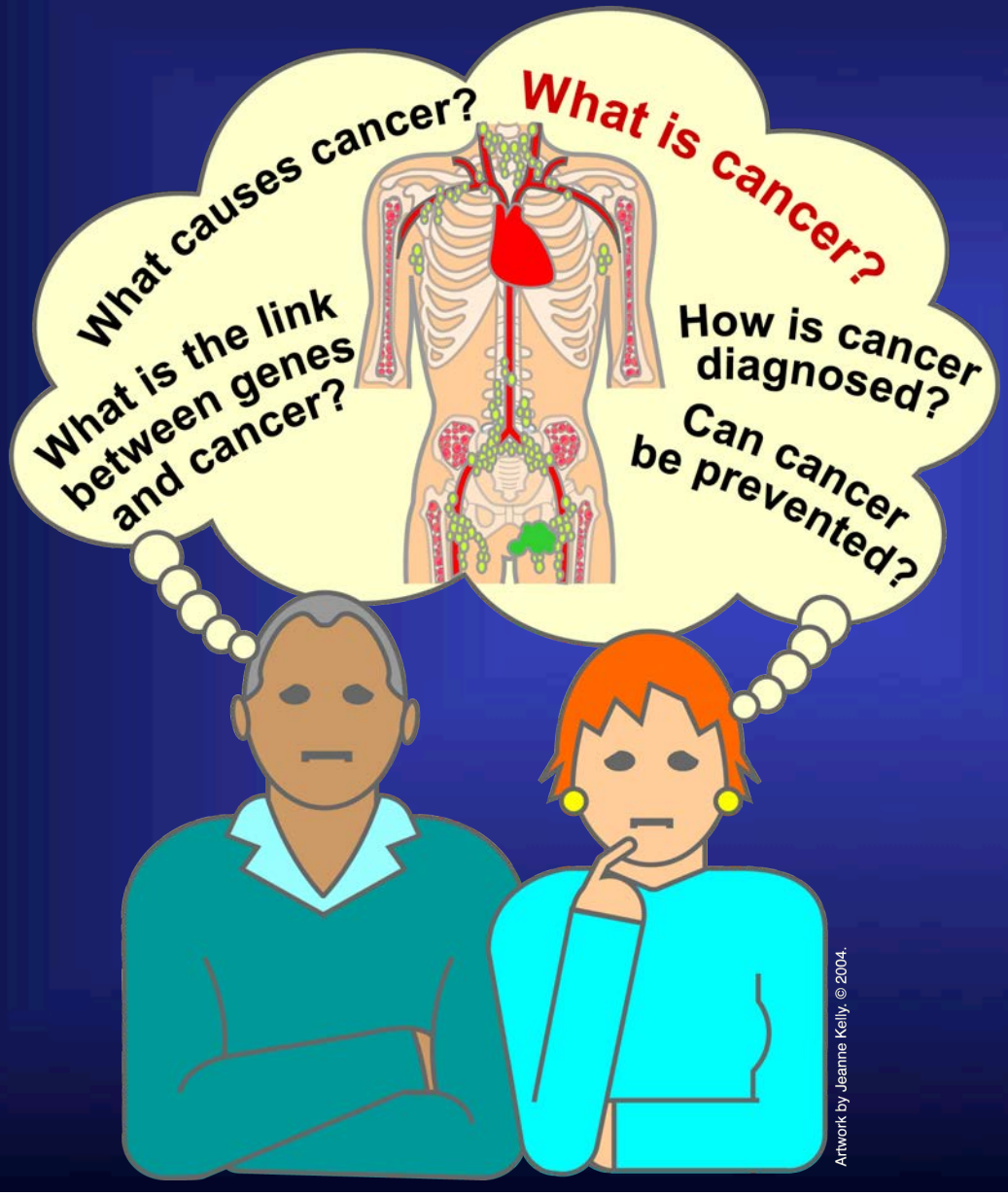
These PowerPoint slides are not locked files. You can mix and match slides from different tutorials as you prepare your own lectures. In the Notes section, you will find explanations of the graphics.

NATIONAL CANCER INSTITUTE

Cancer

NATIONAL CANCER INSTITUTE

Understanding Cancer

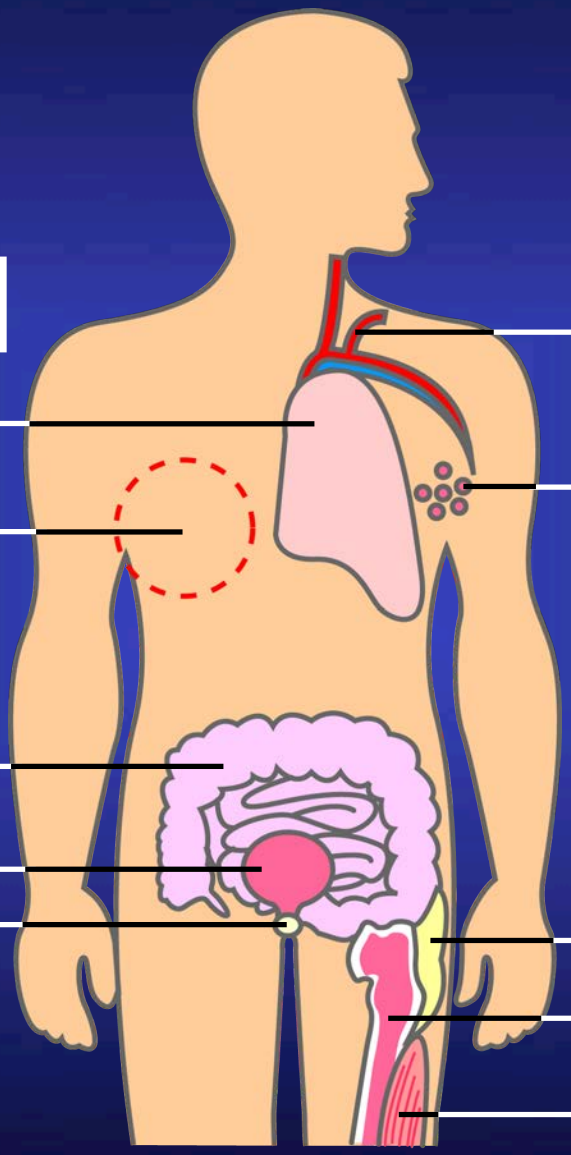


Developed by:
Lewis J. Kleinsmith, Ph.D.
Donna Kerrigan, M.S.
Jeanne Kelly
Brian Hollen

Discusses and illustrates what cancer is, explains the link between genes and cancer, and discusses what is known about the causes, detection, and diagnosis of the disease.

NATIONAL CANCER INSTITUTE

What are some different kinds of cancer?



Lung
Breast (women)
Colon
Bladder
Prostate (men)

Bloodstream

Lymph nodes

Fat

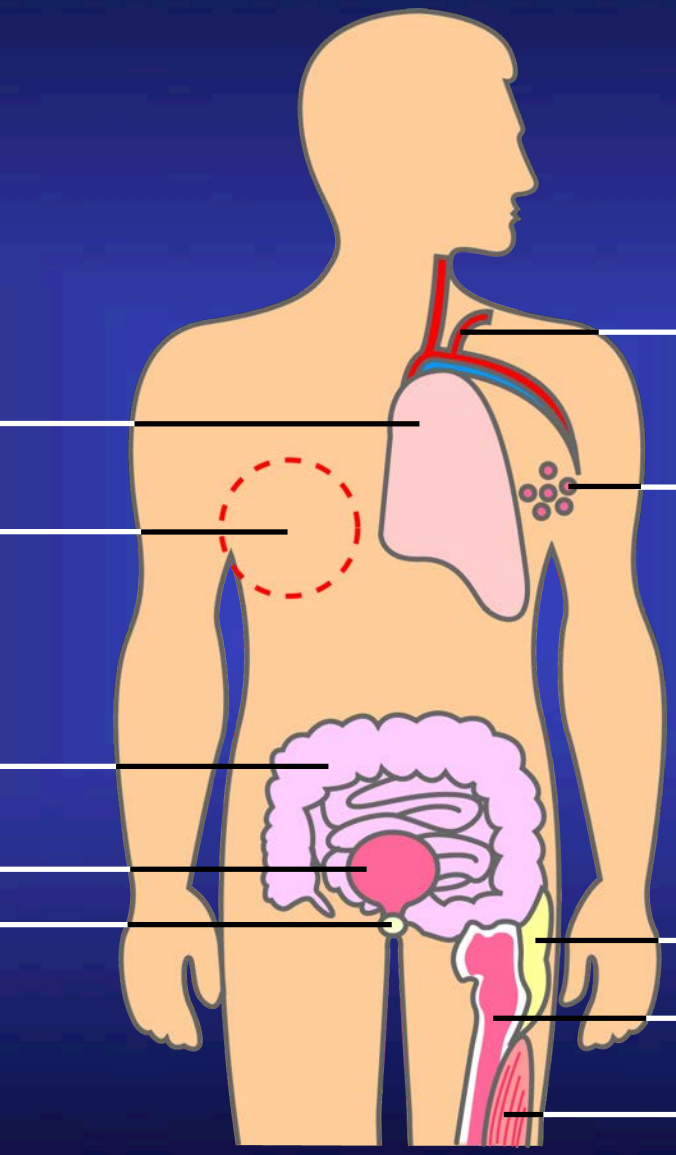
Bone

Muscle

Artwork by Jeanne Kelly. © 2004.

NATIONAL CANCER INSTITUTE

What are some different kinds of cancer?



Artwork by Jeanne Kelly. © 2004.

Carcinomas:

Lung
Breast (women)
Colon
Bladder
Prostate (men)

Leukemias:

Bloodstream

Lymphomas:

Lymph nodes

Sarcomas:

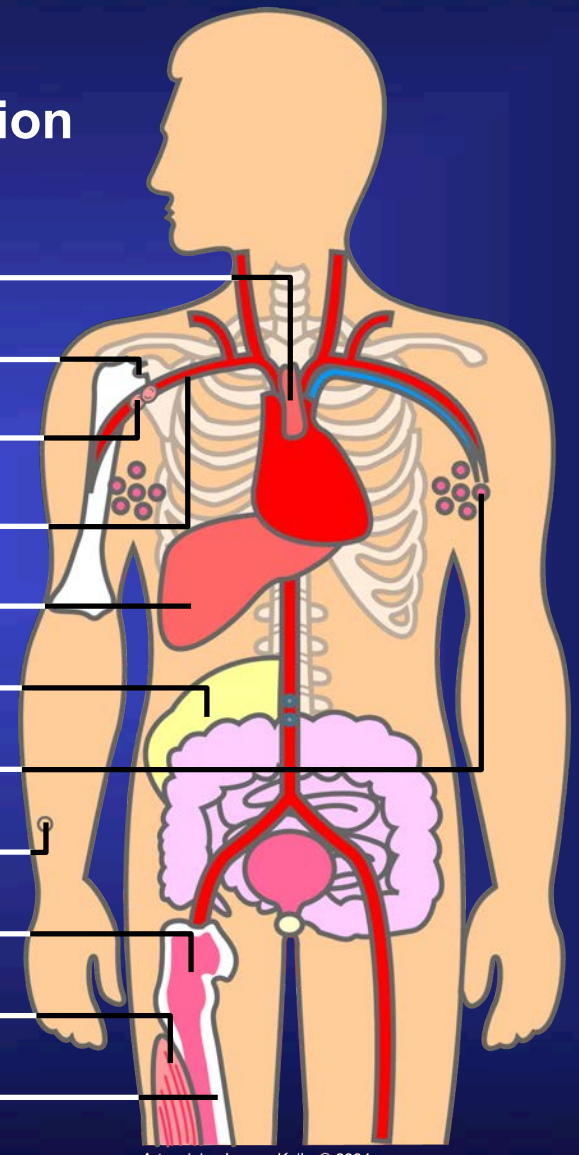
Fat
Bone
Muscle

NATIONAL CANCER INSTITUTE

What are some different kinds of cancer?

Cancer Prefixes Point to Location

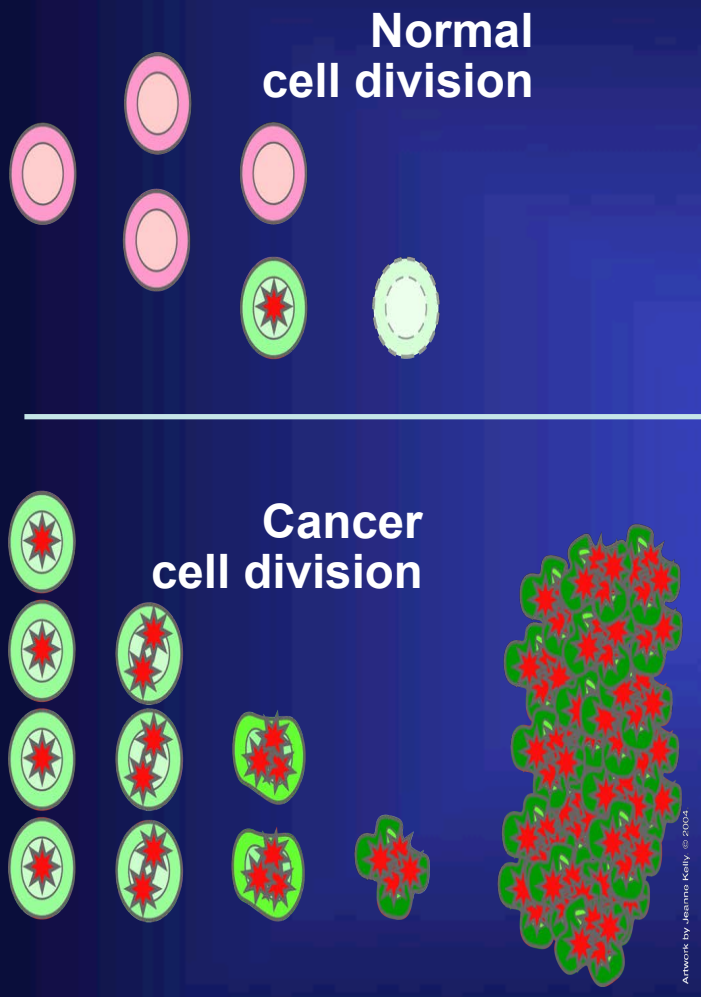
Prefix	*Meaning*
adeno-	gland
chondro-	cartilage
erythro-	red blood cell
hemangio-	blood vessels
hepato-	liver
lipo-	fat
lympho-	lymphocyte
melano-	pigment cell
myelo-	bone marrow
myo-	muscle
osteo-	bone



Artwork by Jeanne Kelly. © 2004.

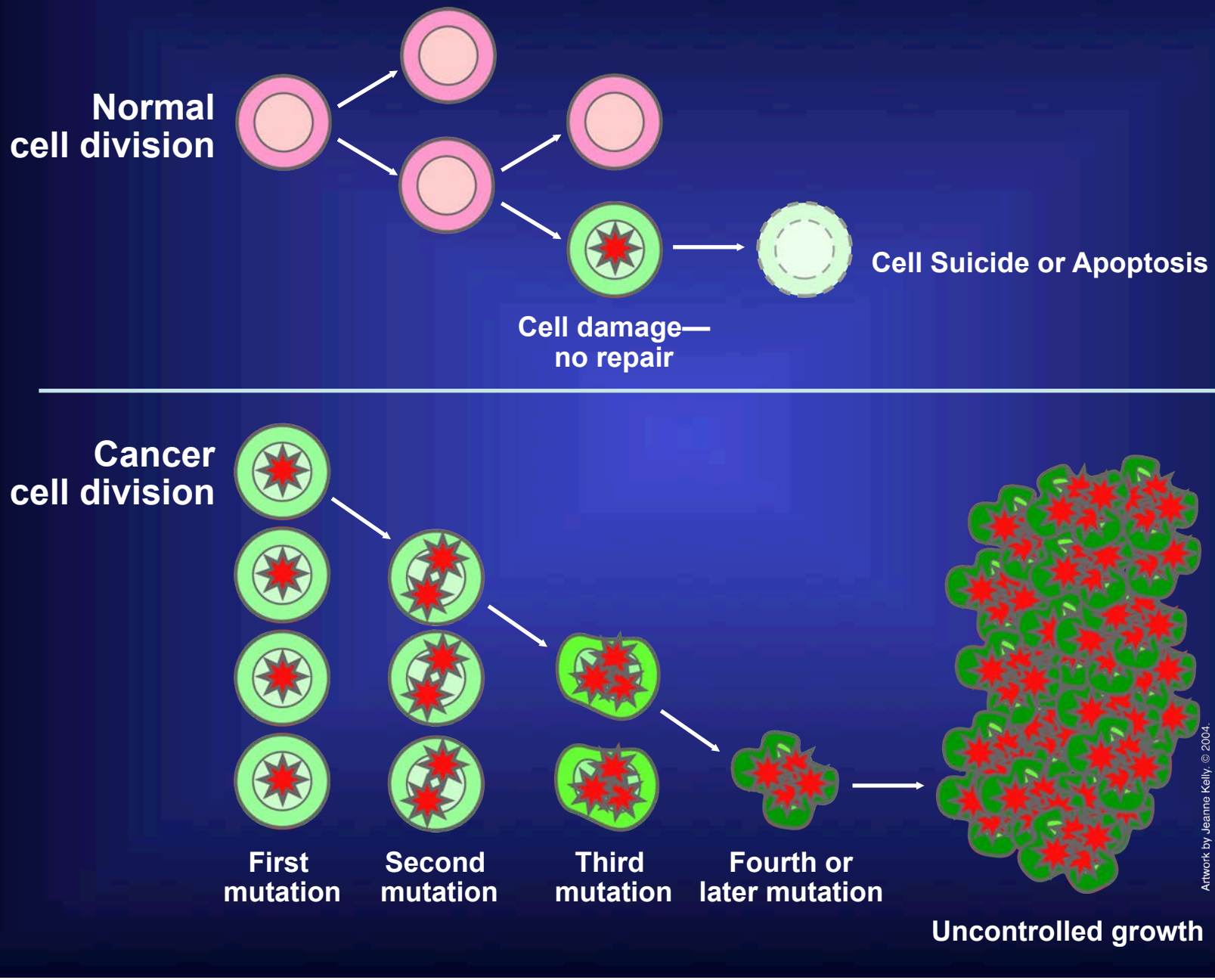
NATIONAL CANCER INSTITUTE

How are Normal and Cancer Cell Division Different?



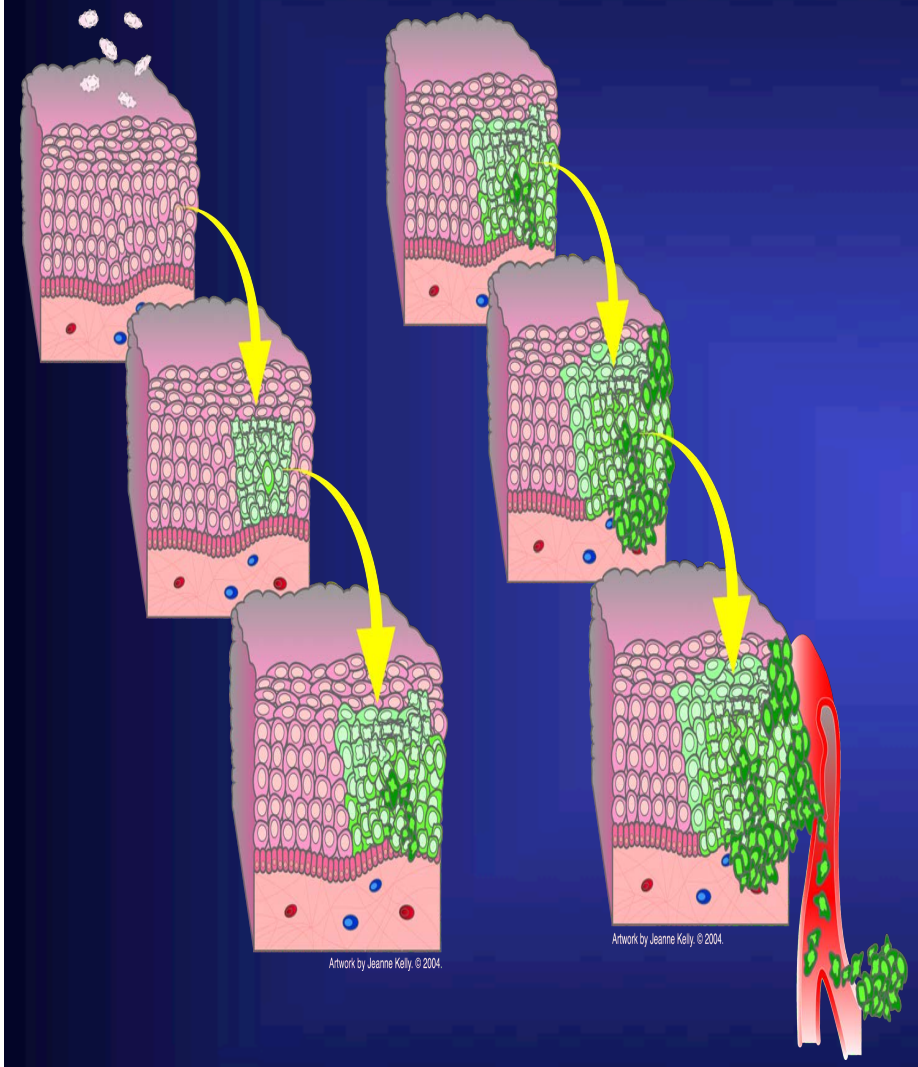
NATIONAL CANCER INSTITUTE

How are Normal and Cancer Cell Division Different?



NATIONAL CANCER INSTITUTE

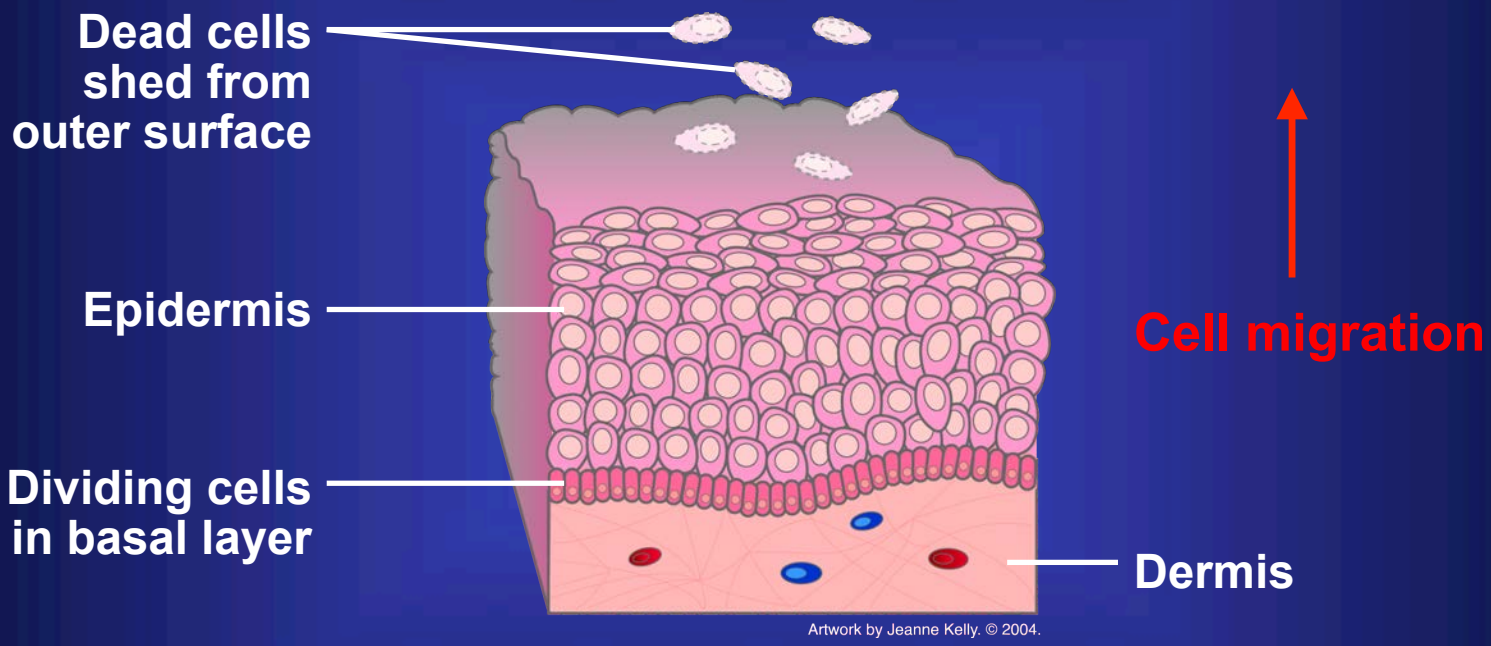
How are normal and cancer growth different?



NATIONAL CANCER INSTITUTE

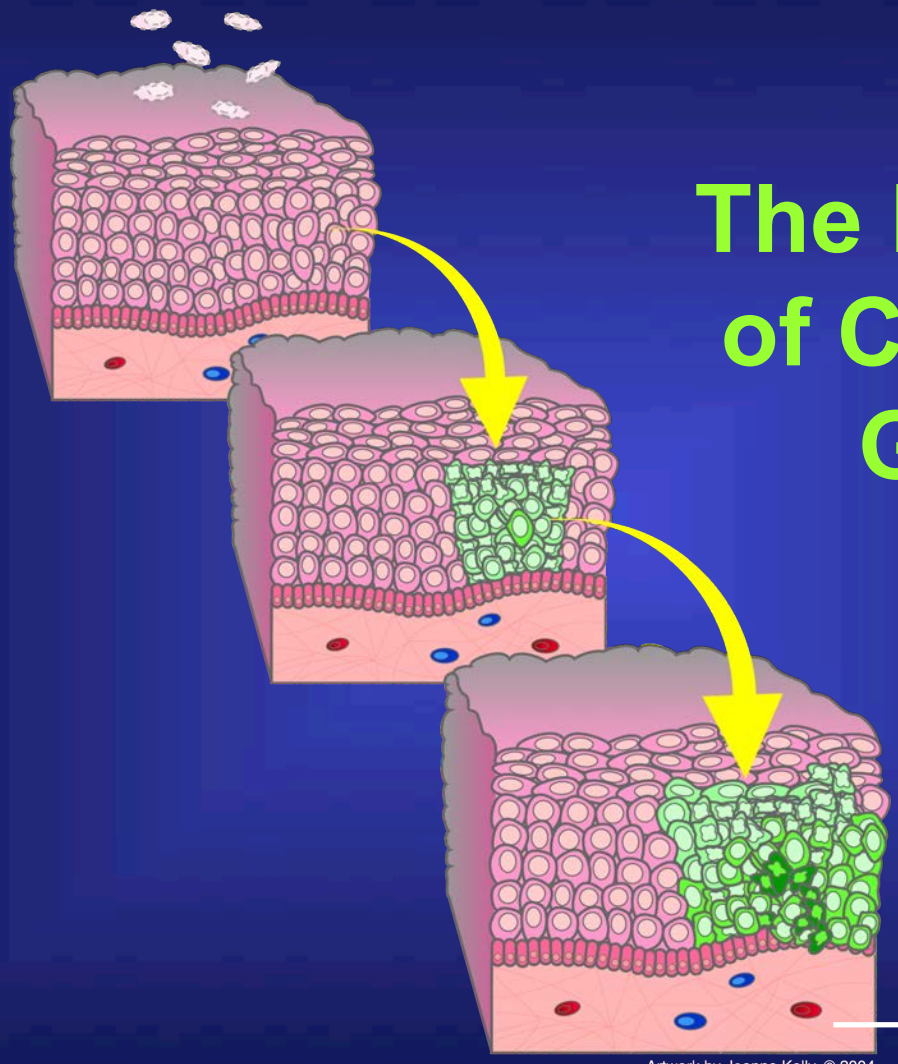
How are normal and cancer growth different?

Normal Growth



NATIONAL CANCER INSTITUTE

How are normal and cancer growth different?



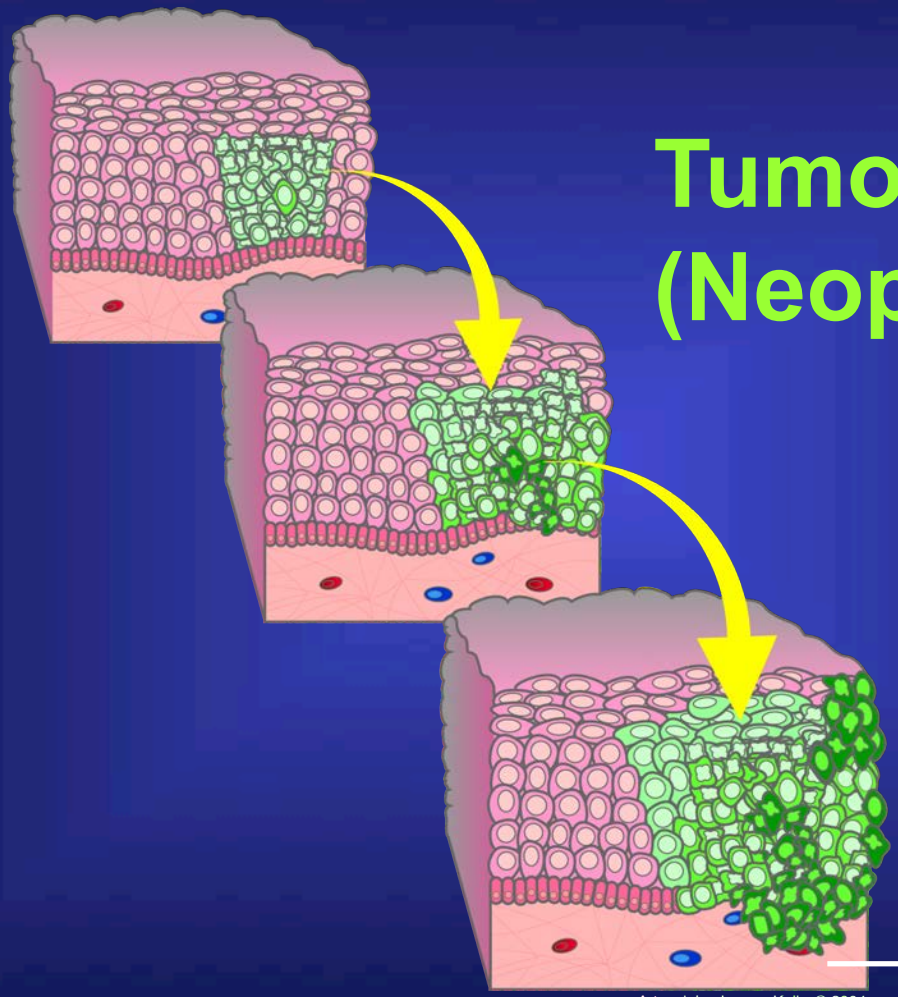
The Beginning of Cancerous Growth

Underlying tissue

Artwork by Jeanne Kelly. © 2004.

