CANCER OVERVIEW

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What is Cancer?

- It is an **abnormal growth of cells** which tend to proliferate in an uncontrolled way and, in some cases, to metastasize (spread).
- **MUTATION OF CELLS**
- It is not a single disease with a single cause.
- It is a group of distinct diseases with different causes, manifestations and treatments.

Oncology Nursing = Cancer Care Nursing

Cancer warning signs

- C – Changes in bowel or bladder habits
- A – A sore that does not heal
- U – Unusual bleeding or discharge
- T – Thickening or lump in the breast or elsewhere in the body
- I – Indigestion or Difficulty swallowing
- O – Obvious change in a wart or mole
- N – Nagging cough or hoarseness
- U – Unexplained anemia
- S – Sudden weight loss

Cancer Pathophysiology

Oncogenesis : the process through which healthy cells are transformed into cancer cells.

Normal cellular genes

Viruses, chemicals and physical agents

MUTATIONS

Mutagenic cells