NATIONAL CANCER INSTITUTE

How are normal and cancer growth different?



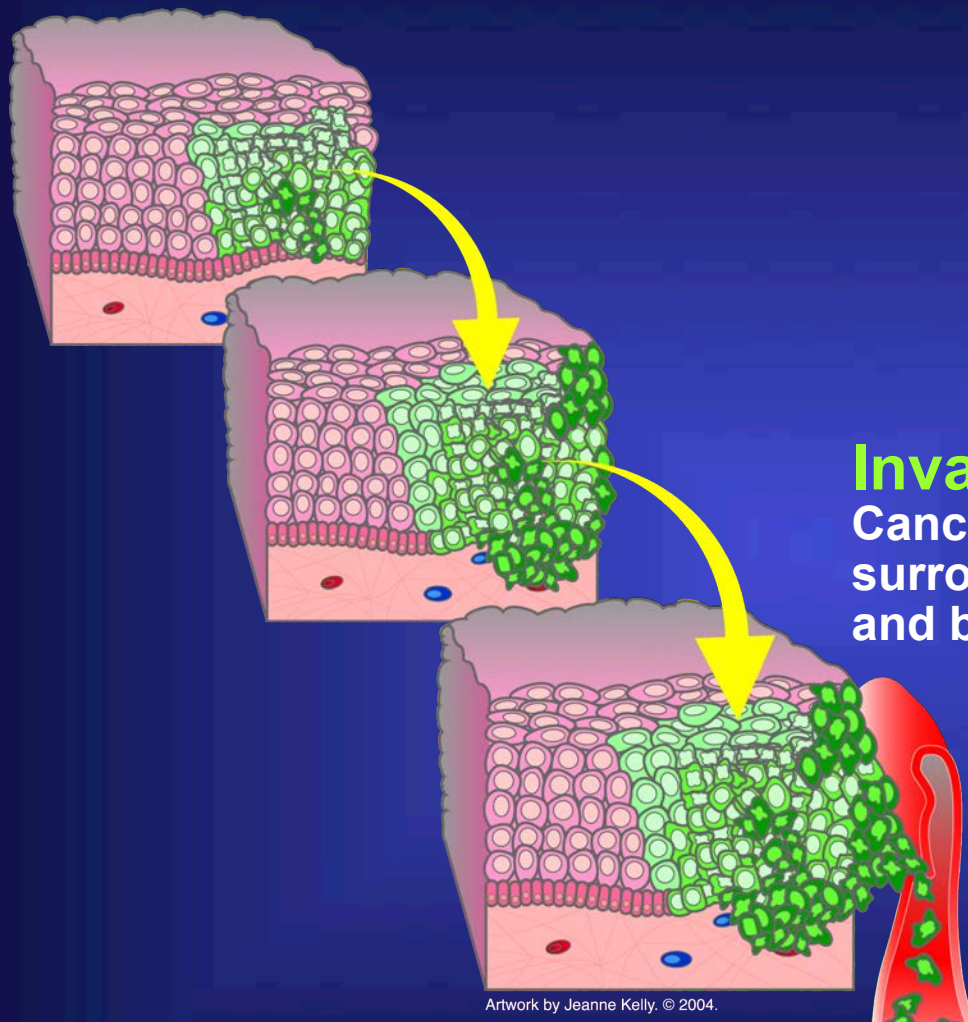
Tumors
(Neoplasms)

Underlying tissue

Artwork by Jeanne Kelly. © 2004.

NATIONAL CANCER INSTITUTE

How are normal and cancer growth different?



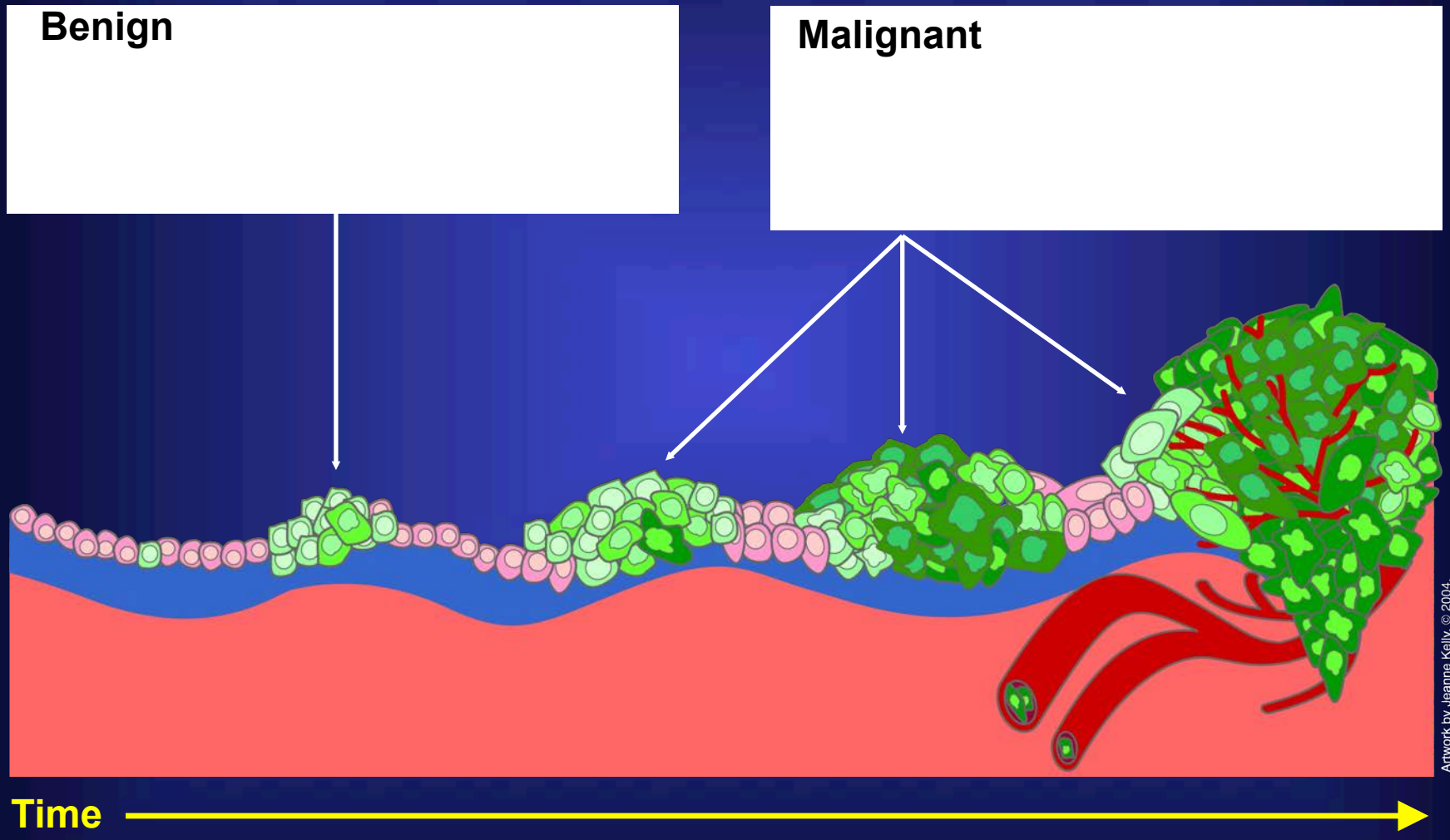
Invasion
Cancer cells grow into surrounding tissues and blood vessels

Metastasis
Cancer cells are transported by the circulatory system to distant sites

Cancer cells reinvade and grow at new location

NATIONAL CANCER INSTITUTE

What is the difference between a benign tumor and a malignant tumor?

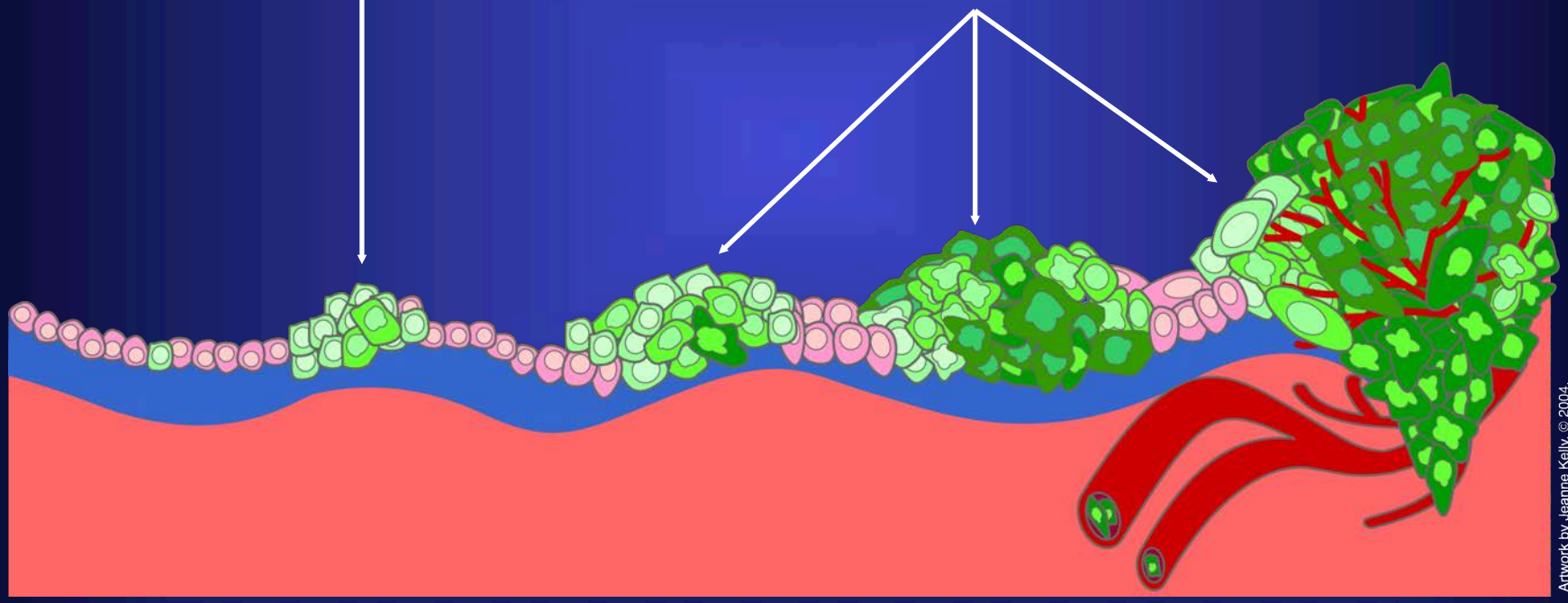


NATIONAL CANCER INSTITUTE

What is the difference between a benign tumor and a malignant tumor?

Benign (not cancer) tumor cells grow only locally and cannot spread by invasion or metastasis

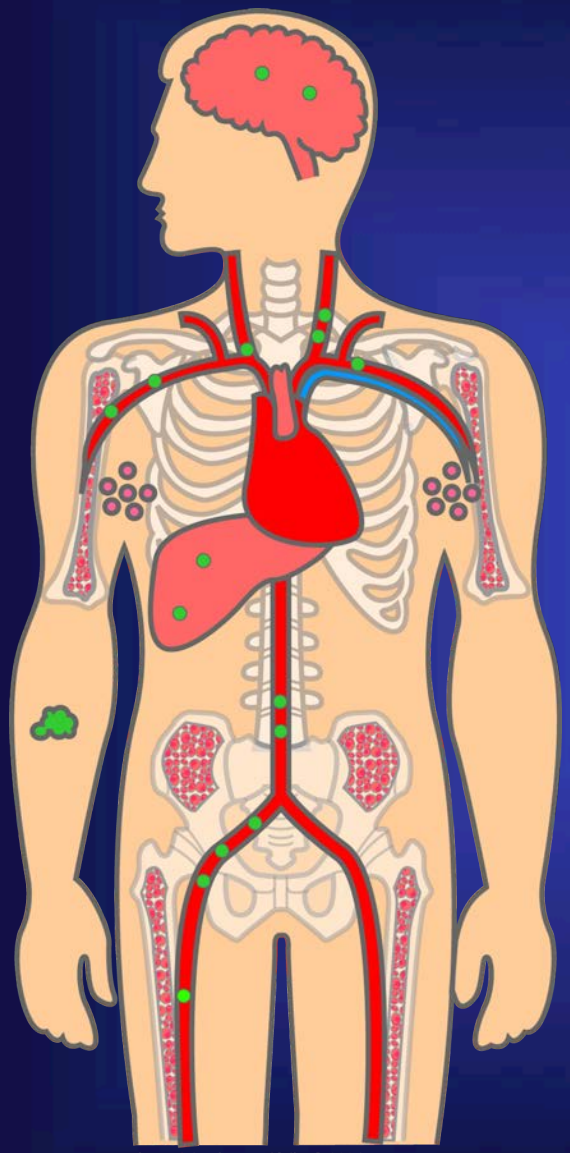
Malignant (cancer) cells invade neighboring tissues, enter blood vessels, and metastasize to different sites



Time

NATIONAL CANCER INSTITUTE

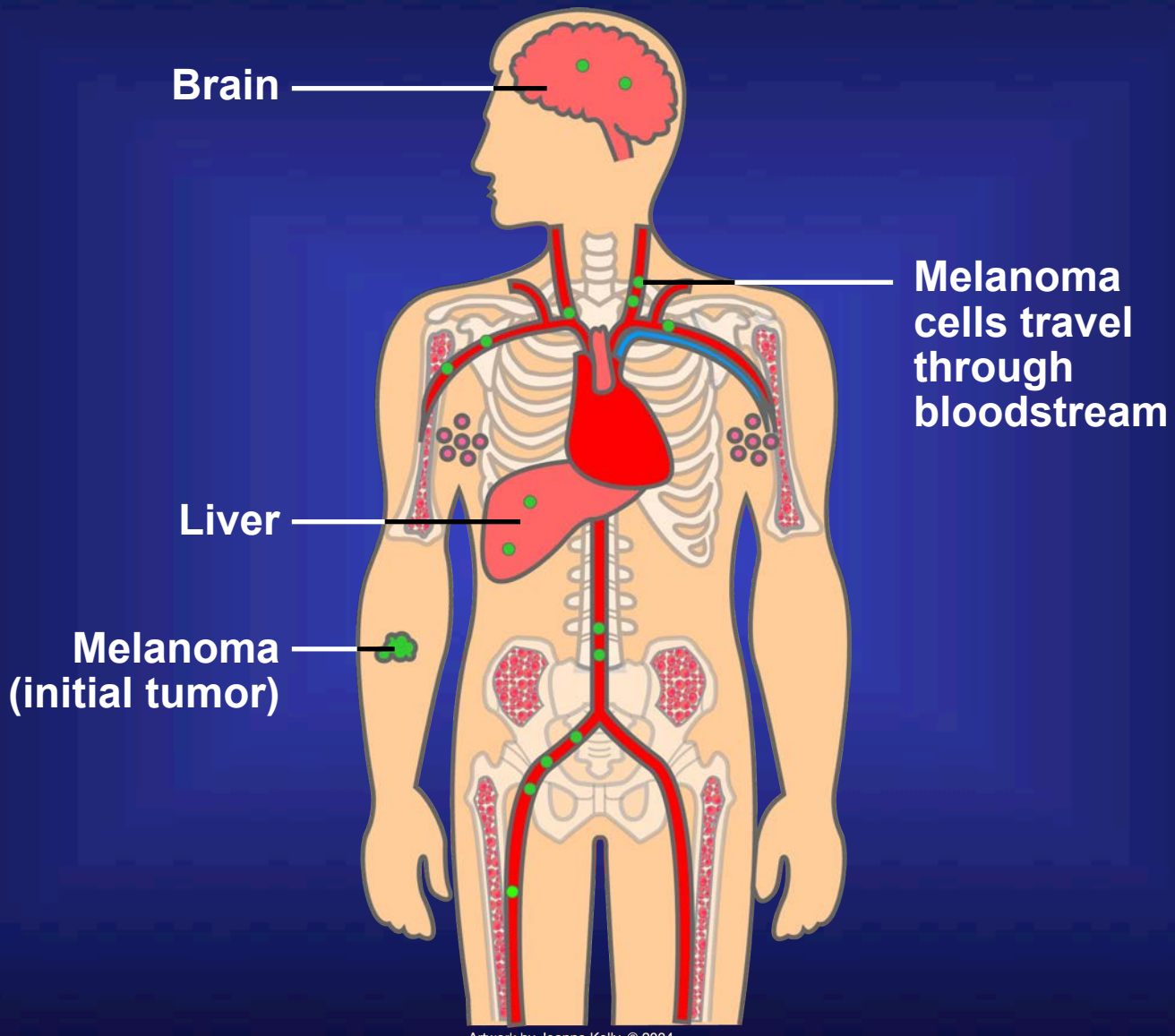
Why are malignant tumors dangerous?



Artwork by Jeanne Kelly. © 2004.

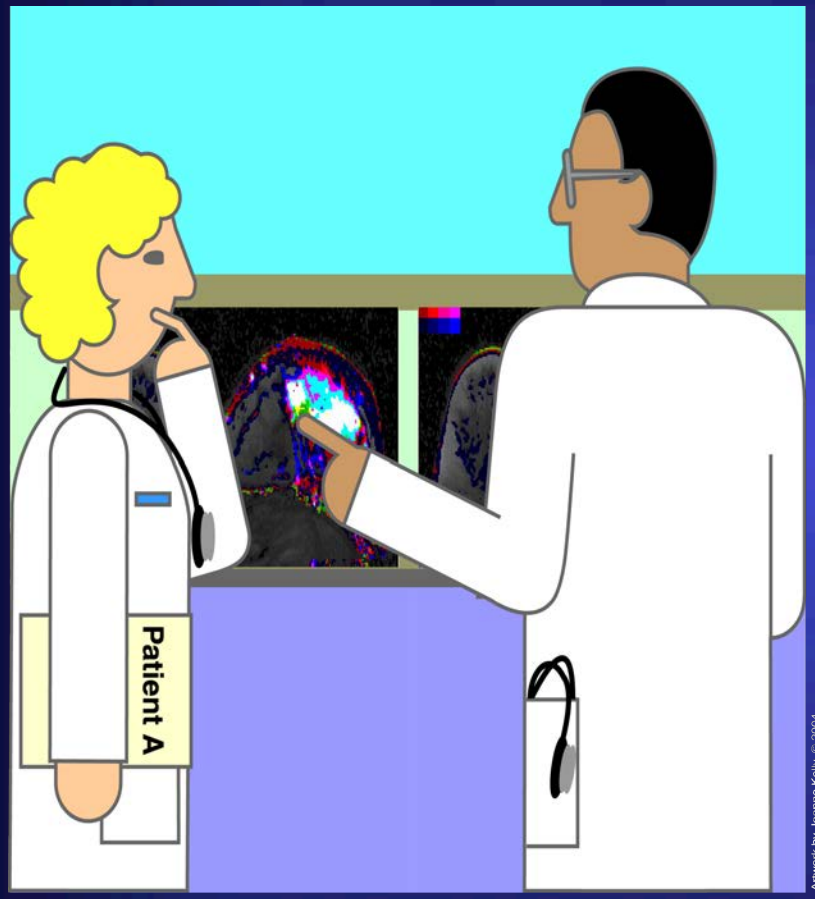
NATIONAL CANCER INSTITUTE

Why are malignant tumors dangerous?



NATIONAL CANCER INSTITUTE

What is cancer screening?



Why is cancer screening important?

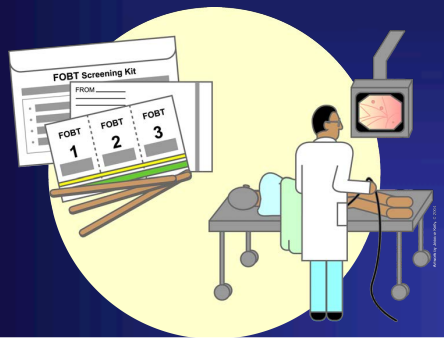
NATIONAL CANCER INSTITUTE

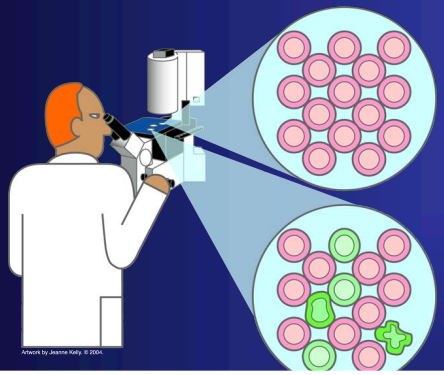
Why is cancer screening important?

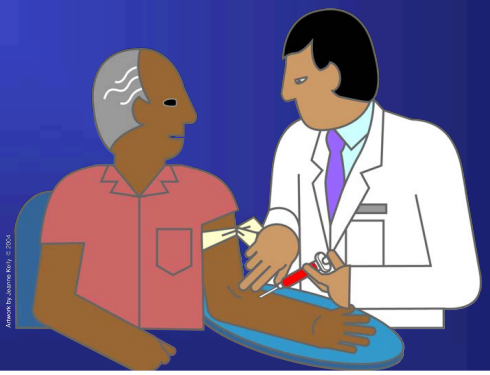
Early Cancer May Not Have Any Symptoms

NATIONAL CANCER INSTITUTE

What are some types of cancer screening?



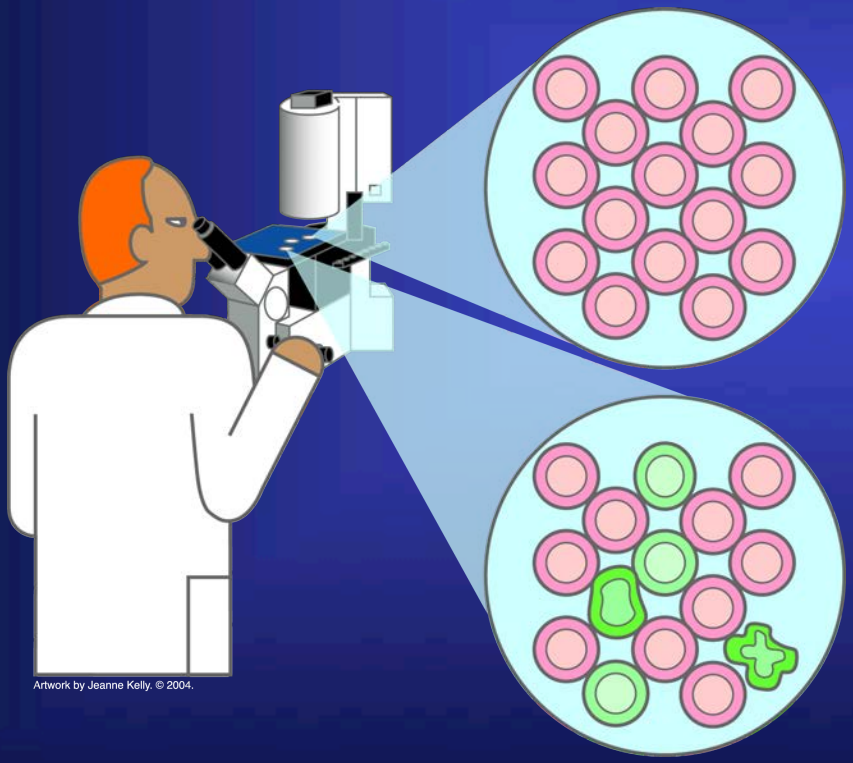




NATIONAL CANCER INSTITUTE

What are some types of cancer screening?

Cervical Cancer Screening (Pap Smear)



Normal
Pap smear

Abnormal
Pap smear

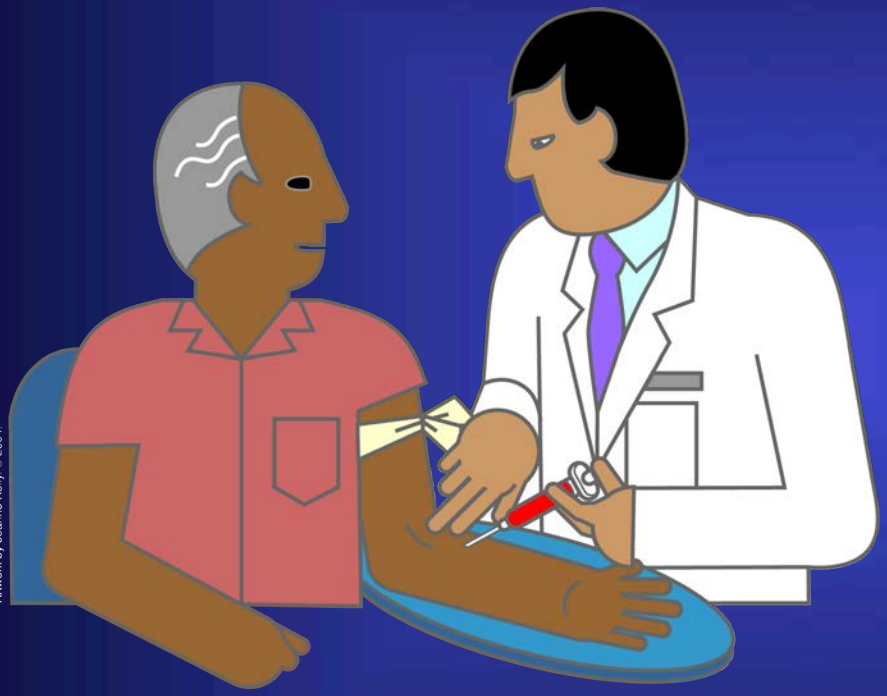
NATIONAL CANCER INSTITUTE

What are some types of cancer screening?

Breast Cancer Screening (Mammogram)

NATIONAL CANCER INSTITUTE

What are some types of cancer screening?



Prostate and Ovarian Cancer Screening

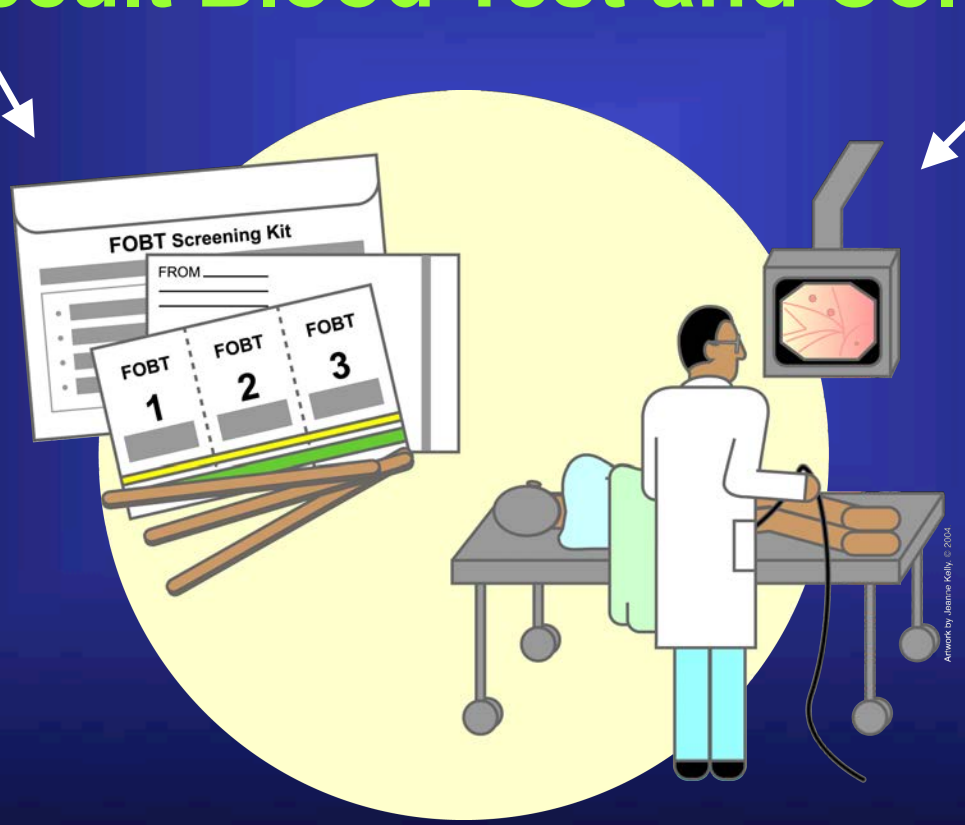
(Blood Tests)

NATIONAL CANCER INSTITUTE

What are some types of cancer screening?

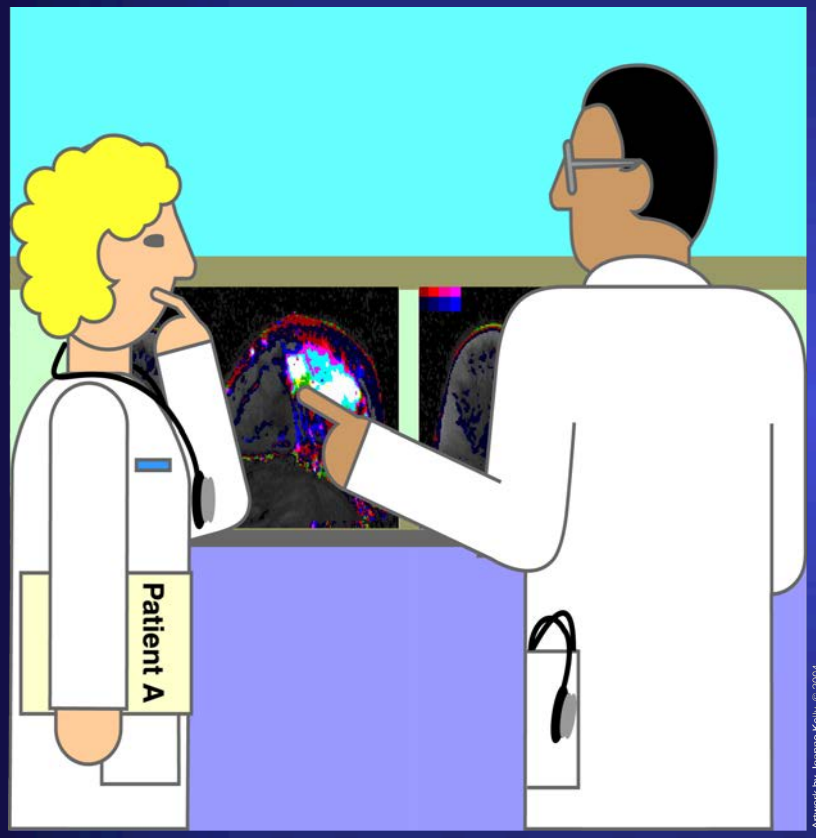
Colon Cancer Screening

Fecal Occult Blood Test and Colonoscopy



NATIONAL CANCER INSTITUTE

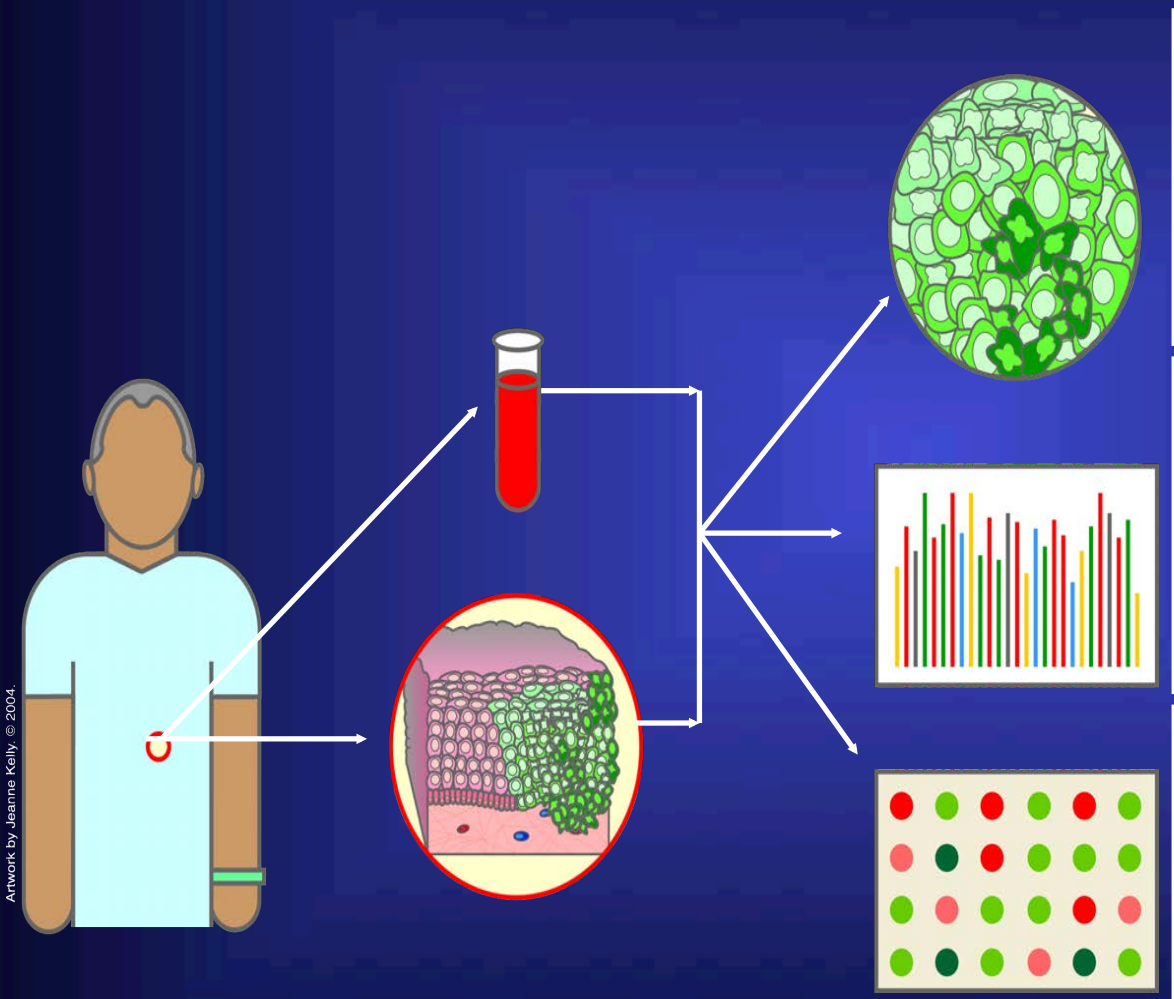
How is cancer diagnosed?



NATIONAL CANCER INSTITUTE

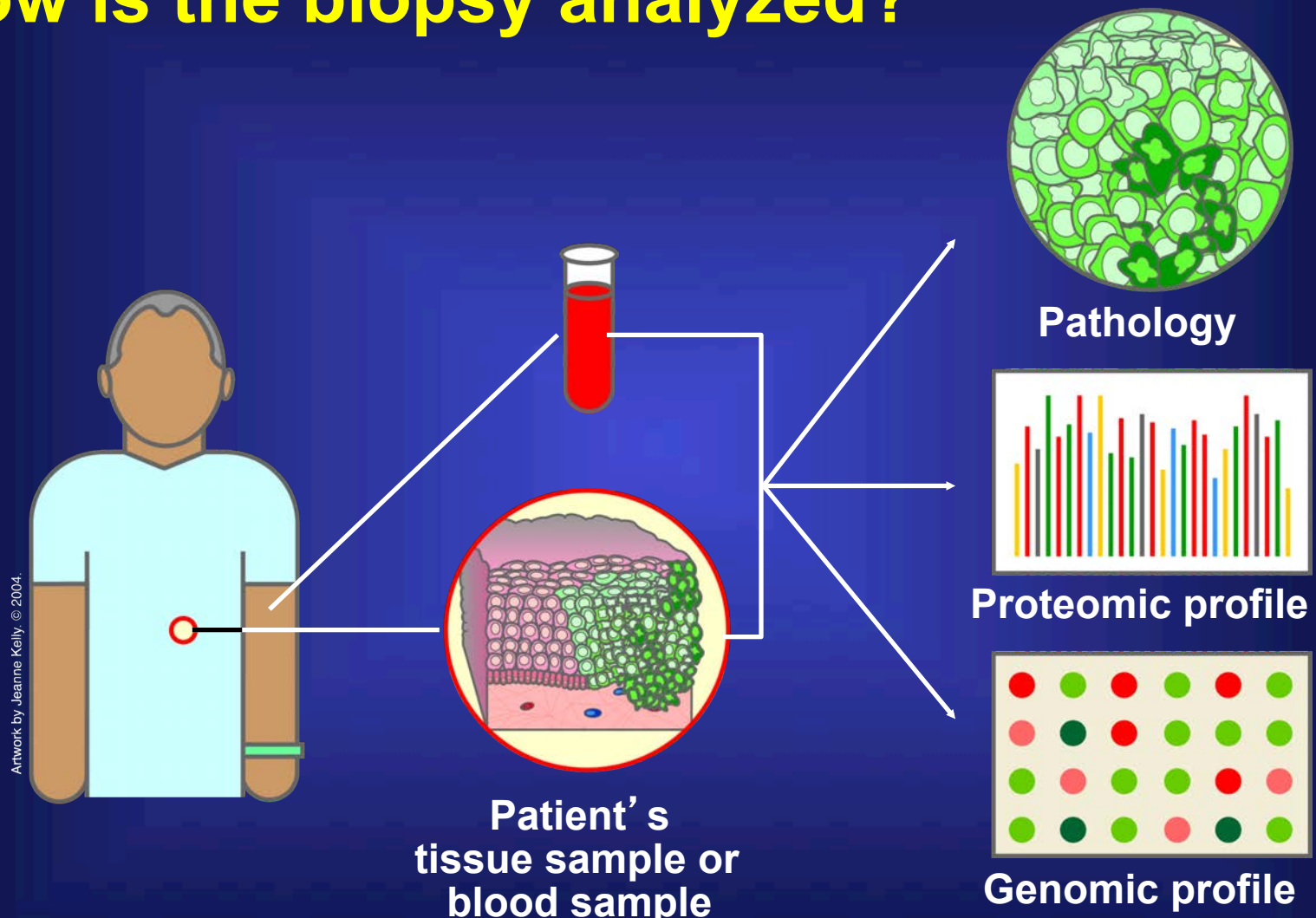
What is a biopsy?

How is the biopsy analyzed?



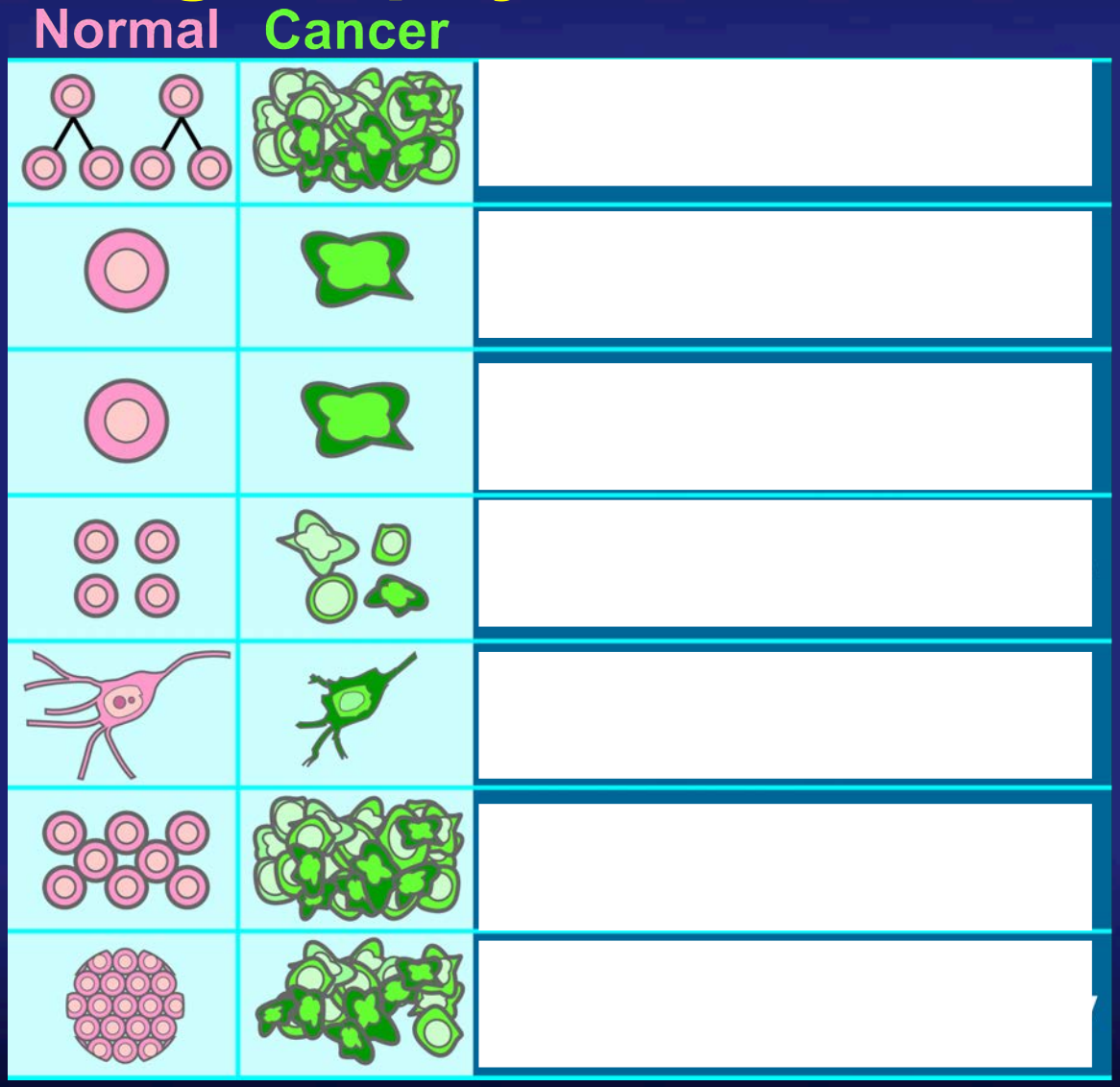
What is a biopsy?

How is the biopsy analyzed?

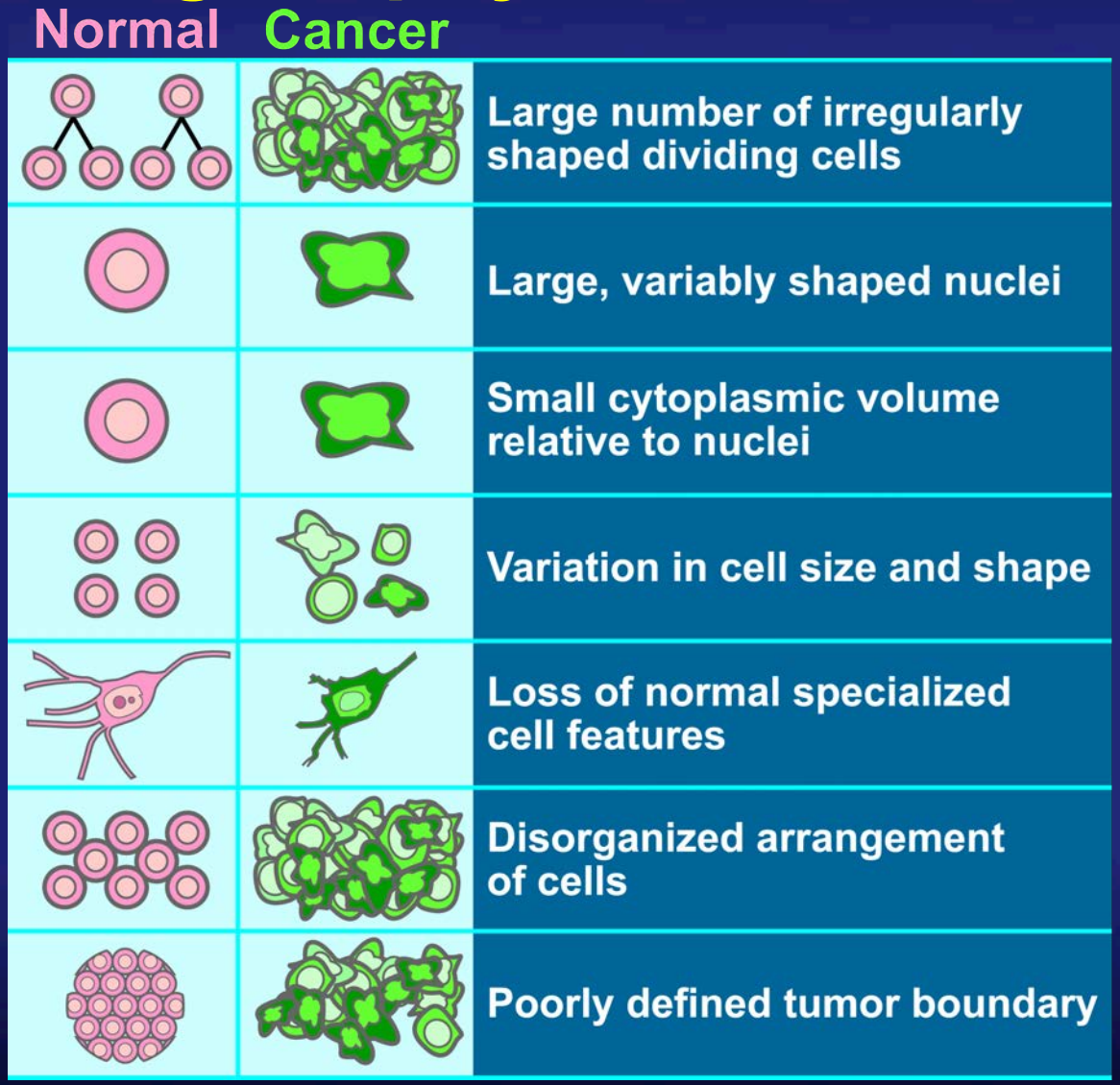


NATIONAL CANCER INSTITUTE

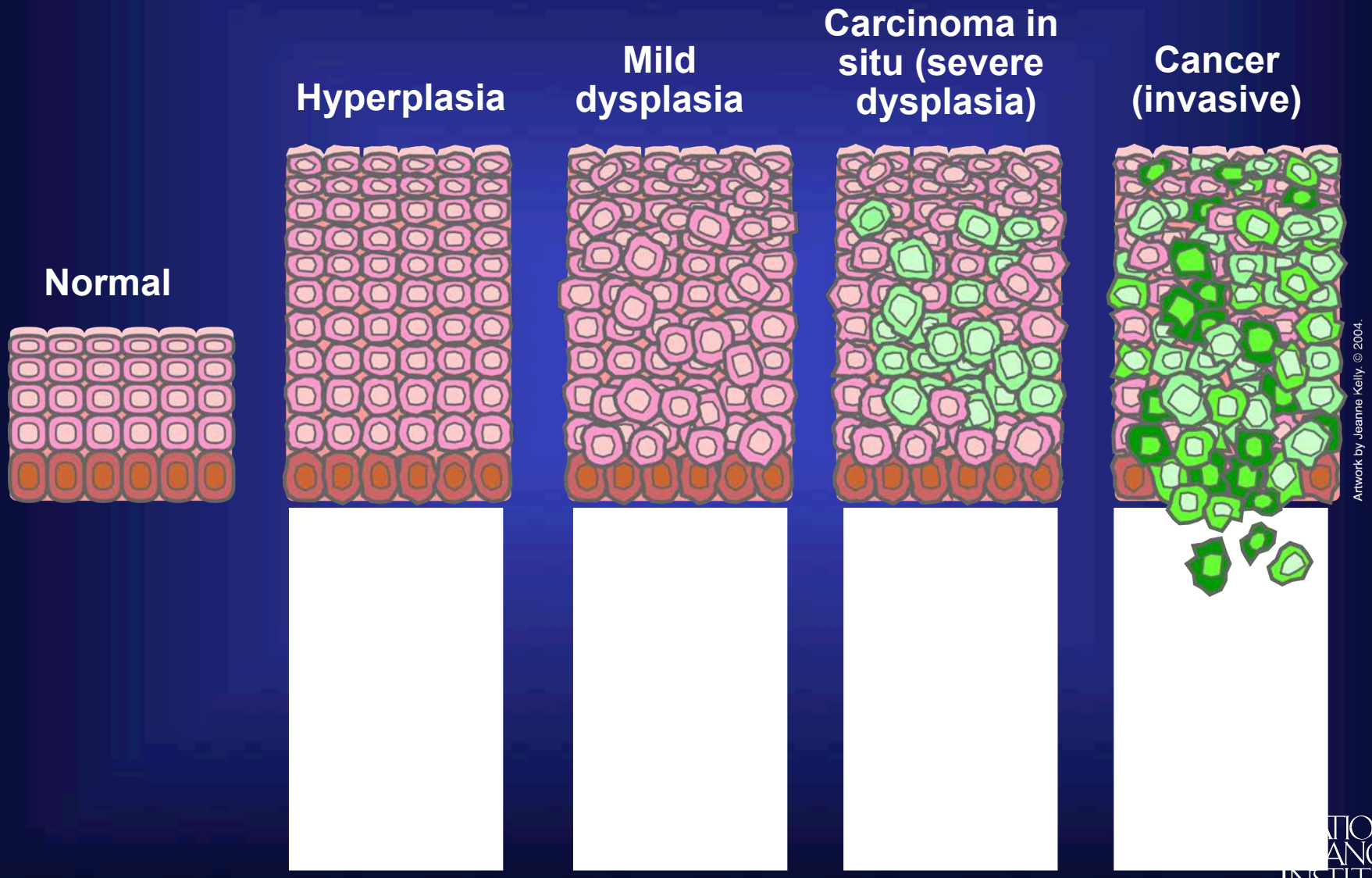
What does a pathologist look for examining biopsy tissue?



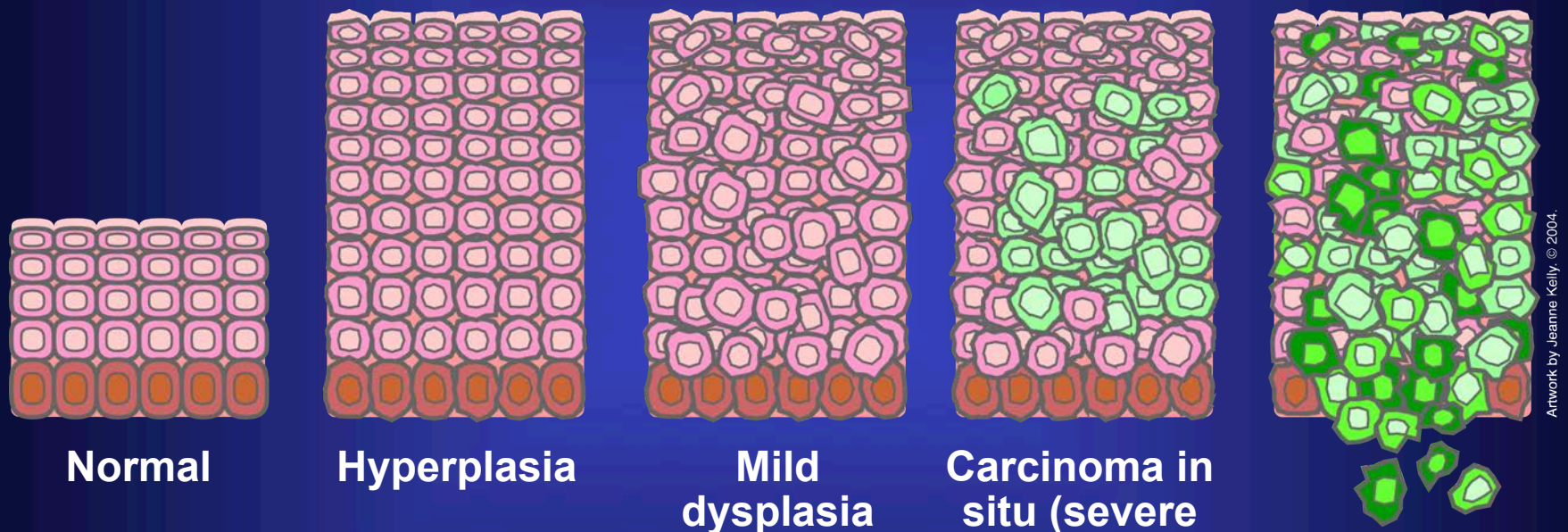
What does a pathologist look for examining biopsy tissue?



What does a pathologist look for when he examines biopsy tissue with a microscope?

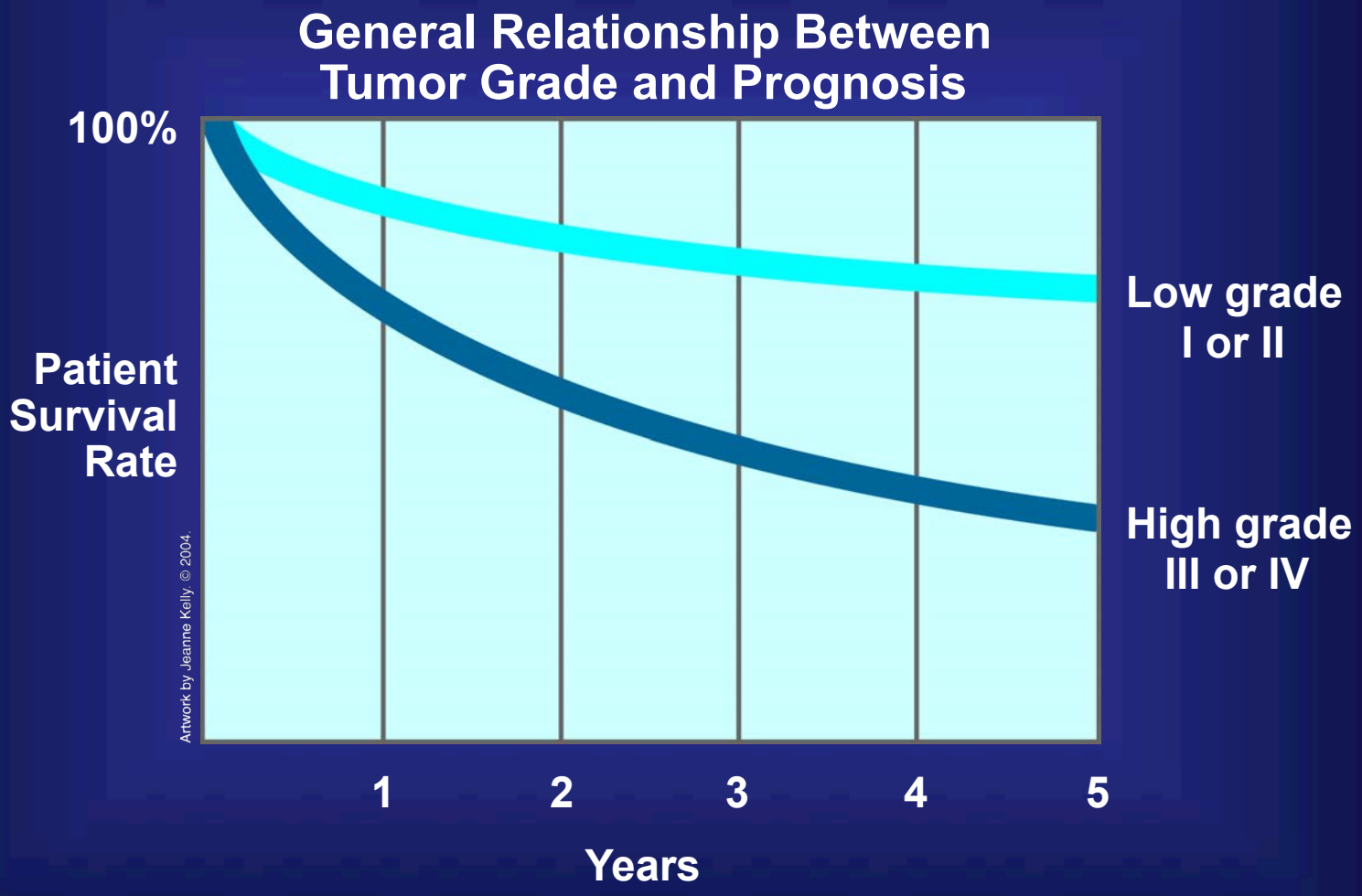


What does a pathologist look for when he/she examines biopsy tissue with a microscope?



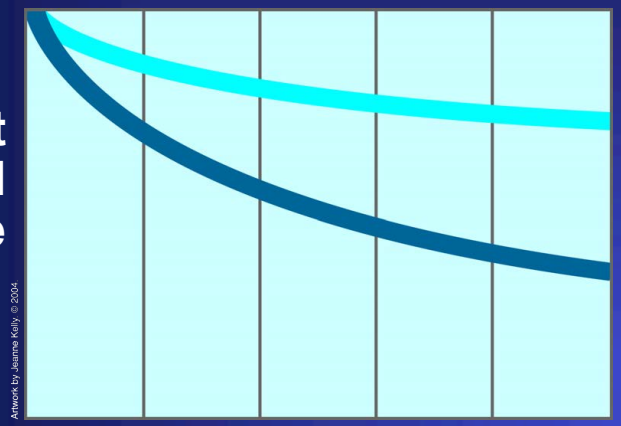
NATIONAL CANCER INSTITUTE

What is the relationship between tumor grade and patient survival?

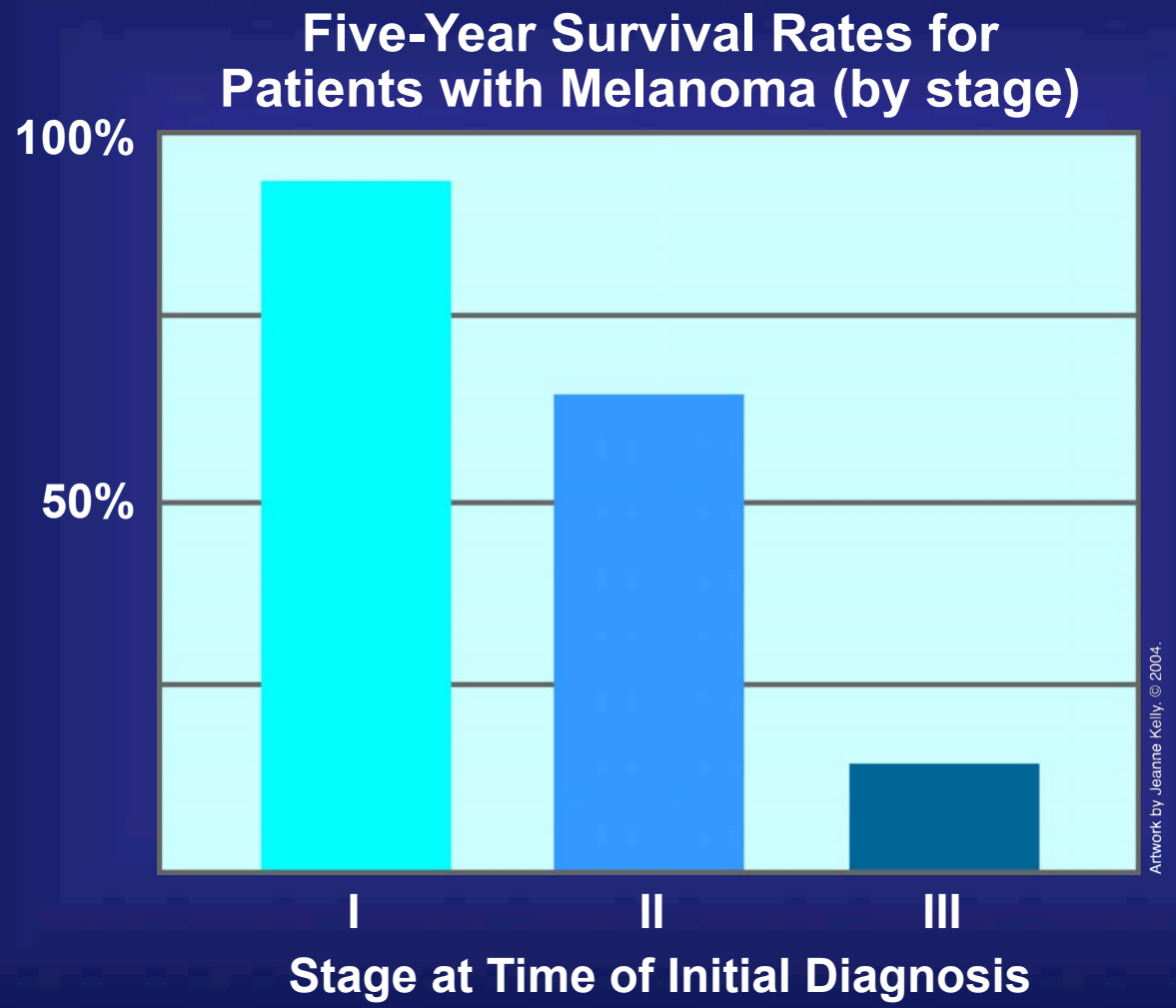


NATIONAL CANCER INSTITUTE

What is the relationship between tumor grade and patient prognosis?



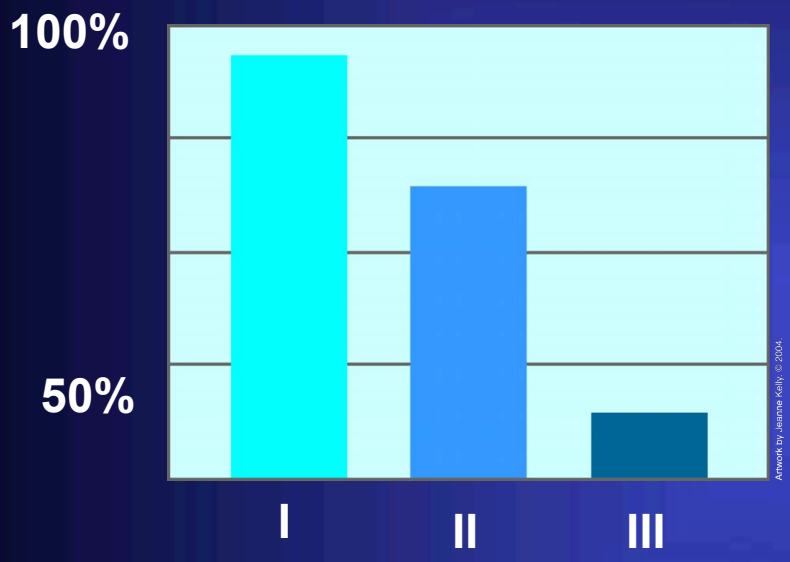
What does Stage III cancer mean?



NATIONAL CANCER INSTITUTE

What does Stage III cancer mean?

Five-Year Survival Rates for Patients with Melanoma (by stage)

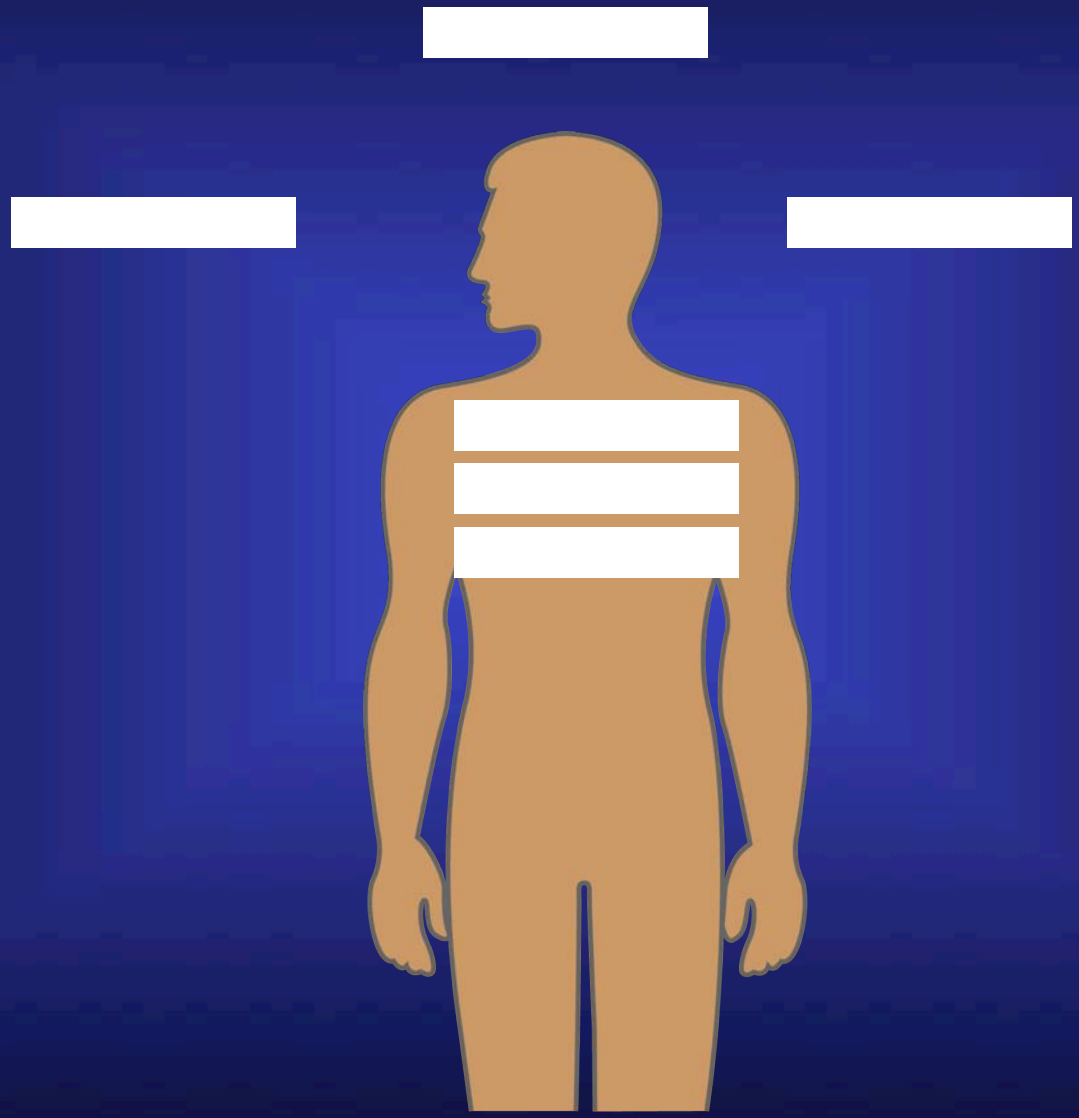


Stage at Time of Initial Diagnosis

Stage III Cancer

NATIONAL CANCER INSTITUTE

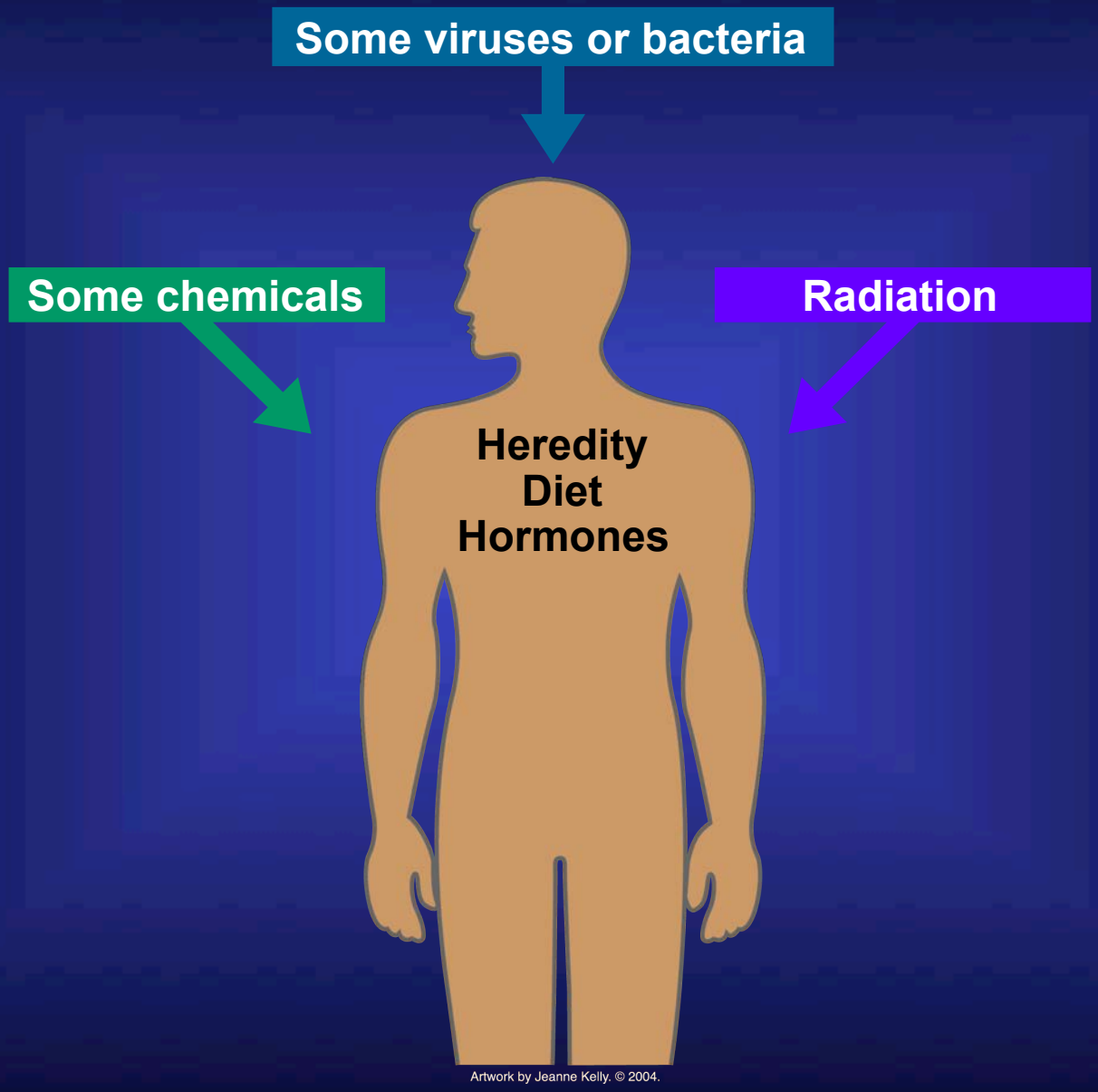
What Causes Cancer?



Artwork by Jeanne Kelly. © 2004.

NATIONAL CANCER INSTITUTE

What Causes Cancer?

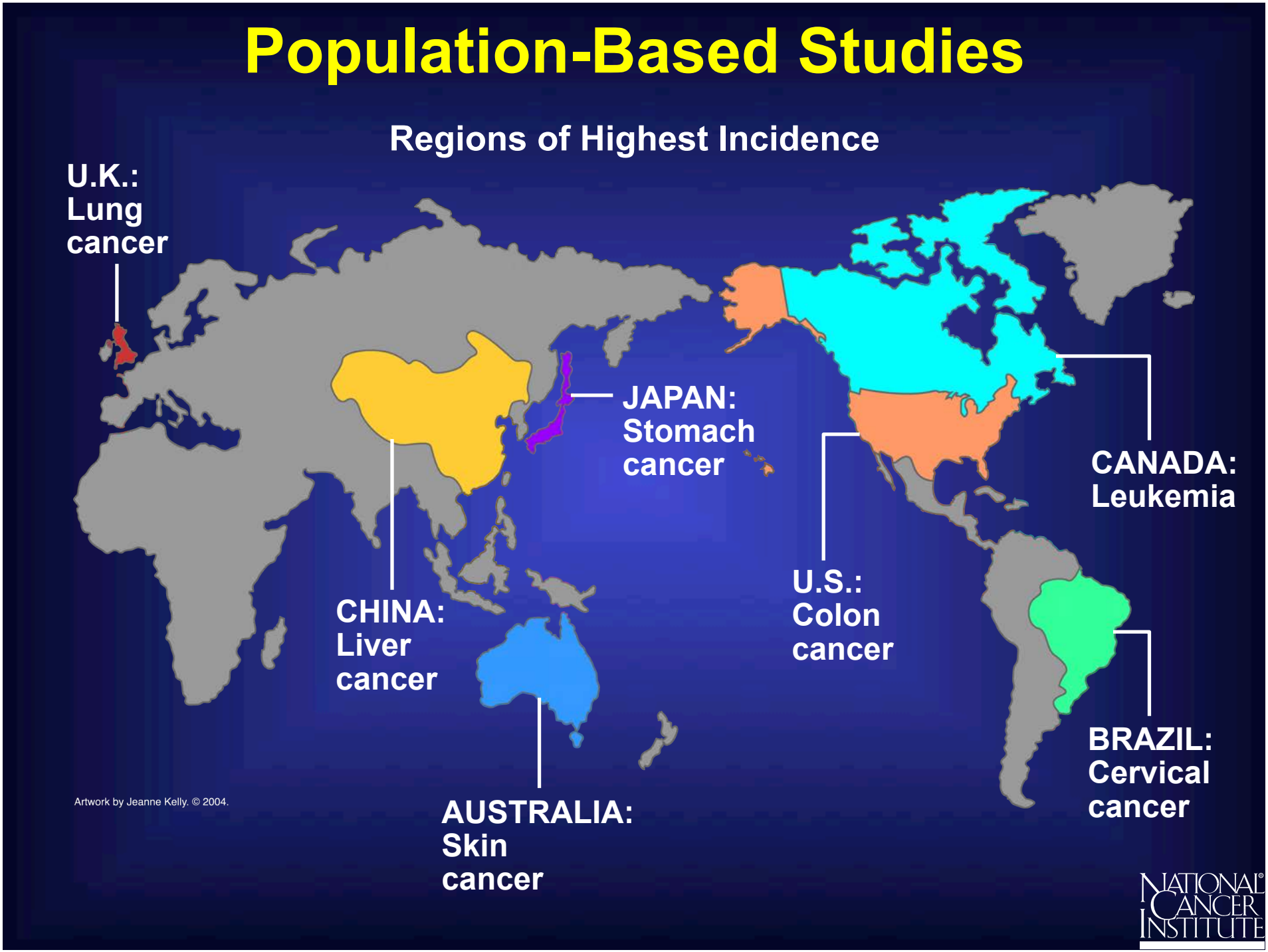


NATIONAL CANCER INSTITUTE

How could you explain the differences in the cancer incidence in different countries?

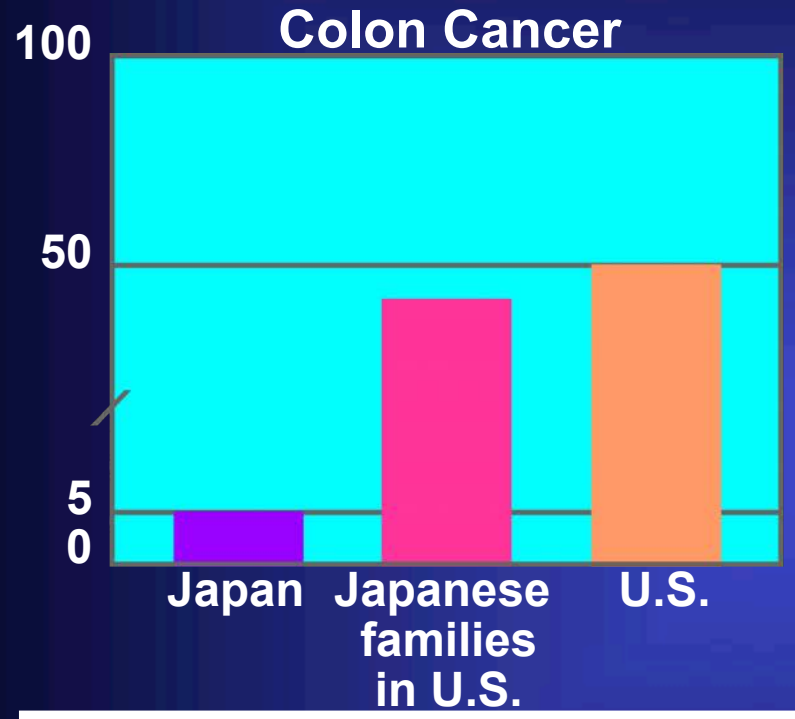
NATIONAL CANCER INSTITUTE

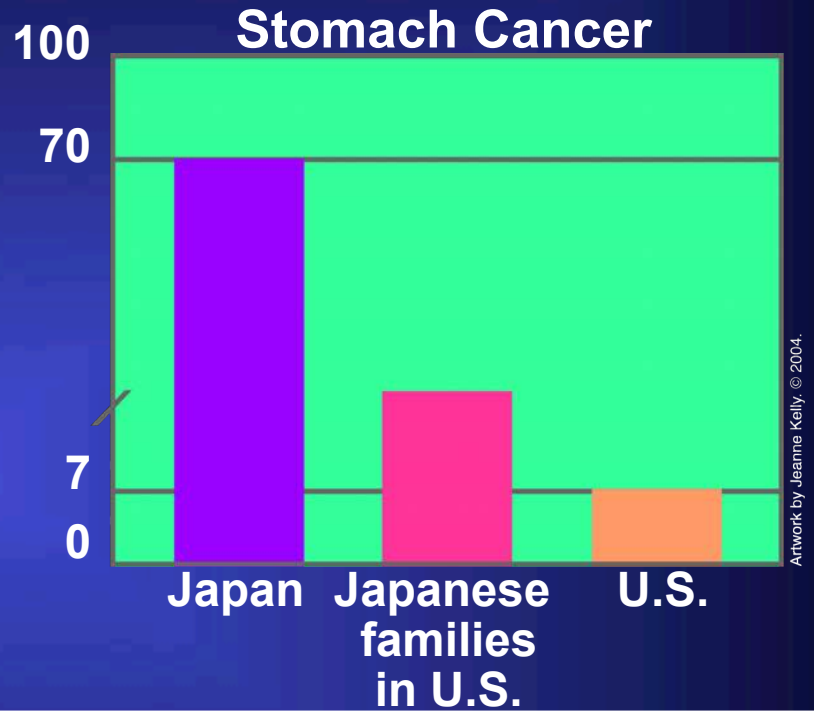
Population-Based Studies



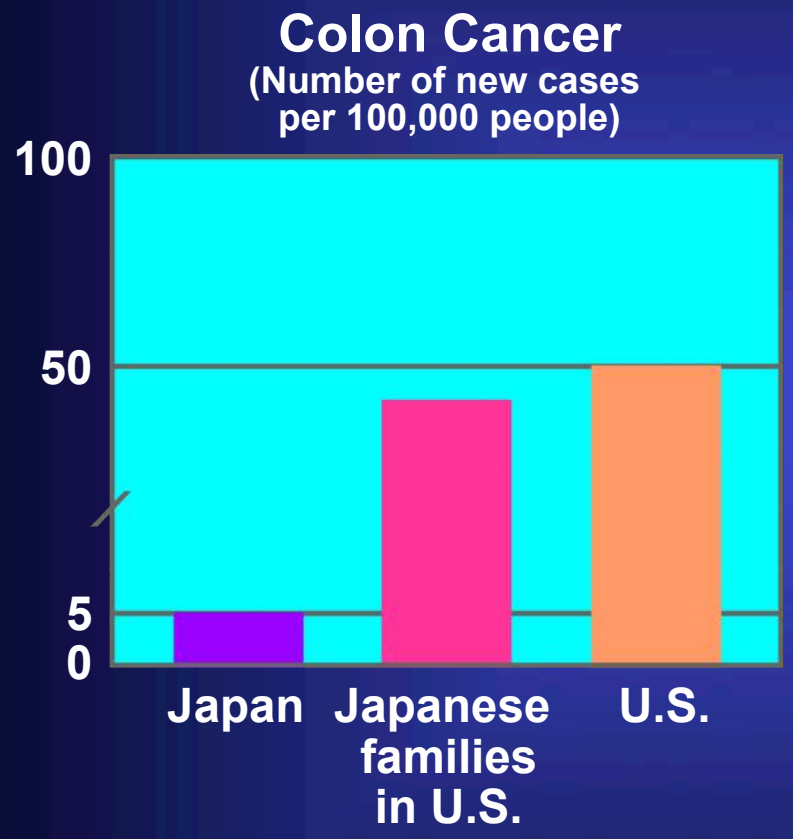
NATIONAL CANCER INSTITUTE

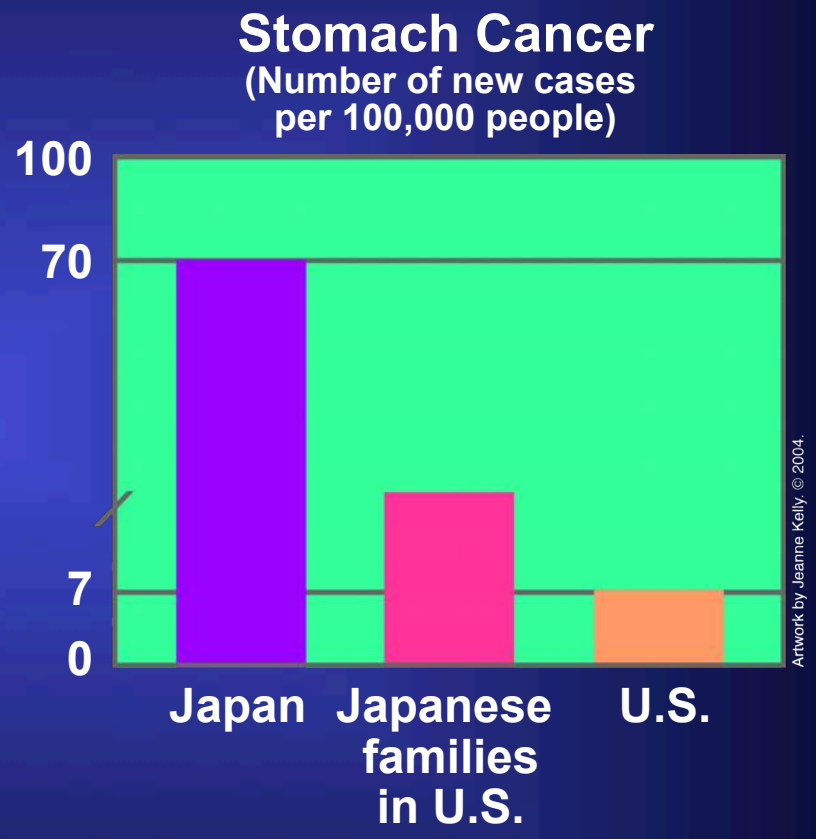
Is the incidence of these cancers due to genes, behavior, or environmental risk?





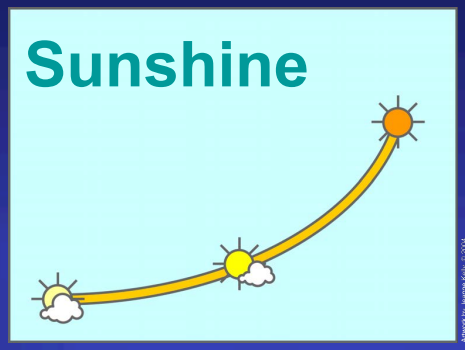
Is the incidence of these cancers due to genes behavior, or environmental risk?

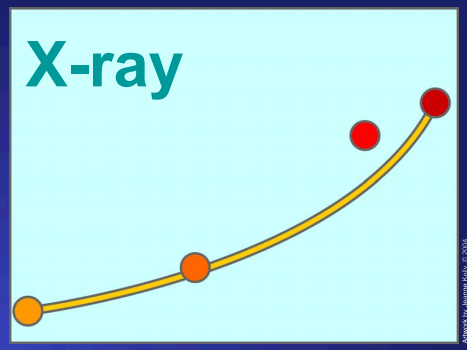


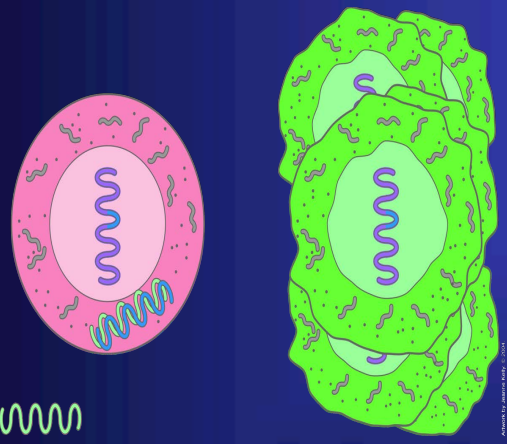


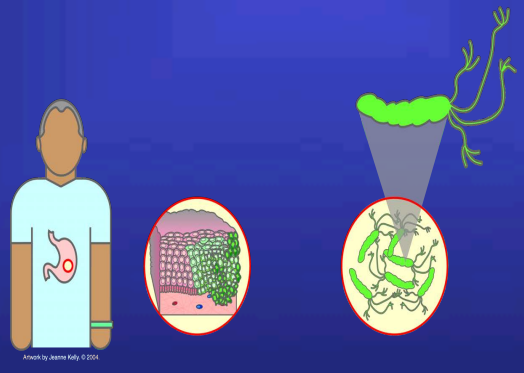
NATIONAL CANCER INSTITUTE

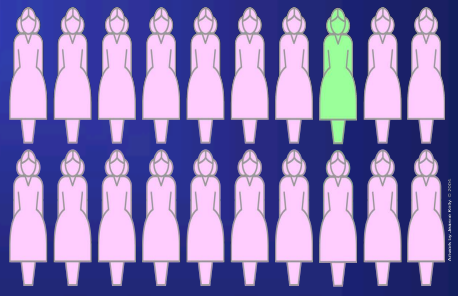
What increases peoples' risk of cancer?











What increases peoples' risk of cancer?

aminostilbene
arsenic
benz[*a*]anthracene
benz[*a*]pyrene
benzene
benzo[*b*]fluoranthene
benzo[*c*]phenanthrene
benzo[*f*]fluoranthene
cadmium
chrysene
dibenz[*a c*]anthracene
dibenzo[*a e*]fluoranthene
dibenz[*a h*]acridine
dibenz[*a j*]acridine
dibenzo[*c g*]carbazone
N-dibutylnitrosamine
2,3-dimethylchrysene
indeno[1,2,3-*c d*]pyrene
S-methylchrysene
S-methylfluoranthene
alpha-naphthylamine
nickel compounds
N-nitrosodimethylamine
N-nitrosomethylethylamine
N-nitrosodiethylamine
N-nitrosonornicotine
N-nitrosoanabasine
N-nitrosopiperidine
polonium-210

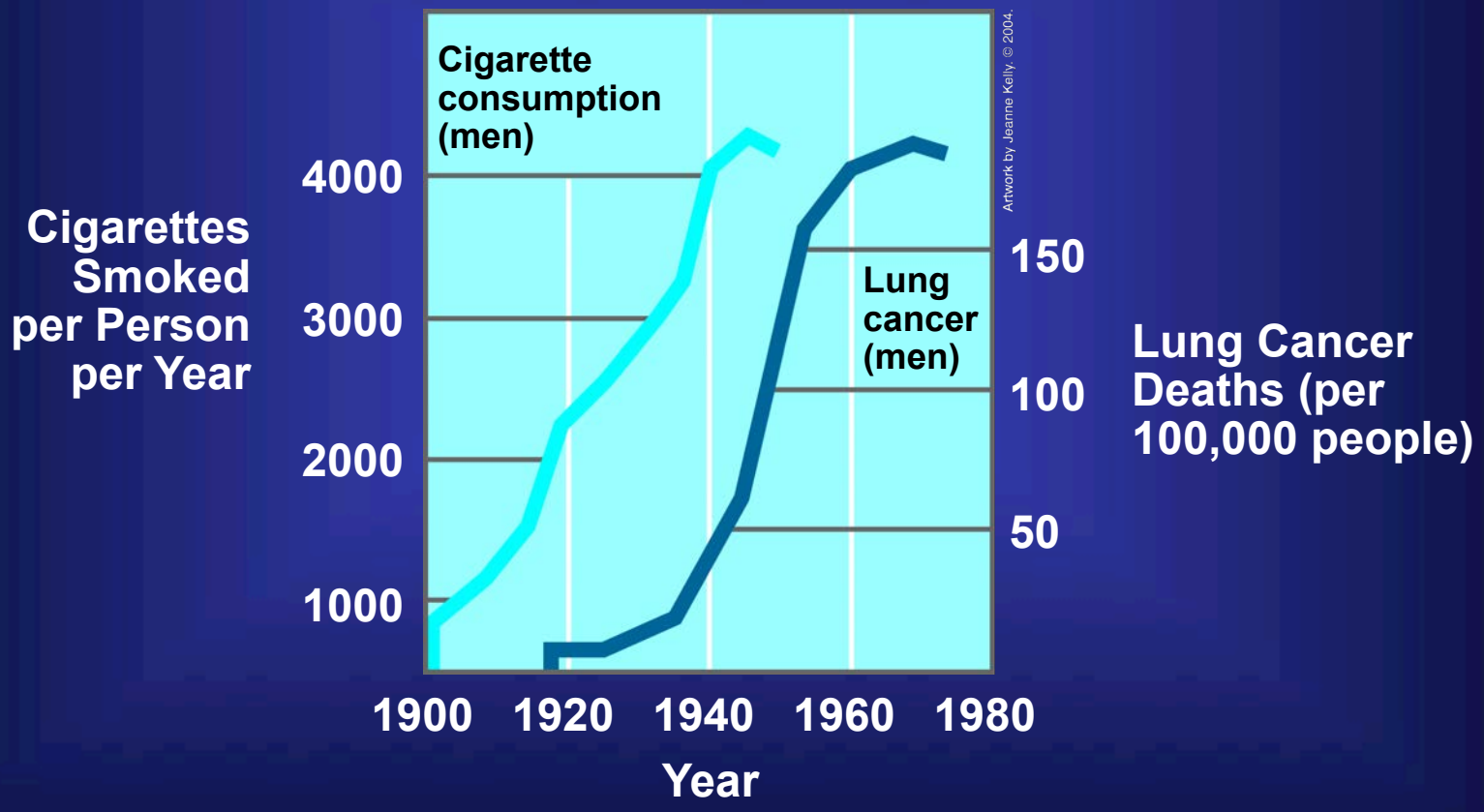
Artwork by Jeanne Kelly. © 2004.

Some Carcinogenic Chemicals in Tobacco Smoke

NATIONAL CANCER INSTITUTE

What increases peoples' risk of cancer?

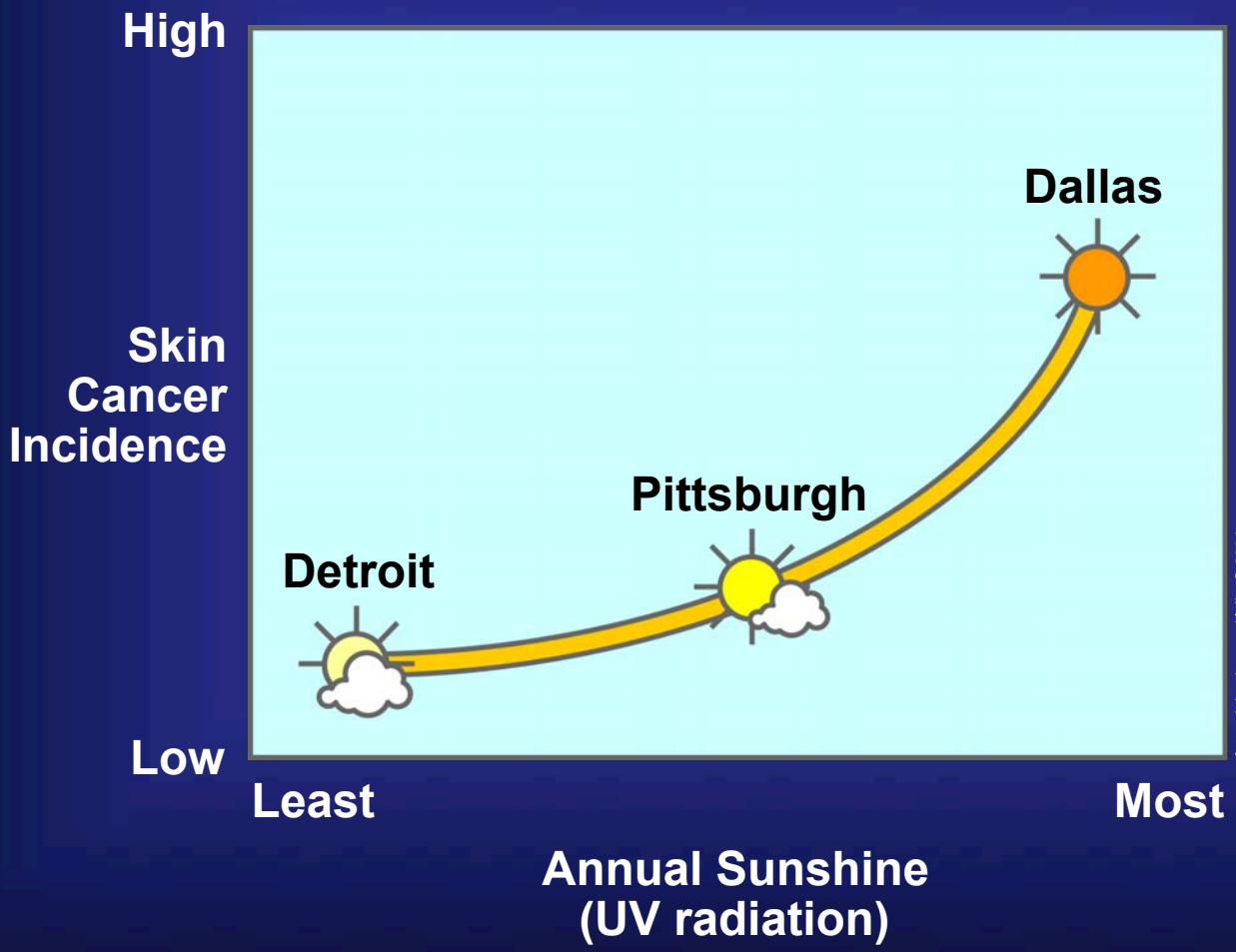
20-Year Lag Time Between Smoking and Lung Cancer



NATIONAL CANCER INSTITUTE

What increases peoples' risk of cancer?

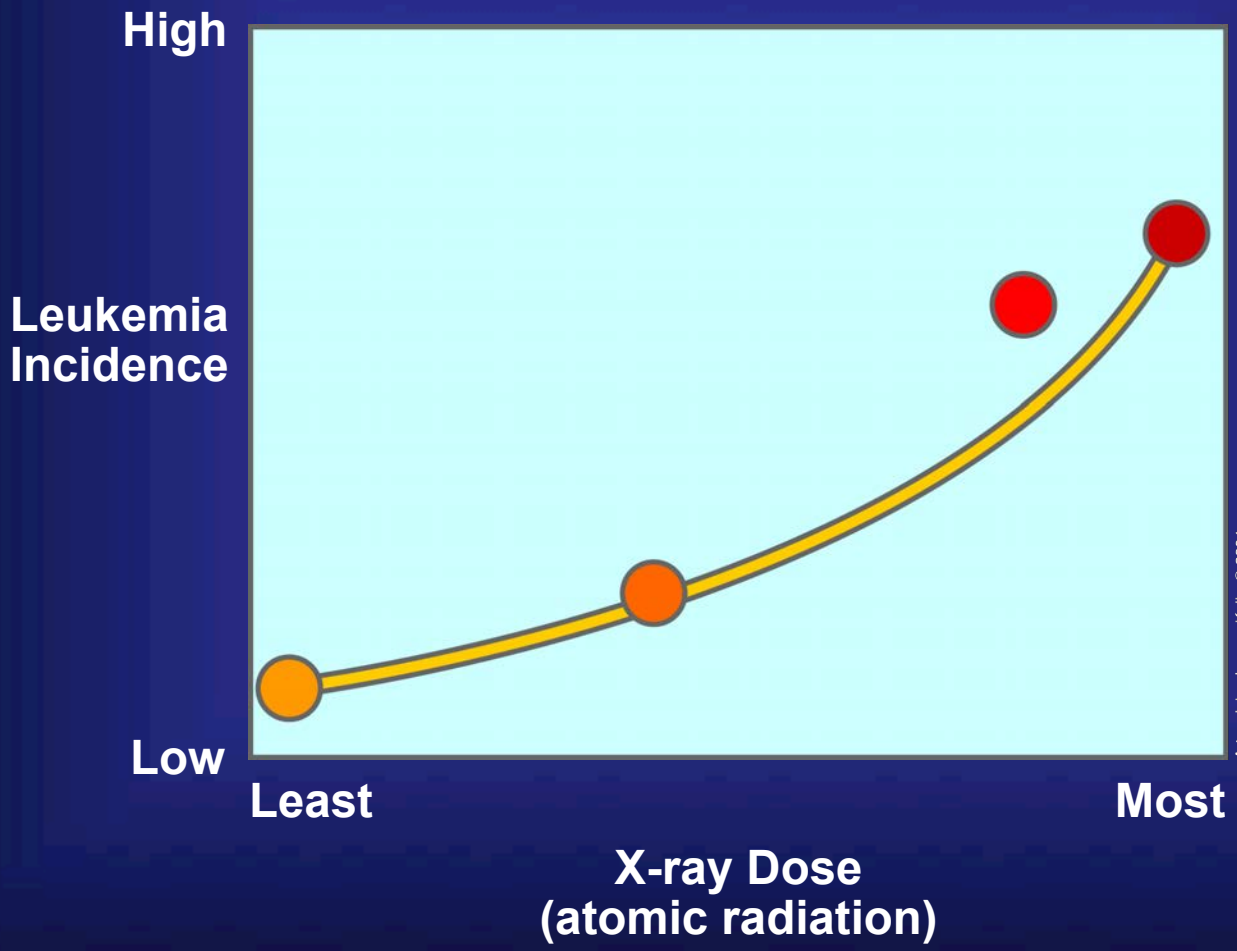
Low Strength (Ultraviolet) Radiation



NATIONAL CANCER INSTITUTE

What increases peoples' risk of cancer?

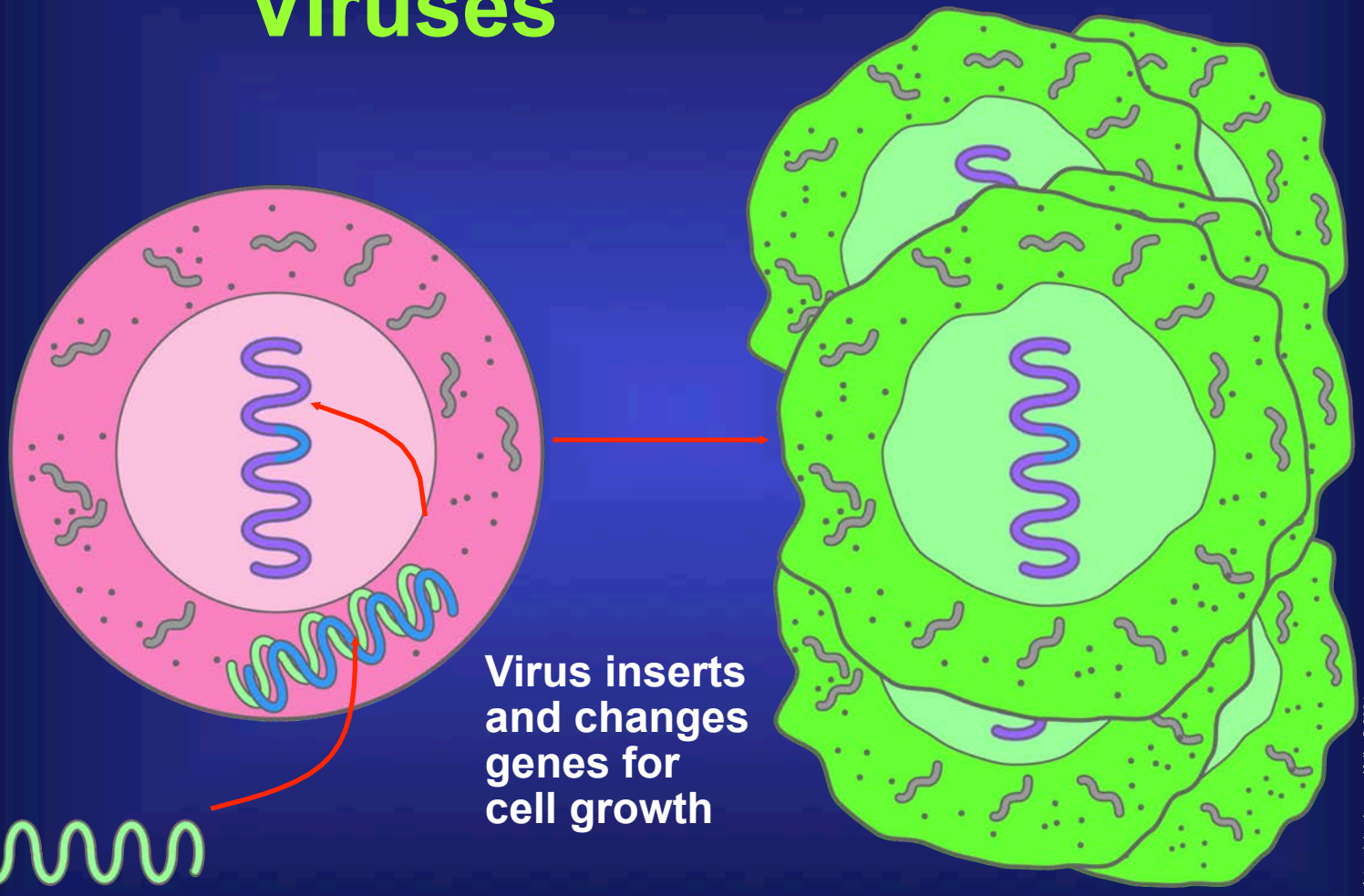
High-Strength (Atomic) Radiation



NATIONAL CANCER INSTITUTE

What increases peoples' risk of cancer?

Viruses



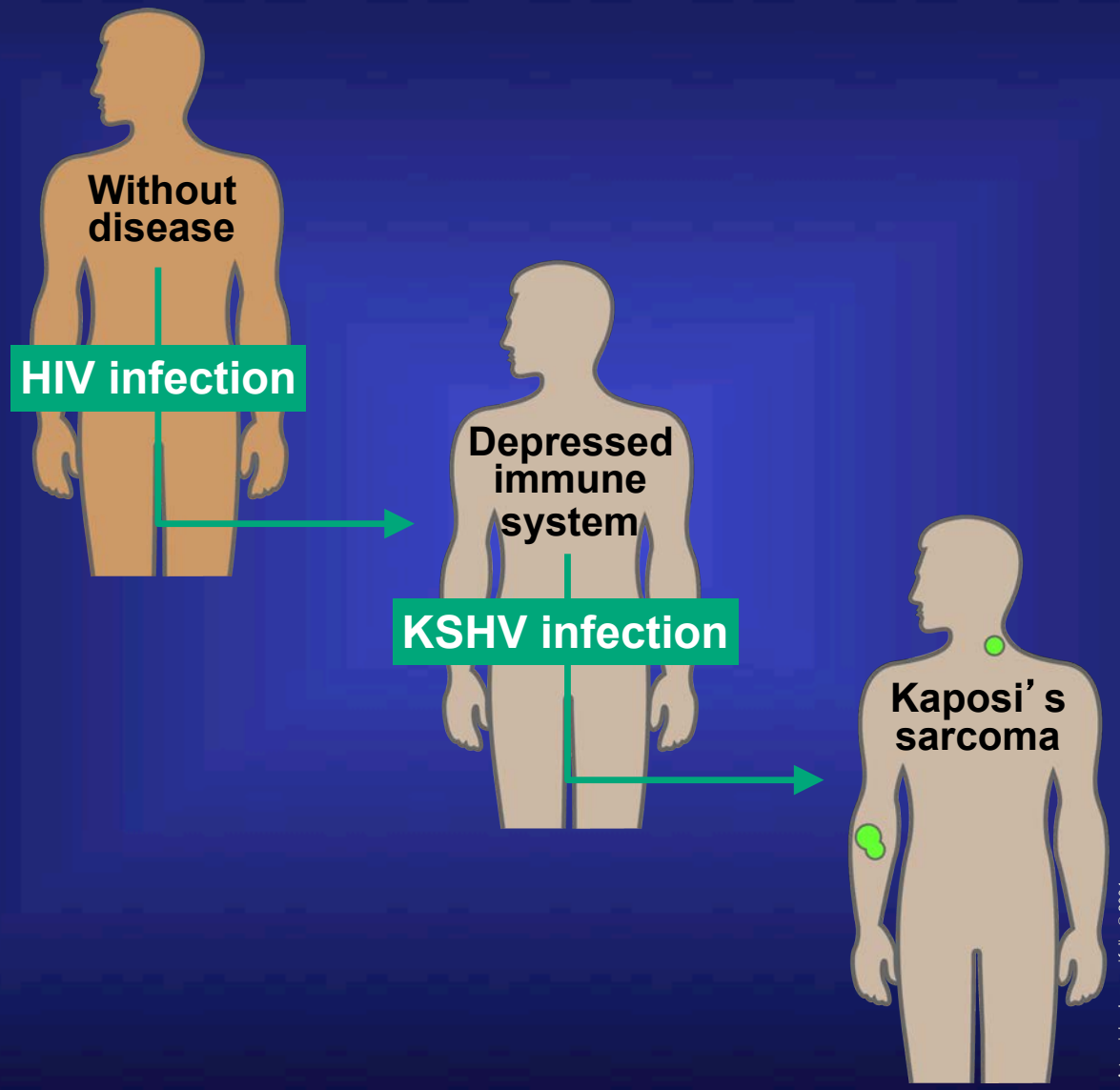
What increases peoples' risk of cancer?

Some Viruses Associated with Human Cancers

Virus	*Type of Cancer*
Epstein-Barr virus	Burkitt's lymphoma
Human papillomavirus	Cervical cancer
Hepatitis B virus	Liver cancer
Human T-cell lymphotrophic virus	Adult T-cell leukemia
Kaposi's sarcoma-associated herpesvirus	Kaposi's sarcoma

NATIONAL CANCER INSTITUTE

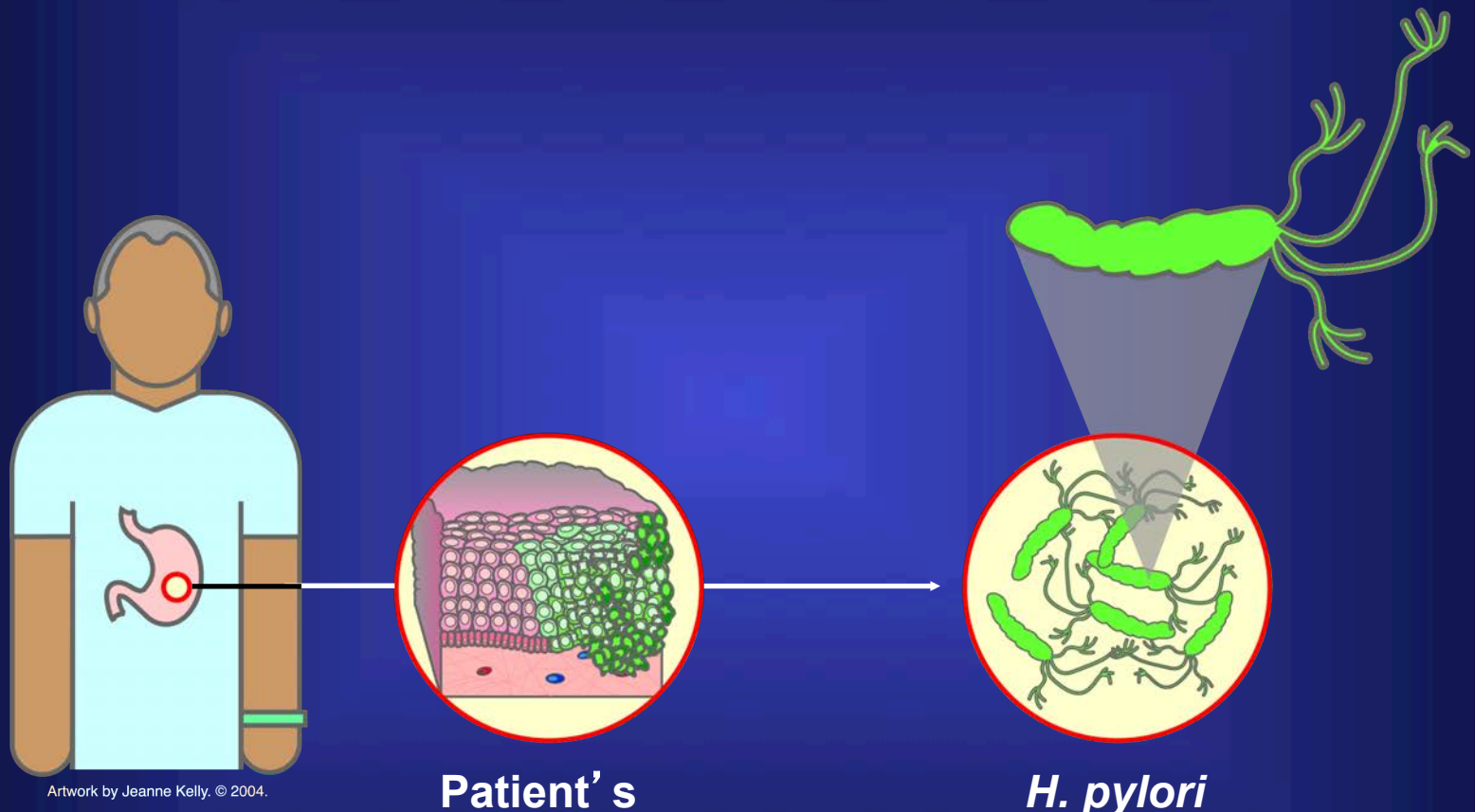
What increases peoples' risk of cancer?



NATIONAL CANCER INSTITUTE

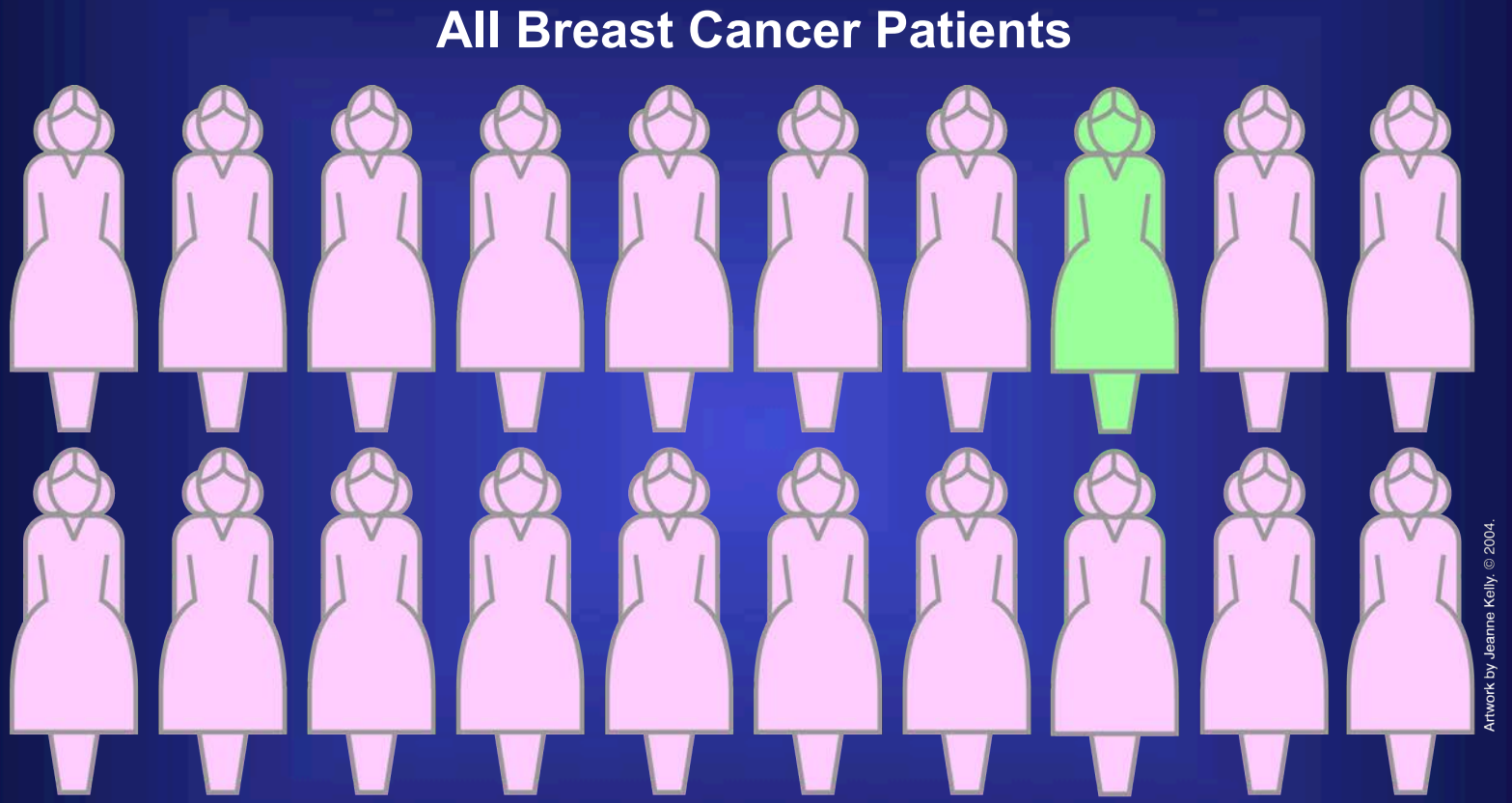
What increases peoples' risk of cancer?

Bacteria and Stomach Cancer



NATIONAL CANCER INSTITUTE

What increases peoples' risk of cancer?



- Inherited factor(s)
- Other factor(s)

NATIONAL CANCER INSTITUTE

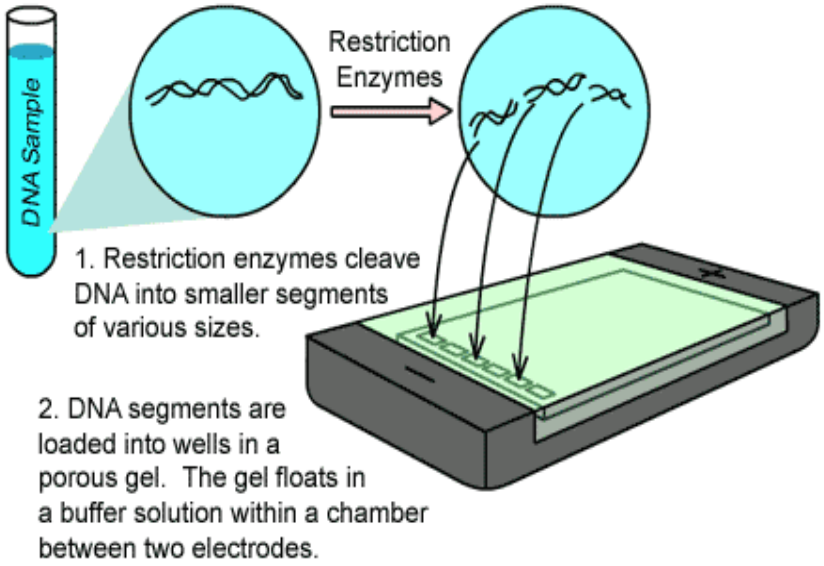
What increases peoples' risk of cancer?

Inherited Conditions That Increase Risk for Cancer

Name of Condition	*Type of Cancer*
Hereditary retinoblastoma	Retinoblastoma
Xeroderma pigmentosum	Skin
Wilms' tumor	Kidney
Li-Fraumeni syndrome	Sarcomas, brain, breast, leukemia
Familial adenomatous polyposis	Colon, rectum
Paget's disease of bone	Bone
Fanconi's aplastic anemia	Leukemia, liver, skin

How do you know if you have genes that make getting cancer more likely?

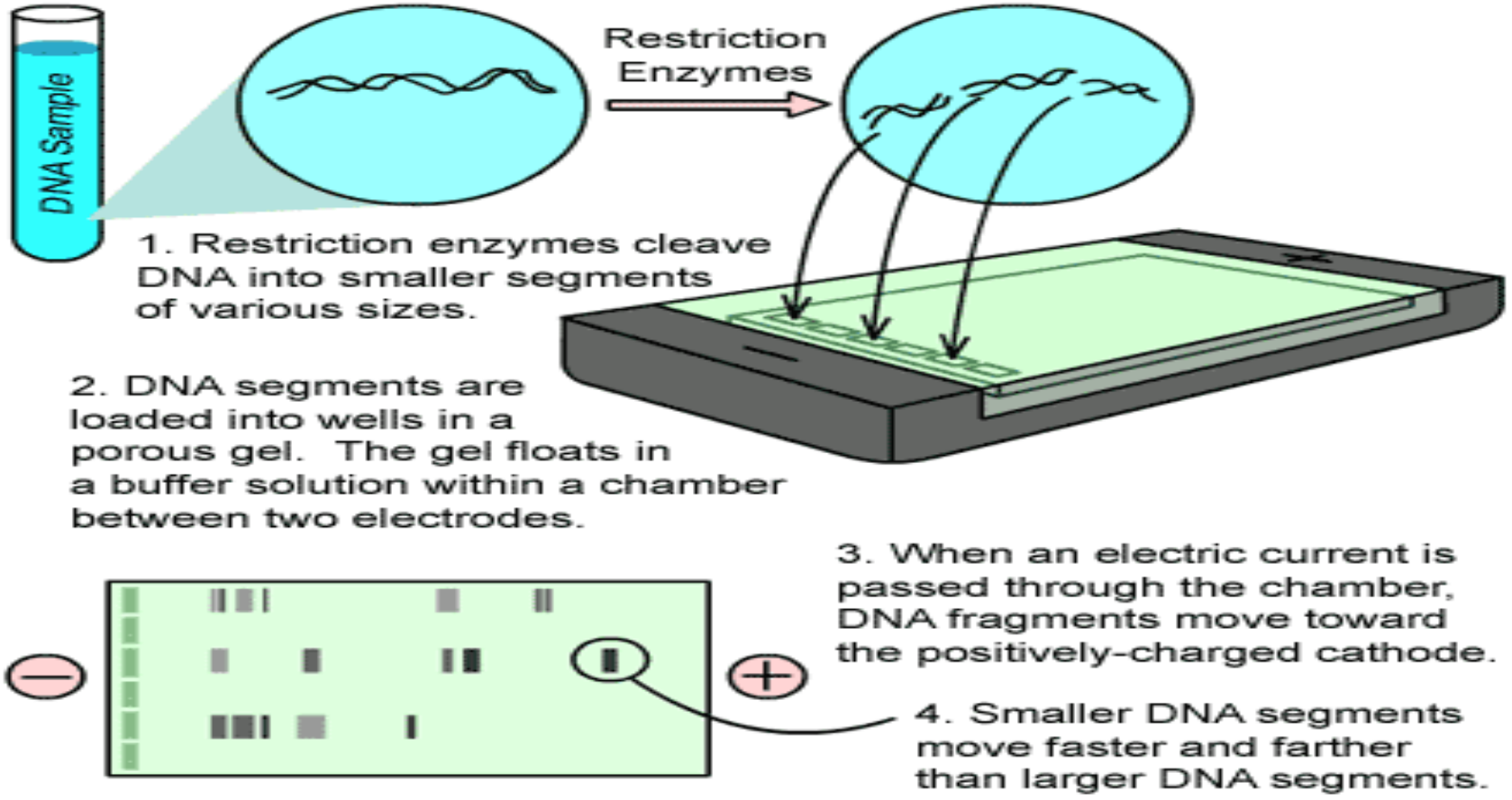
Genetic Testing



NATIONAL CANCER INSTITUTE

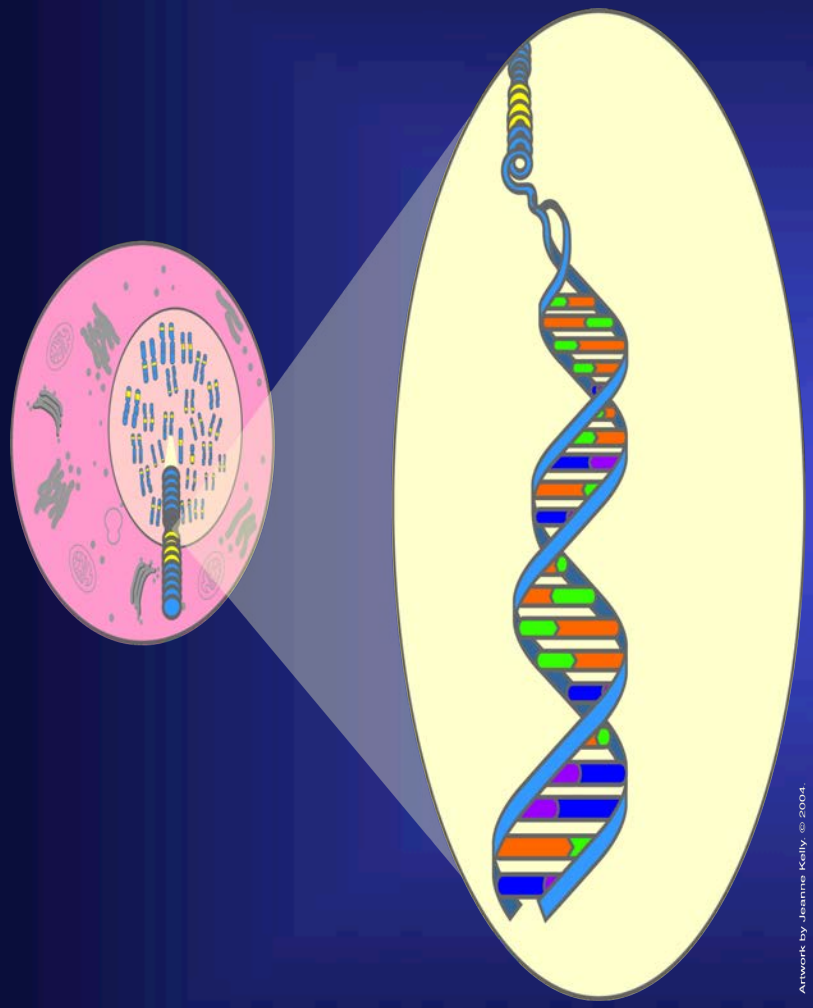
How do you know if you have genes that make getting cancer more likely?

Genetic Testing



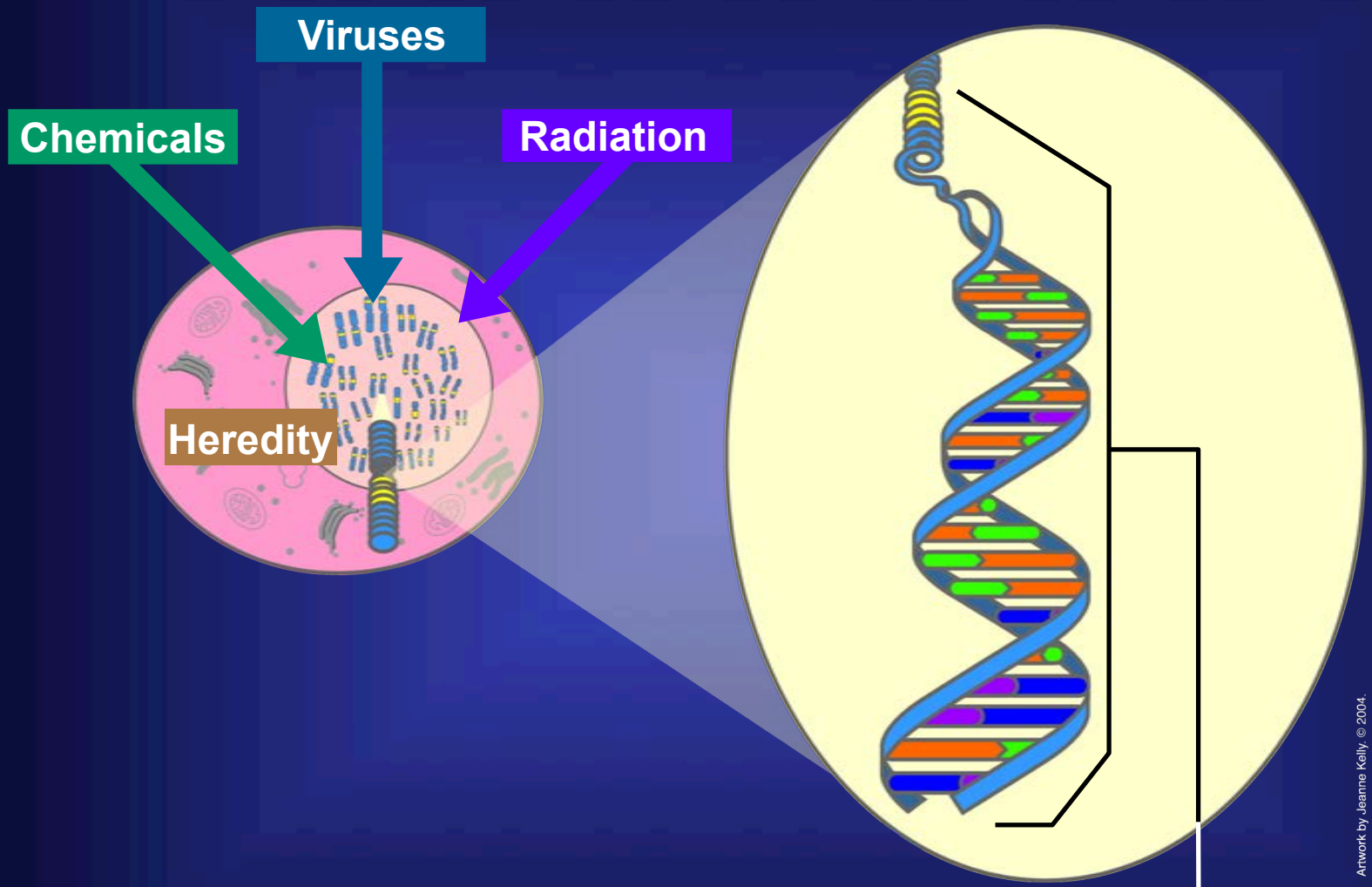
NATIONAL CANCER INSTITUTE

What happens to genes to cause cancer?



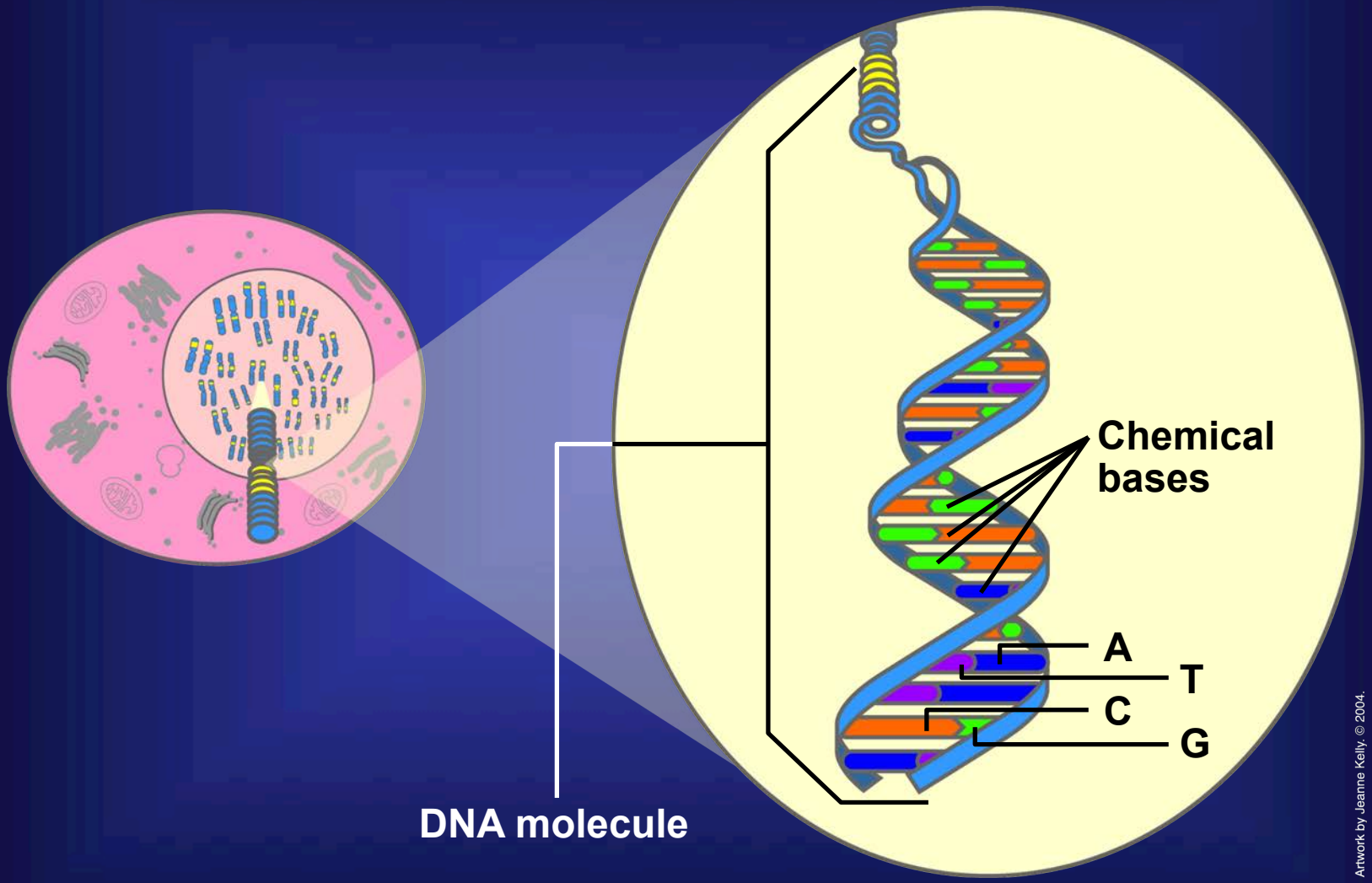
NATIONAL CANCER INSTITUTE

What happens to genes to cause cancer?



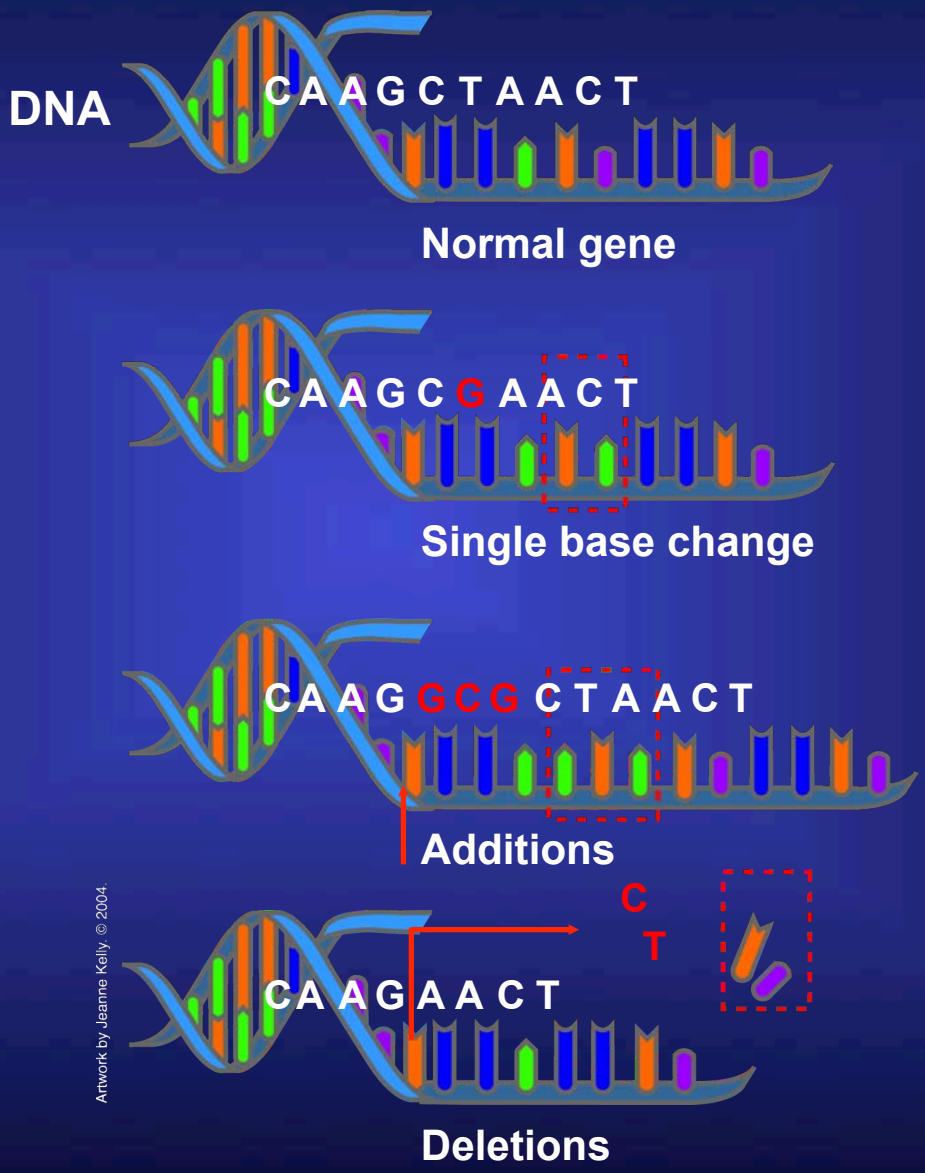
NATIONAL CANCER INSTITUTE

What happens to genes to cause cancer?



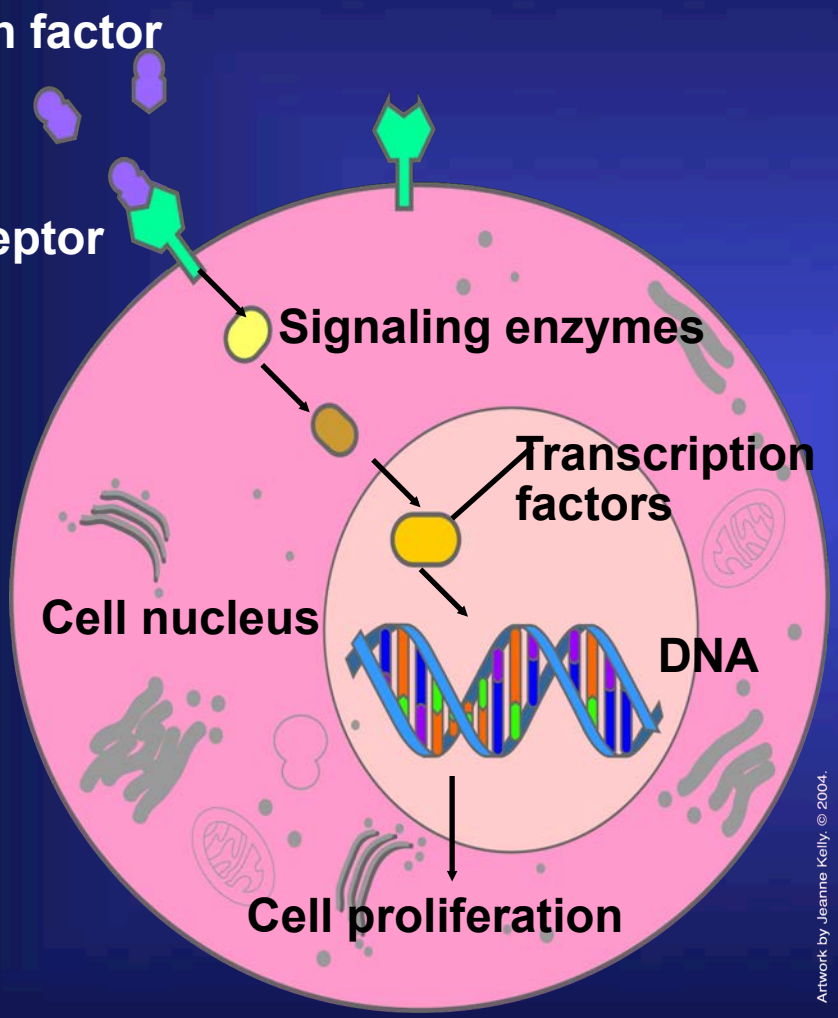
What happens to genes to cause cancer?

DNA Mutations



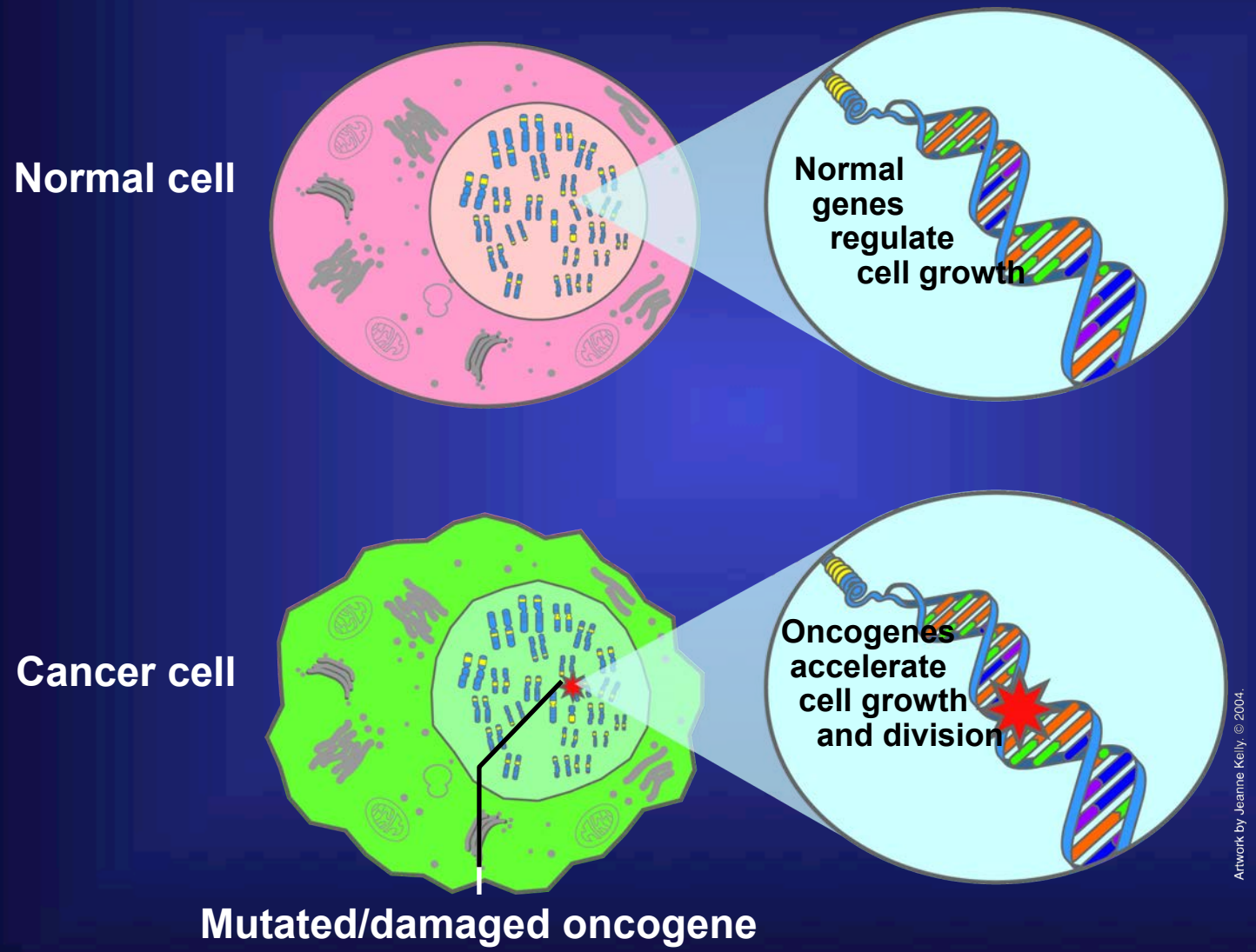
NATIONAL CANCER INSTITUTE

How do mutations in oncogenes lead to cancer?



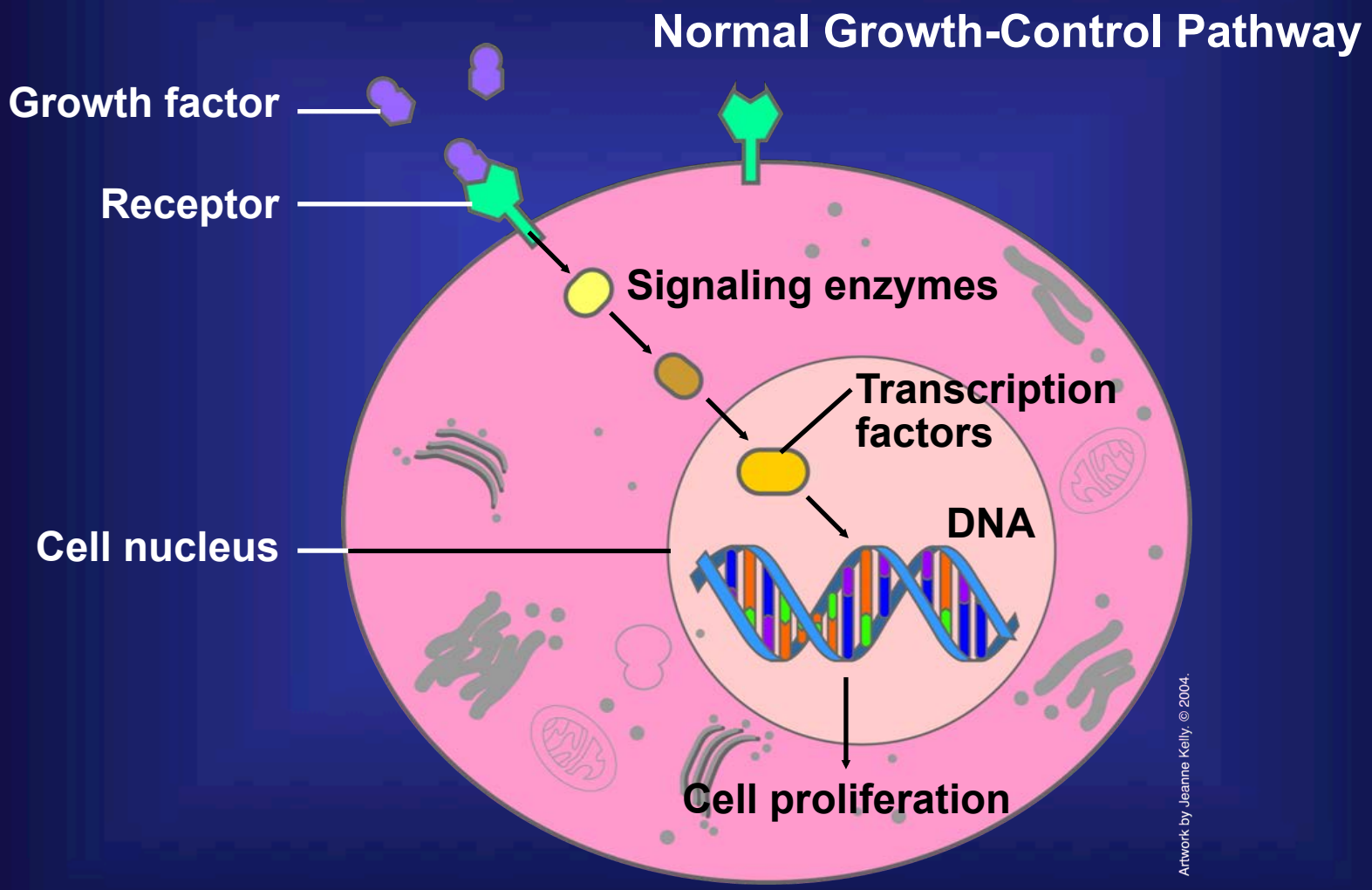
NATIONAL CANCER INSTITUTE

How do mutations in oncogenes lead to cancer?

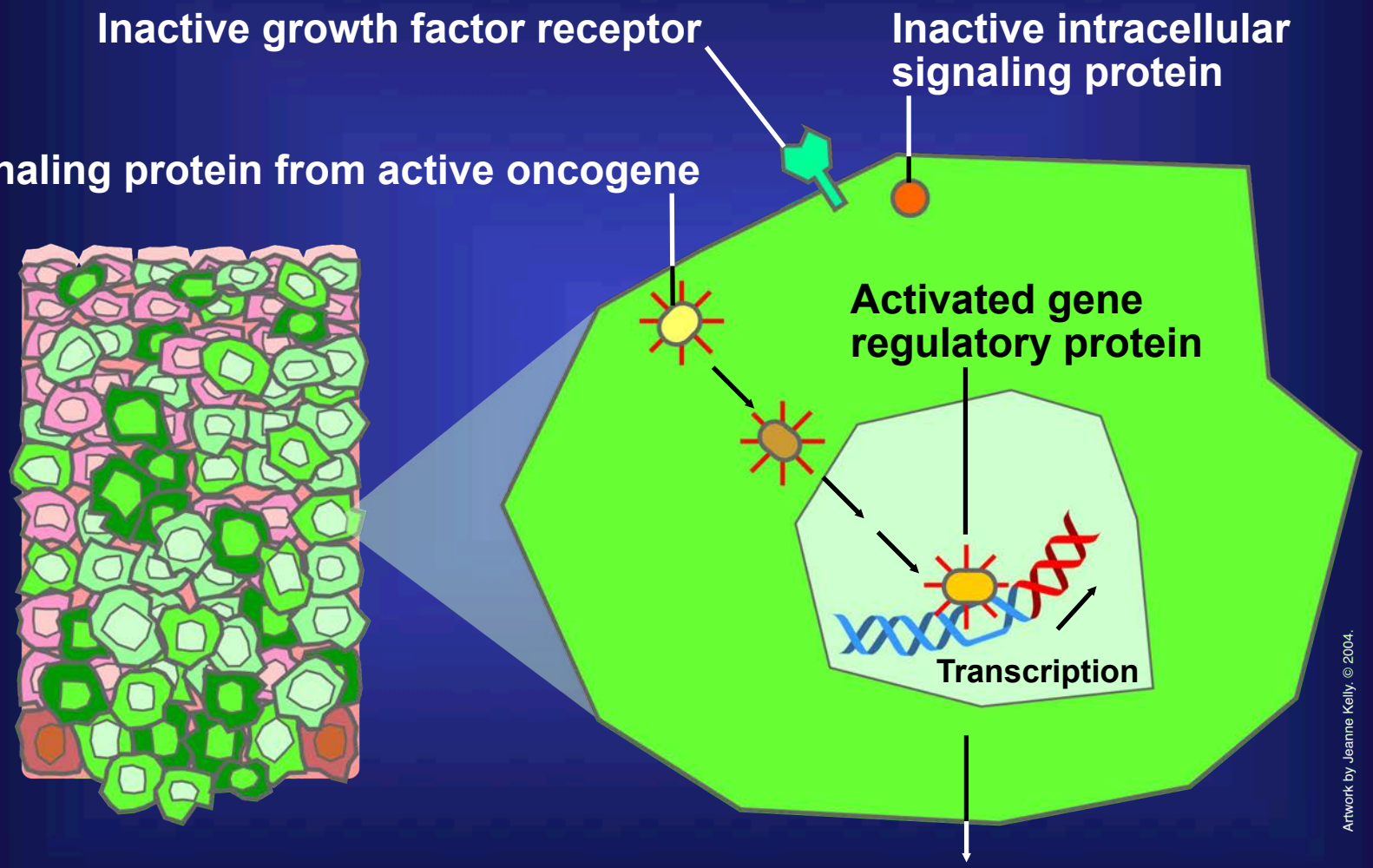


NATIONAL CANCER INSTITUTE

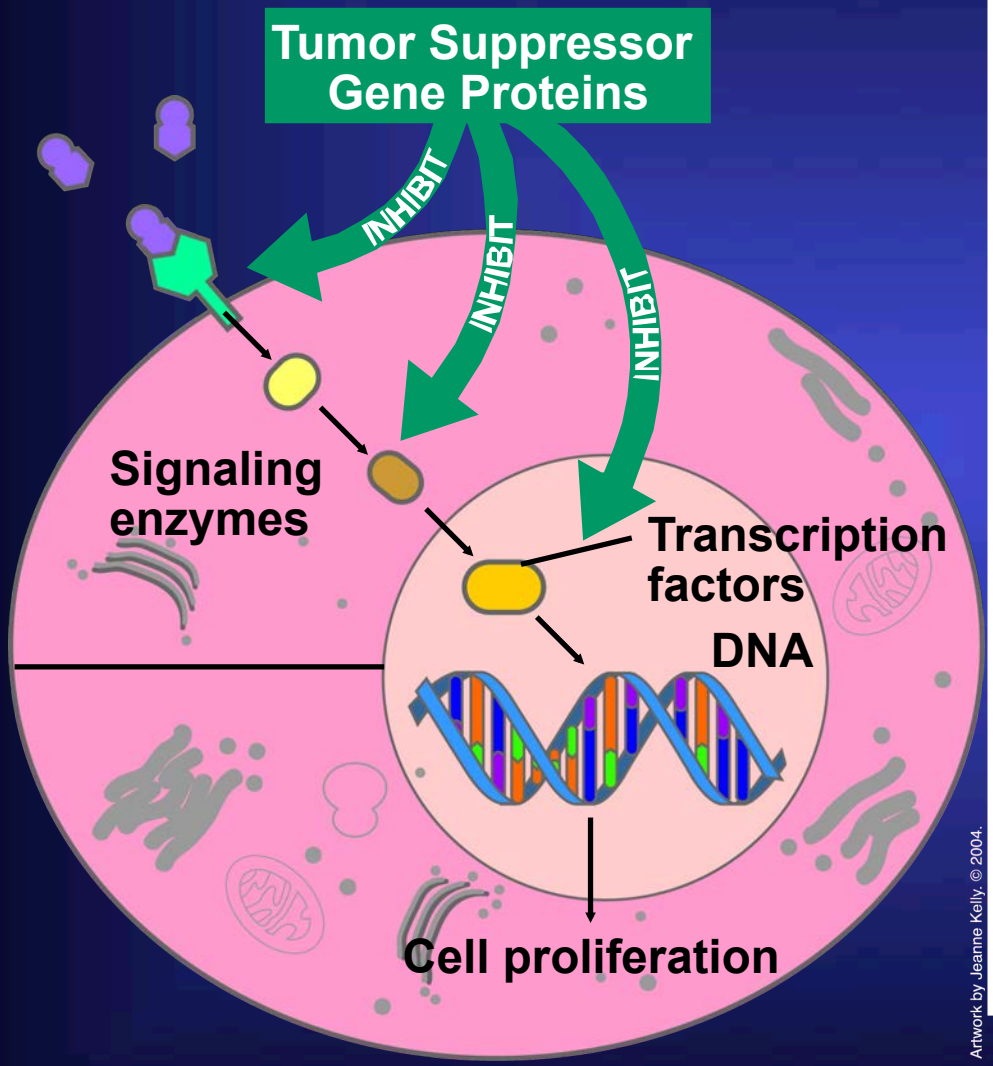
How do mutations in oncogenes lead to cancer?



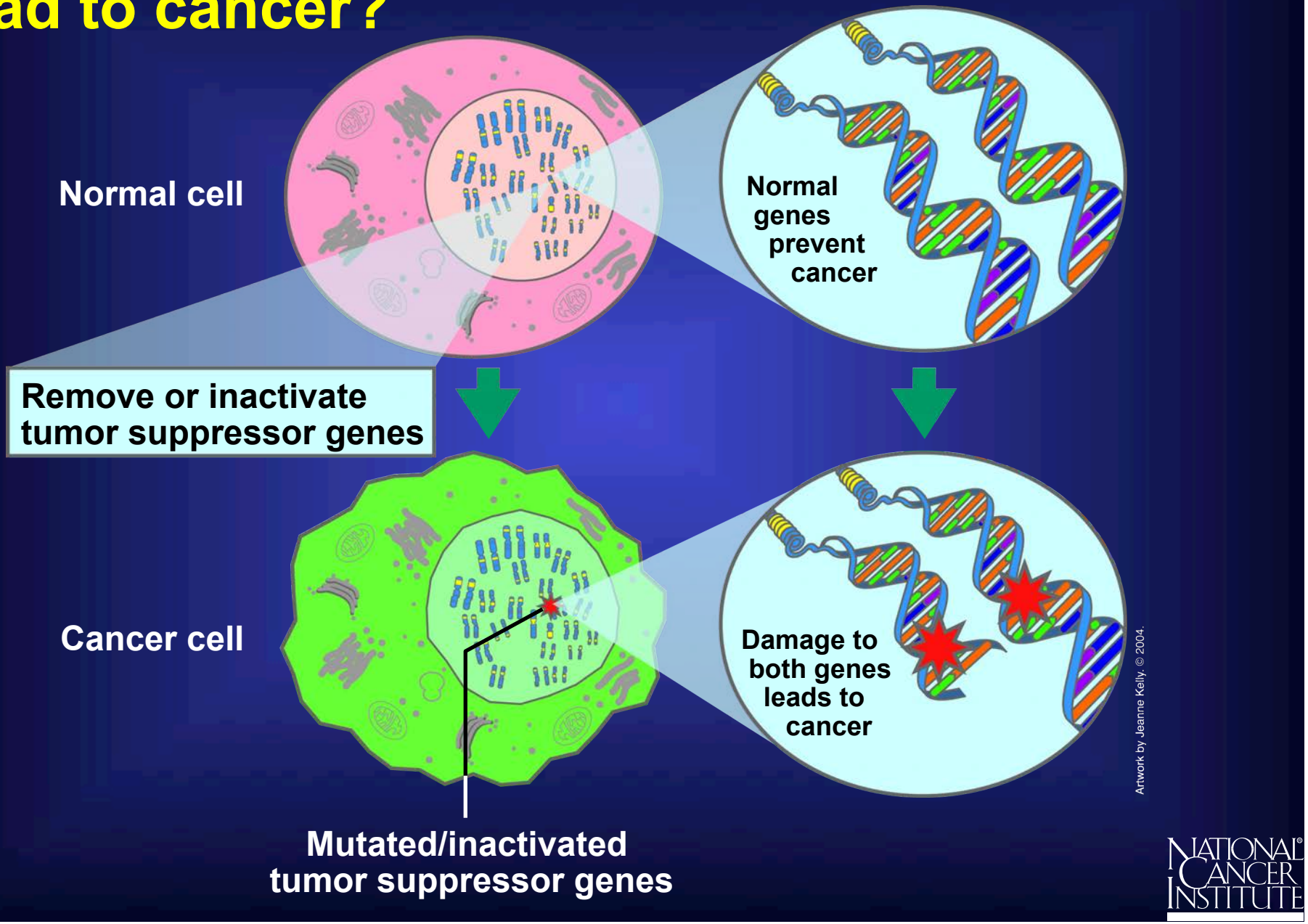
How do mutations in oncogenes lead to cancer?



How do mutations in tumor suppressor genes lead to cancer?

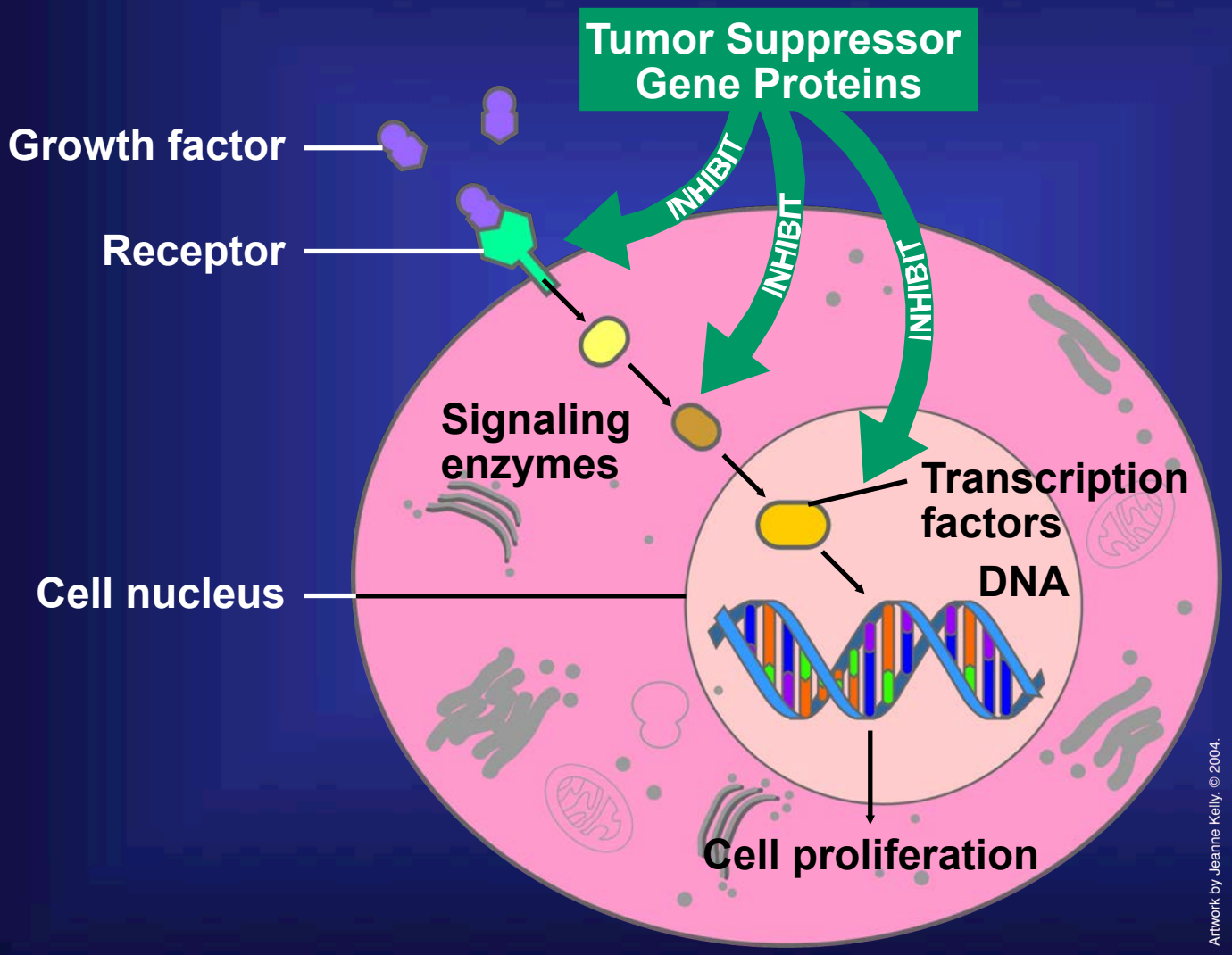


How do mutations in tumor suppressor genes lead to cancer?

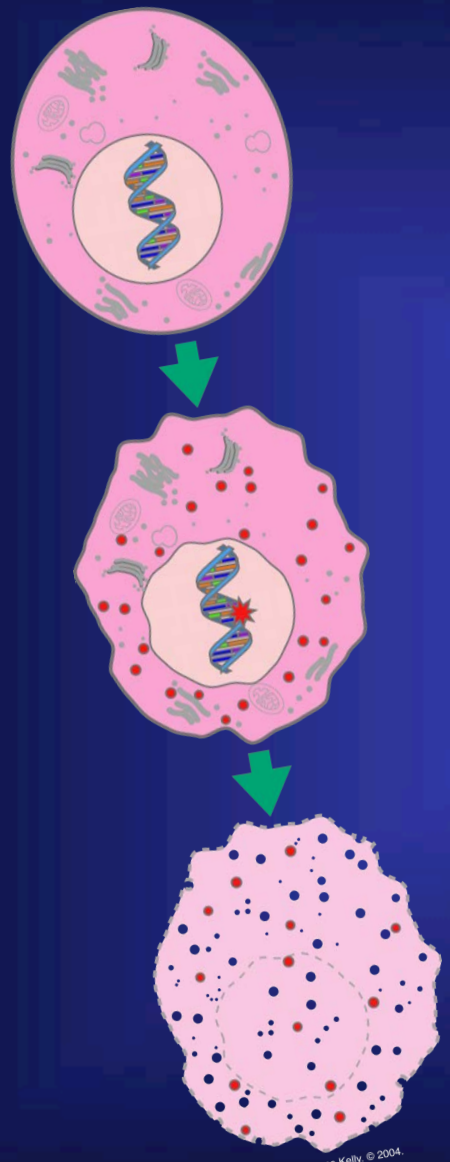


NATIONAL CANCER INSTITUTE

How do mutations in tumor suppressor genes lead to cancer?



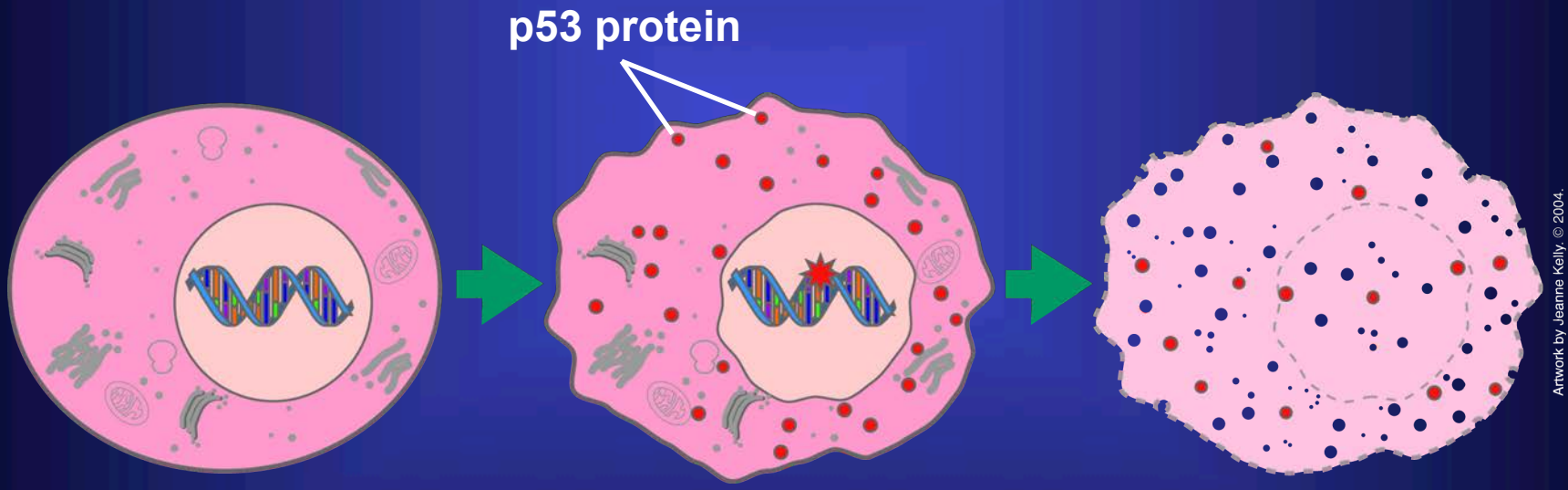
How do mutations in the p53 gene lead to cancer?



NATIONAL CANCER INSTITUTE

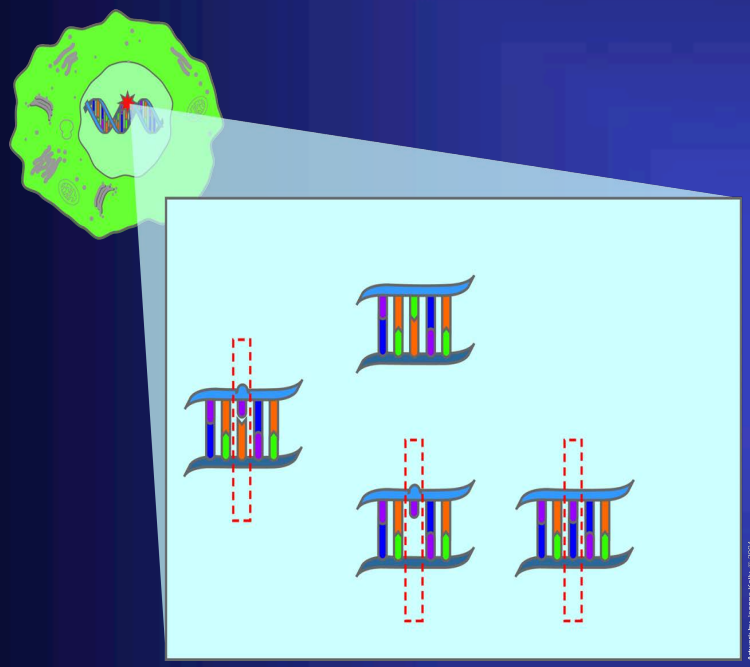
How do mutations in the p53 gene lead to cancer?

p53 Tumor Suppressor Protein Triggers Cell Suicide



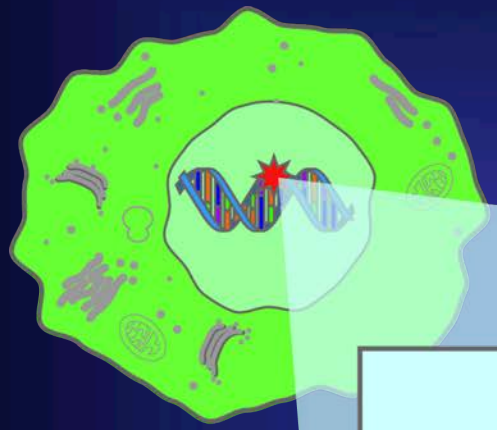
NATIONAL CANCER INSTITUTE

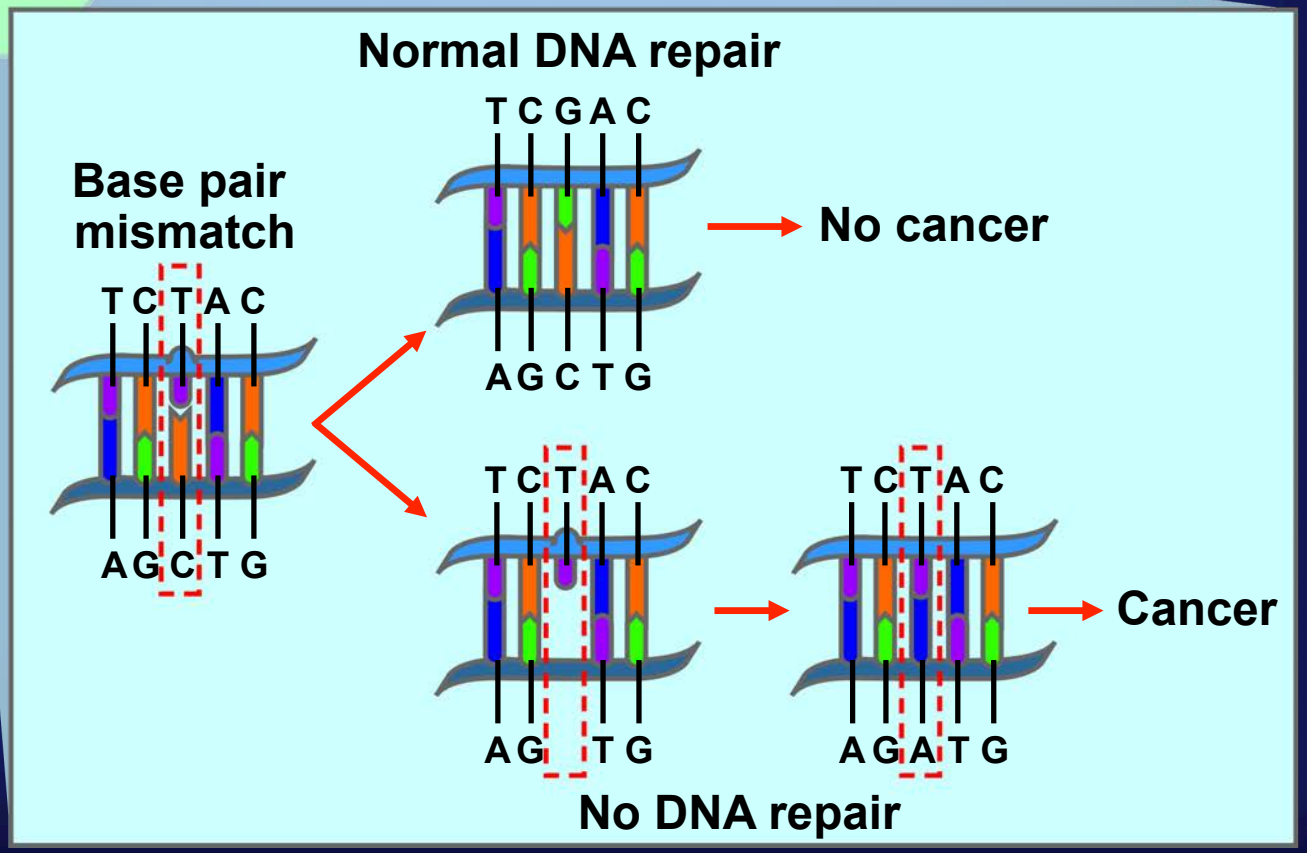
How do mutations in DNA Repair Genes cause cancer?



NATIONAL CANCER INSTITUTE

How do mutations in DNA Repair Genes cause cancer?





What other kinds of mutations can lead to cancer?

Genes Implicated in Cancer

The prime suspects	*But*
Mutations in:	Other mutations also occur in:
■ Oncogenes	
■ Tumor suppressor genes	
■ DNA repair genes	

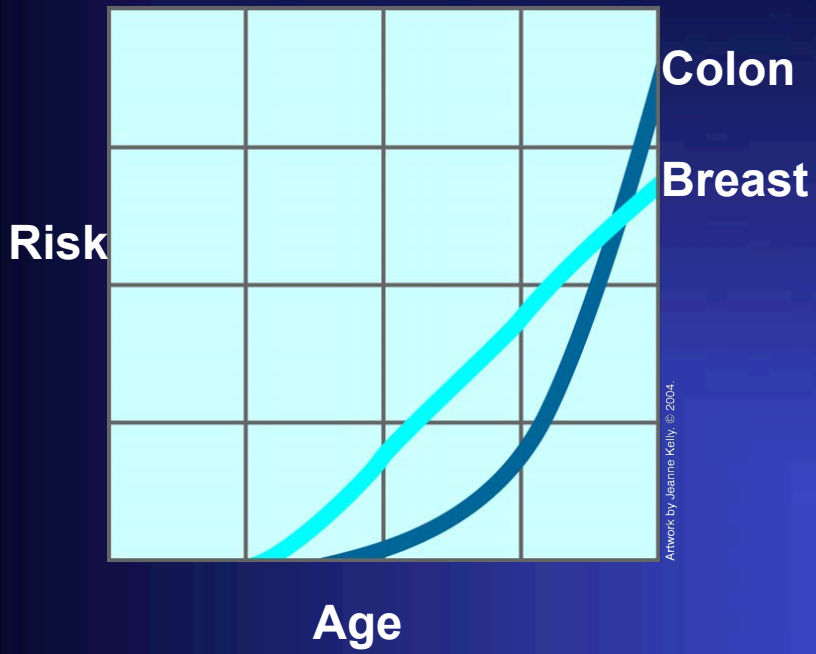
NATIONAL CANCER INSTITUTE

What other kinds of mutations can lead to cancer?

Genes Implicated in Cancer

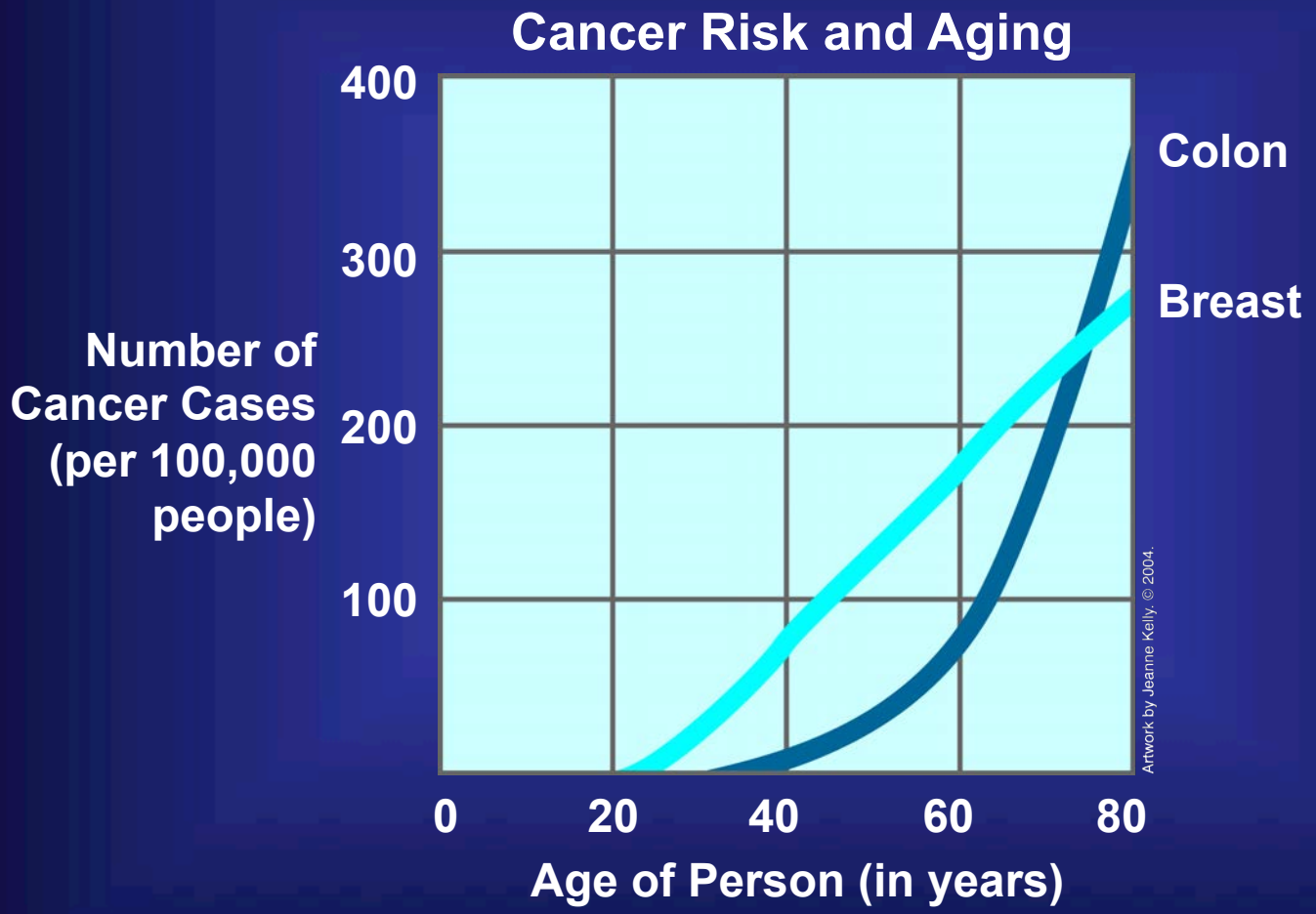
The prime suspects	*But*
Mutations in:	Other mutations also occur in:
■ Oncogenes	■ Cell death genes
■ Tumor suppressor genes	■ Cell signaling genes
■ DNA repair genes	■ Cell cycle checkpoint genes
	■ Cellular senescence genes
	■ Cellular differentiation genes
	■ Metastasis/invasion genes
	■ Carcinogen –activating genes –deactivating genes

Why does cancer risk increase with age?



NATIONAL CANCER INSTITUTE

Why does cancer risk increase with age?

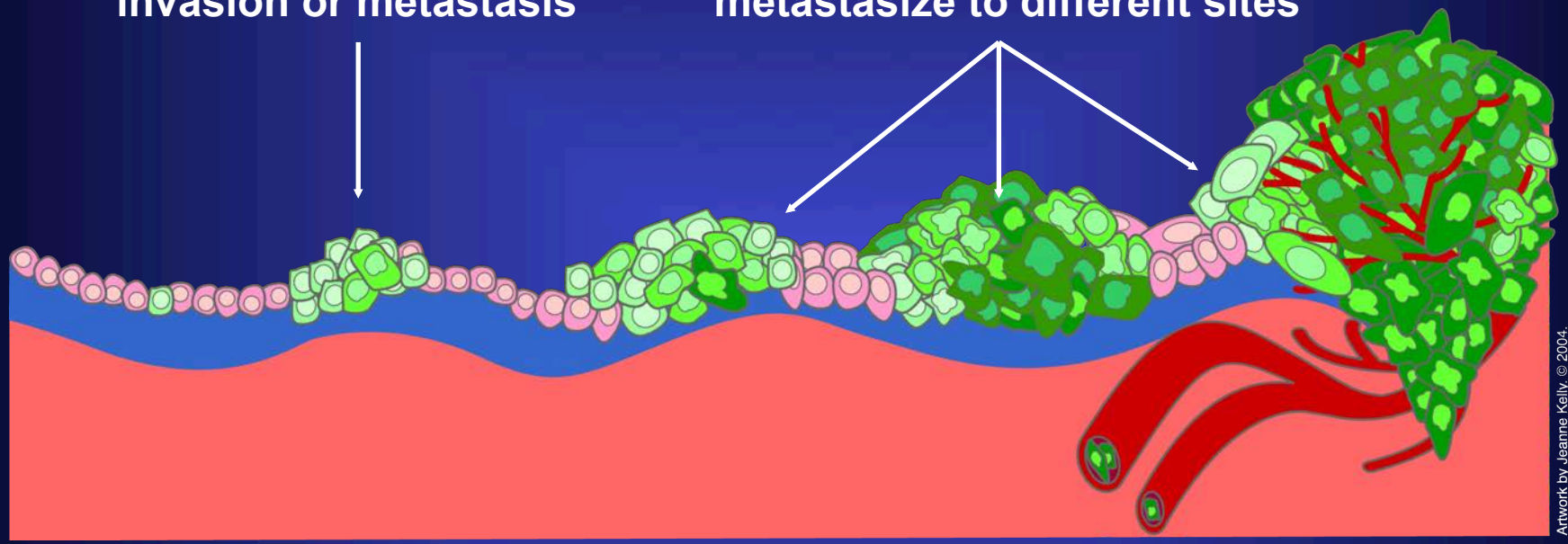


NATIONAL CANCER INSTITUTE

Cancer Tends to Involve Multiple Mutations

Benign tumor cells grow only locally and cannot spread by invasion or metastasis

Malignant cells invade neighboring tissues, enter blood vessels, and metastasize to different sites



Time

Mutation inactivates suppressor gene

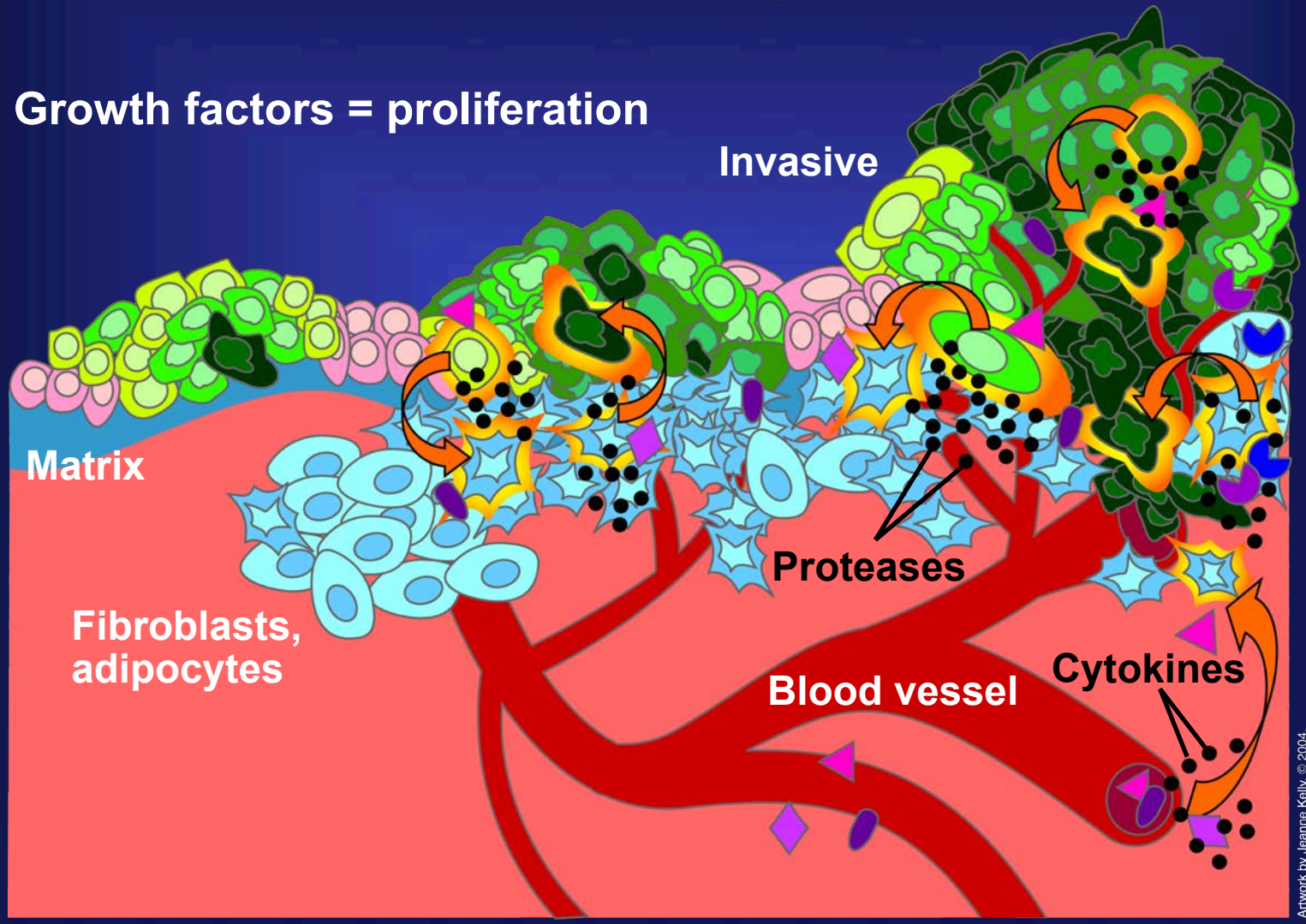
Cells proliferate

Mutations inactivate DNA repair genes

Proto-oncogenes mutate to oncogenes

More mutations, more genetic instability, metastatic disease

Cancer Tends to Corrupt Surrounding Environment



Cytokines, proteases = migration & invasion

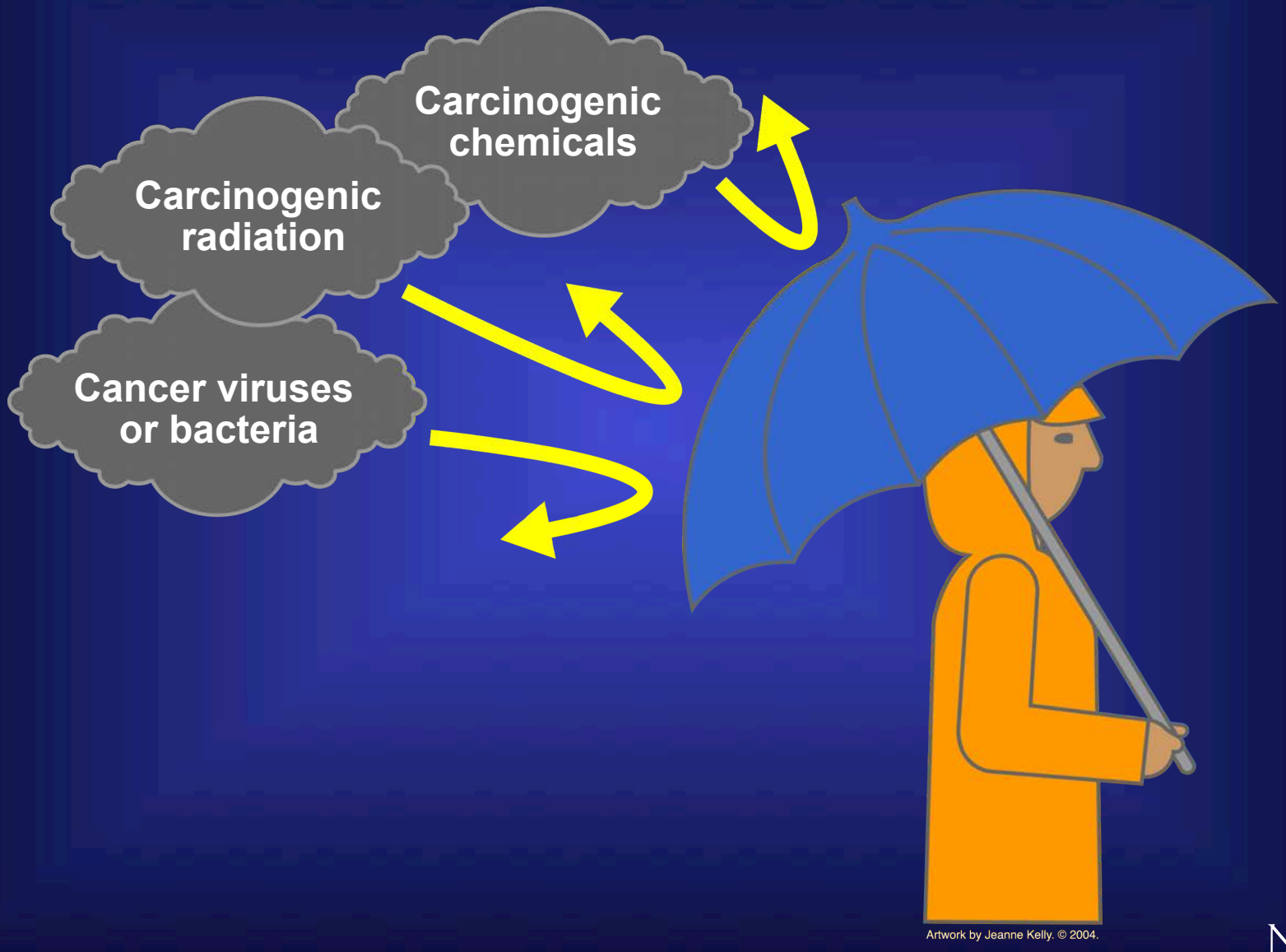
NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?

Artwork by Jeanne Kelly. © 2004.

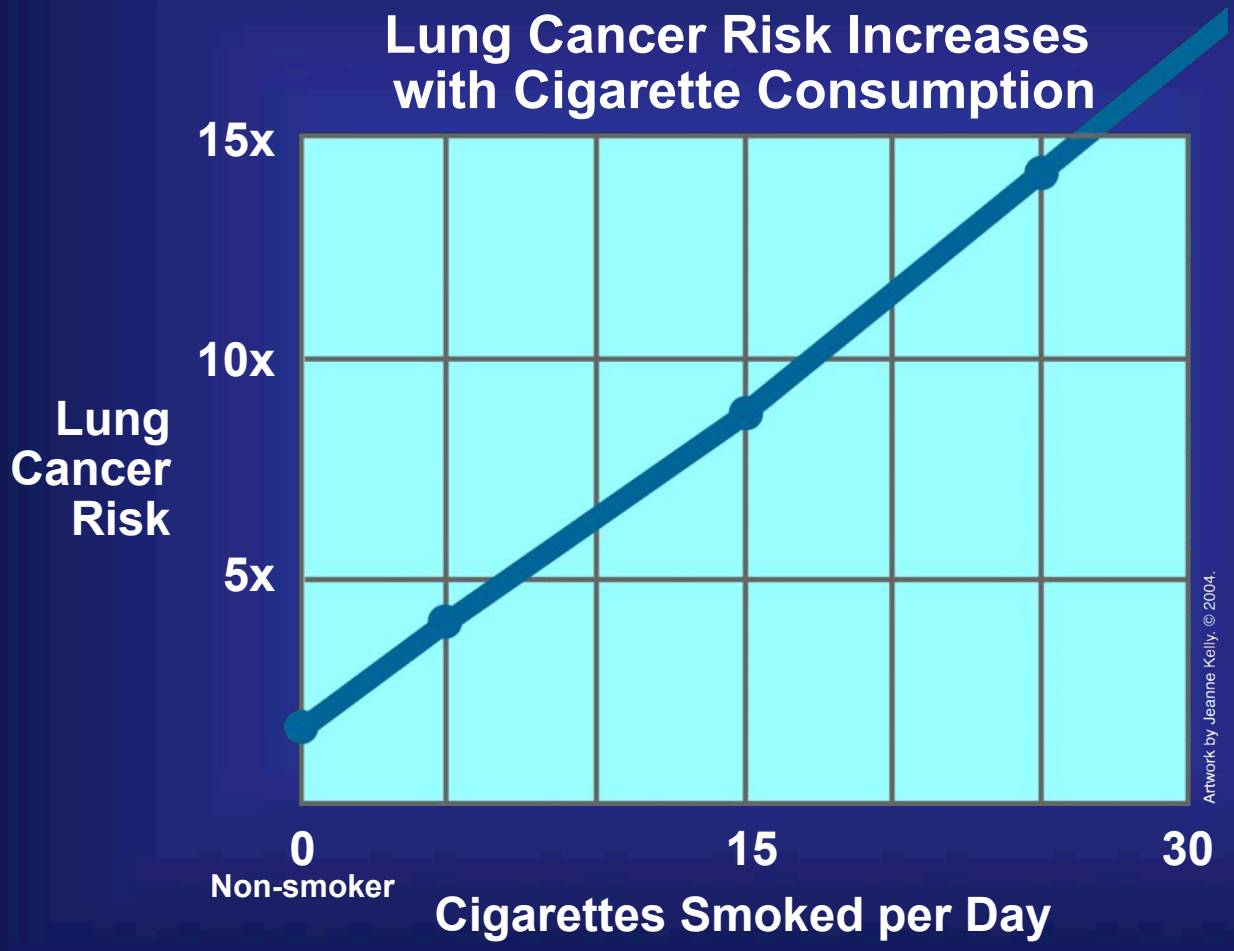
NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?



NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?



NATIONAL CANCER INSTITUTE

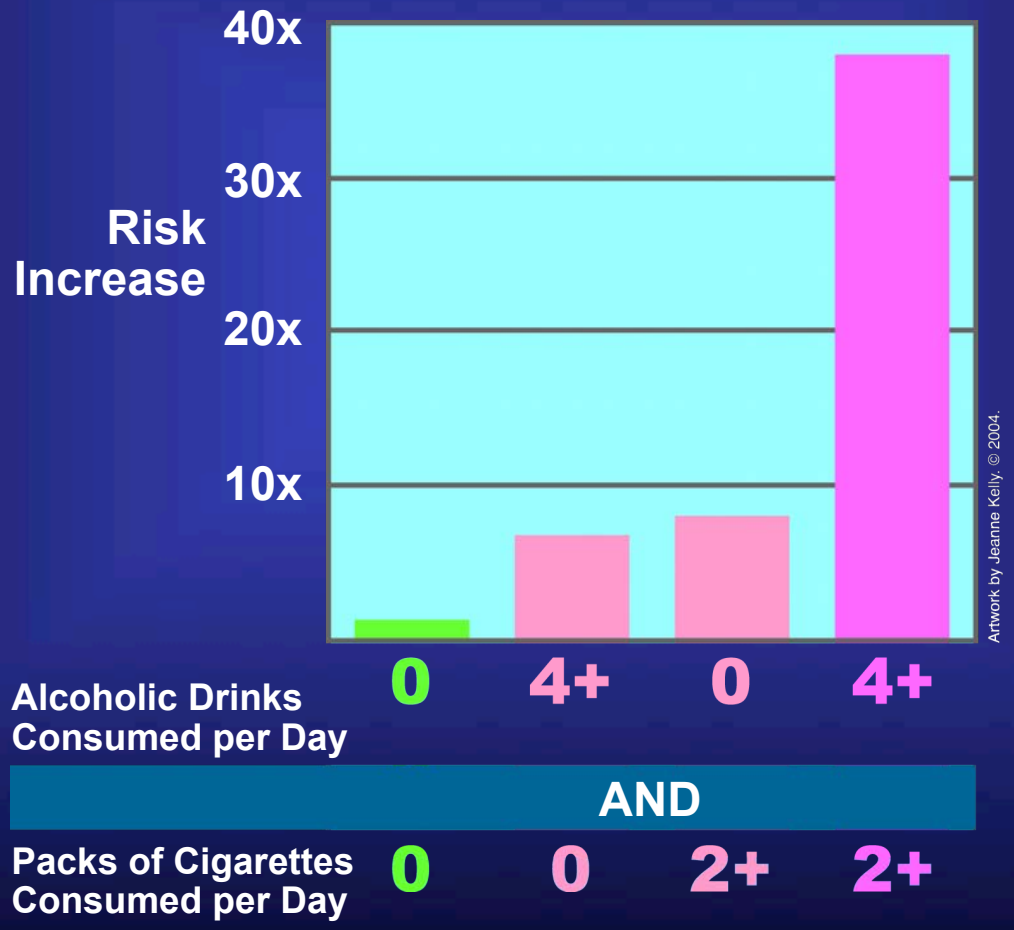
What can people do to prevent cancer?

Artwork by Jeanne Kelly. © 2004.

NATIONAL CANCER INSTITUTE

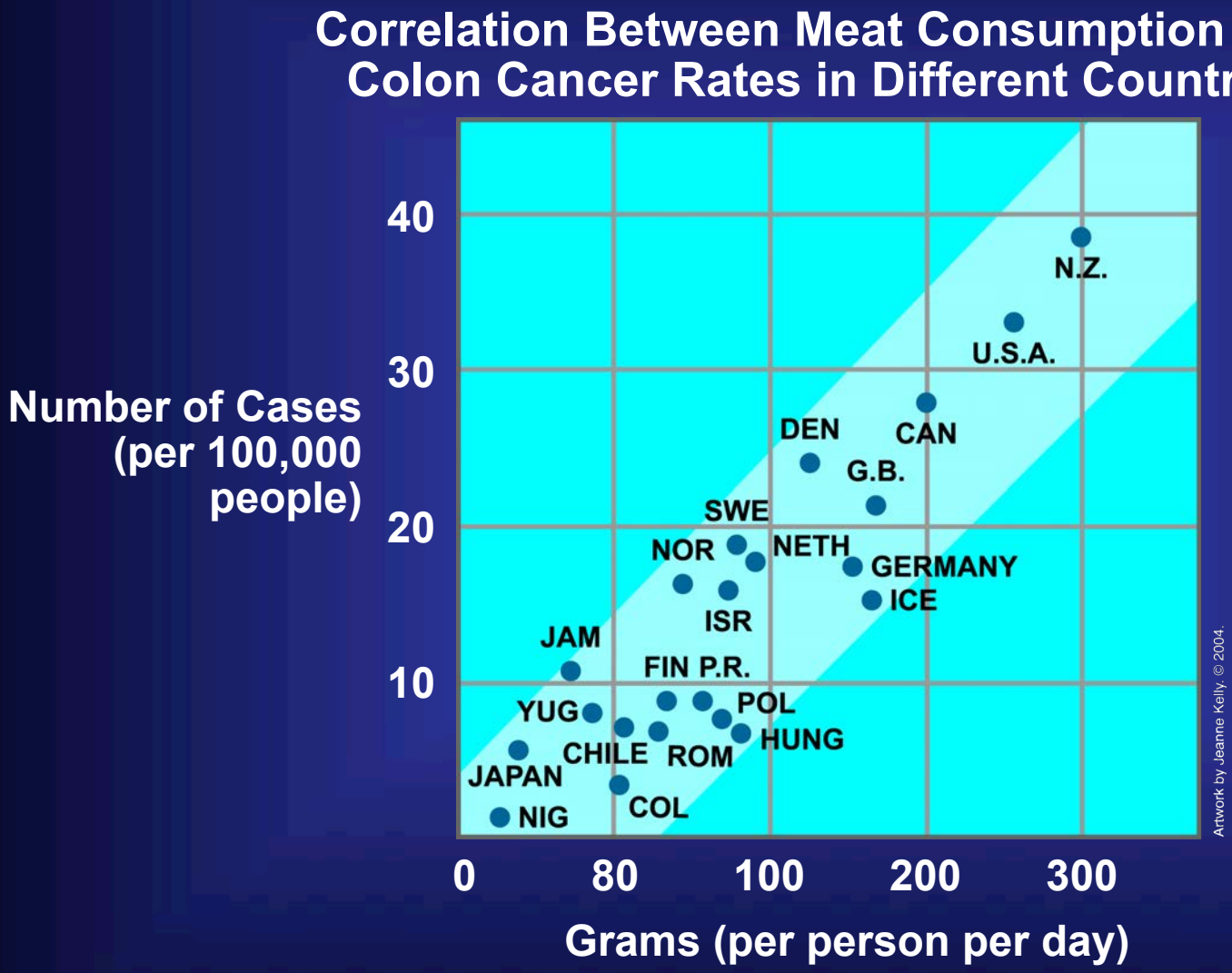
What can people do to prevent cancer?

Combination of Alcohol and Cigarettes Increases Risk for Cancer of the Esophagus



NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?

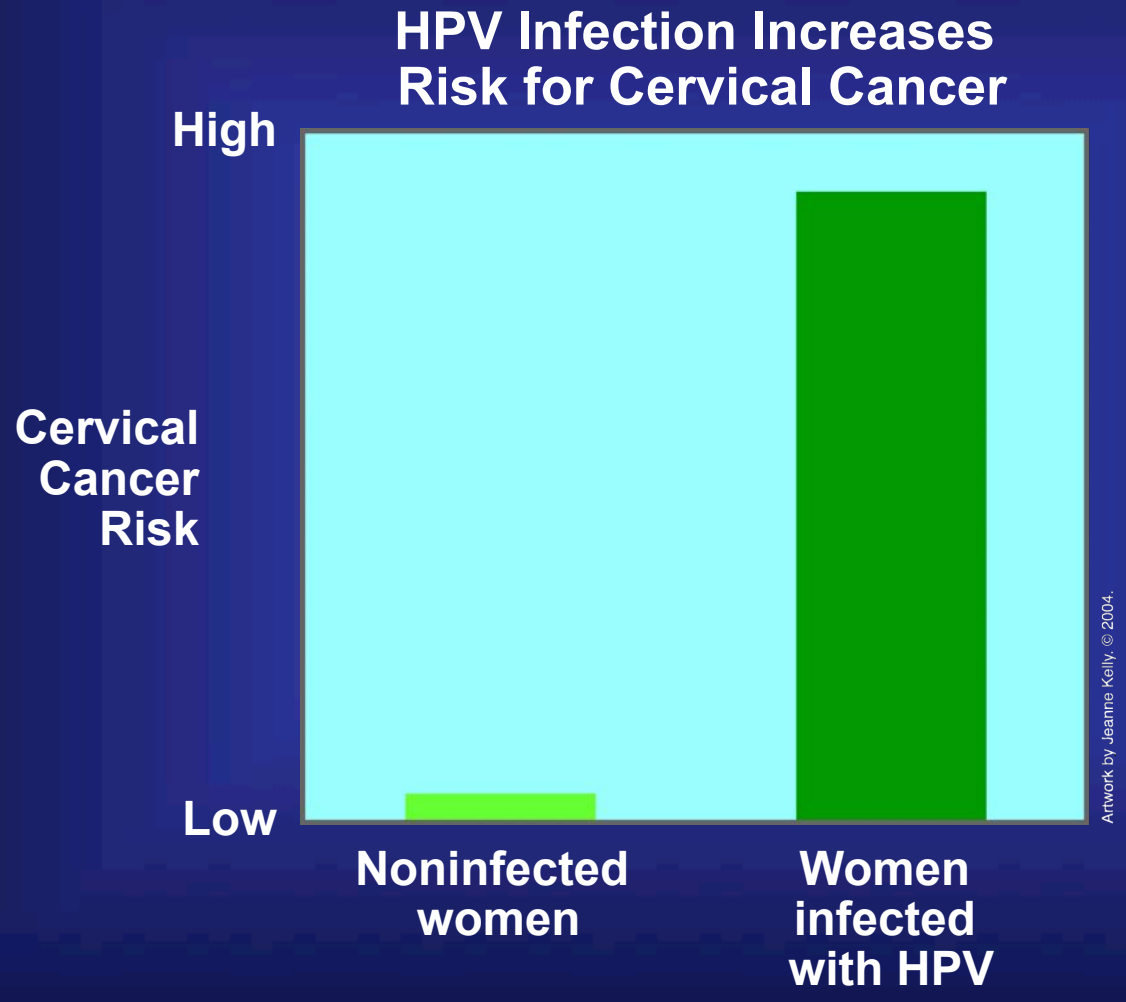


NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?

NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?



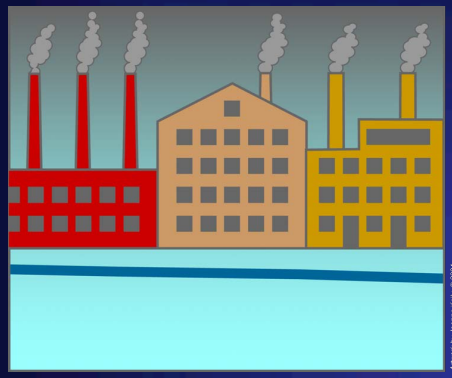
NATIONAL CANCER INSTITUTE

What can people do to prevent cancer?

Some Carcinogens in the Home and Workplace

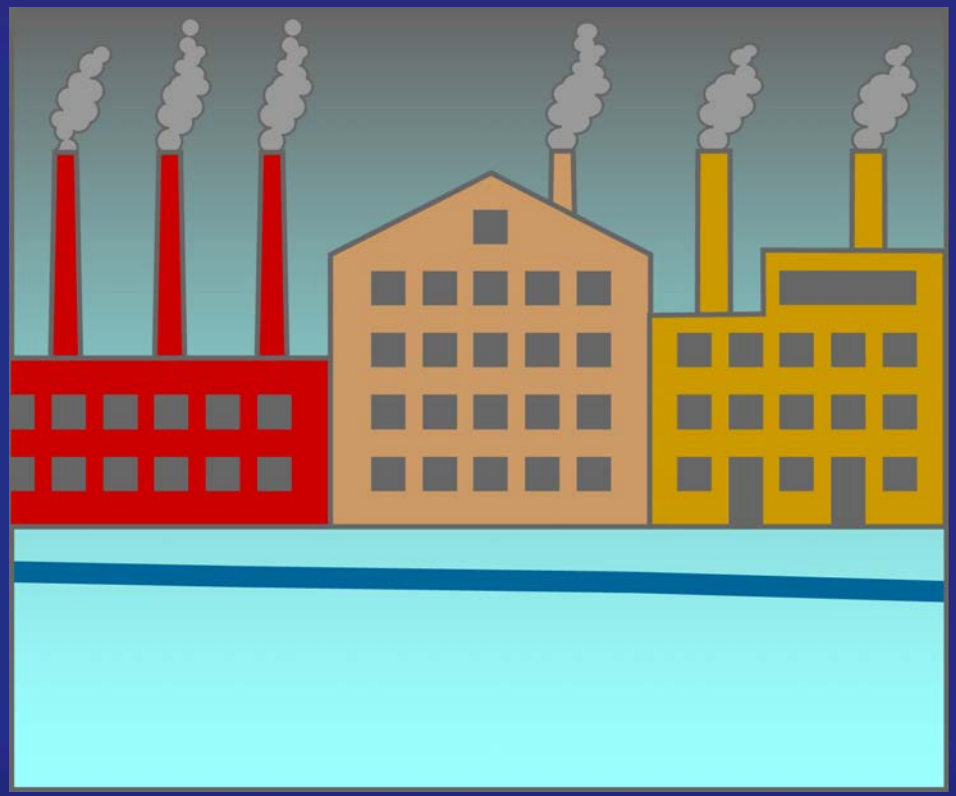
Carcinogen	Occupation	Type of Cancer
Arsenic	Mining, pesticide workers	Lung, skin, liver
Asbestos	Construction workers	Lung, mesothelioma
Benzene	Petroleum, rubber, chemical workers	Leukemia
Chromium	Metal workers, electroplaters	Lung
Leather dust	Shoe manufacturing	Nasal, bladder
Naphthylamine	Chemical, dye, rubber workers	Bladder
Radon	Underground mining	Lung
Soots, tars, oils	Coal, gas, petroleum workers	Lung, skin, liver
Vinyl chloride	Rubber workers, polyvinyl chloride manufacturing	Liver
Wood dust	Furniture manufacturing	Nasal

Does industrial pollution cause cancer?



NATIONAL CANCER INSTITUTE

Does industrial pollution cause cancer?

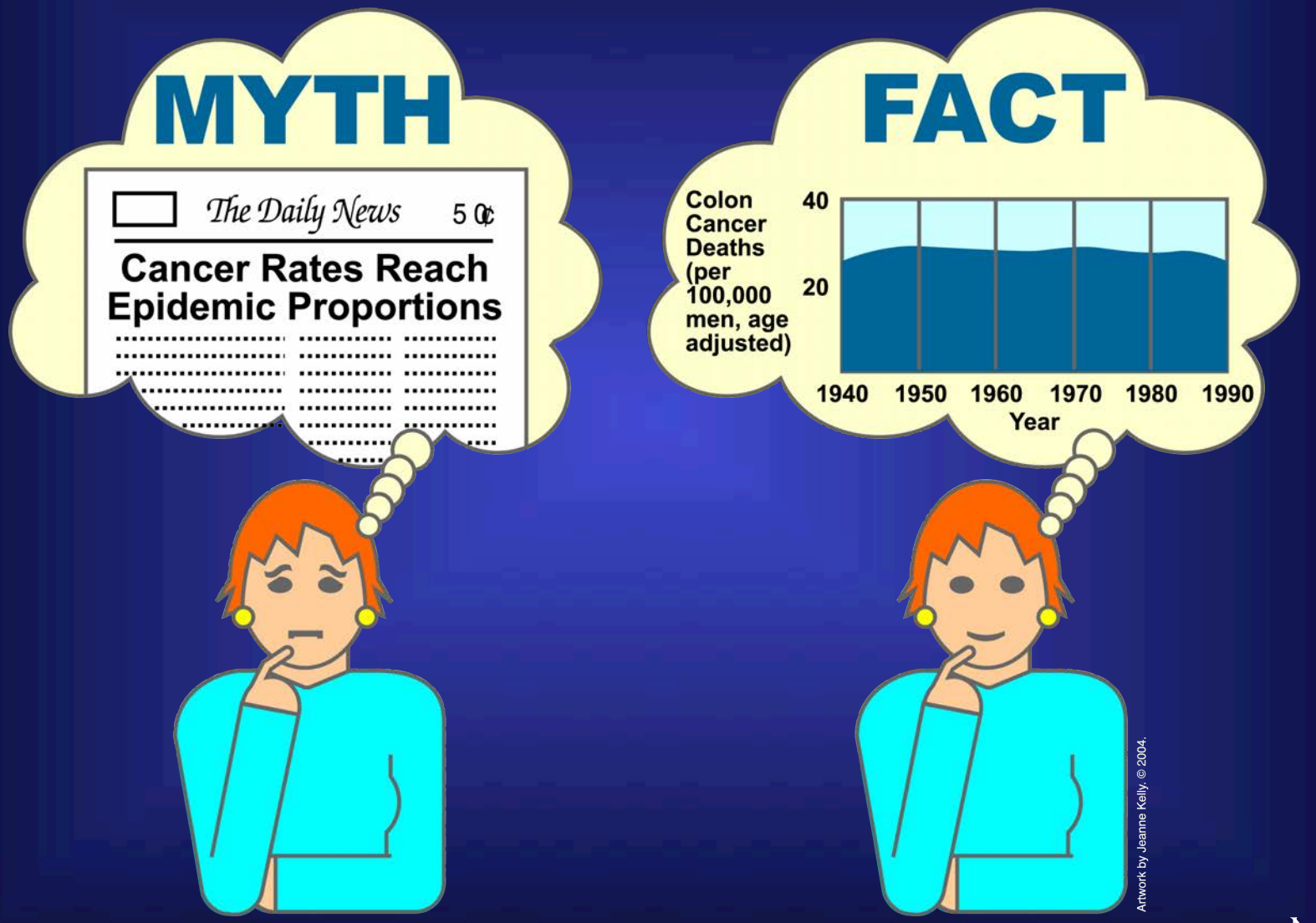


NATIONAL CANCER INSTITUTE

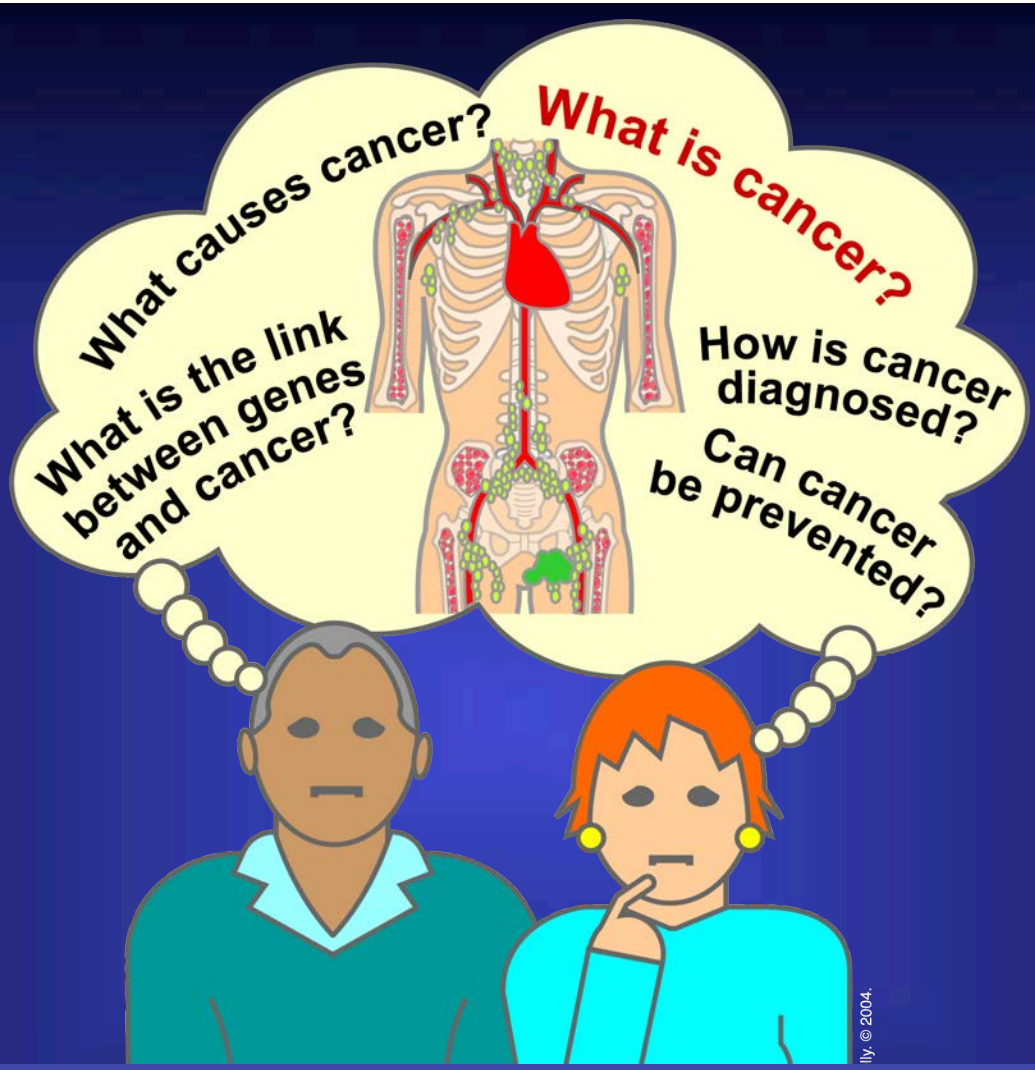
Is There a Cancer "Epidemic"?

NATIONAL CANCER INSTITUTE

Is There a Cancer "Epidemic"?



NATIONAL CANCER INSTITUTE



Write a paragraph to answer each of these questions.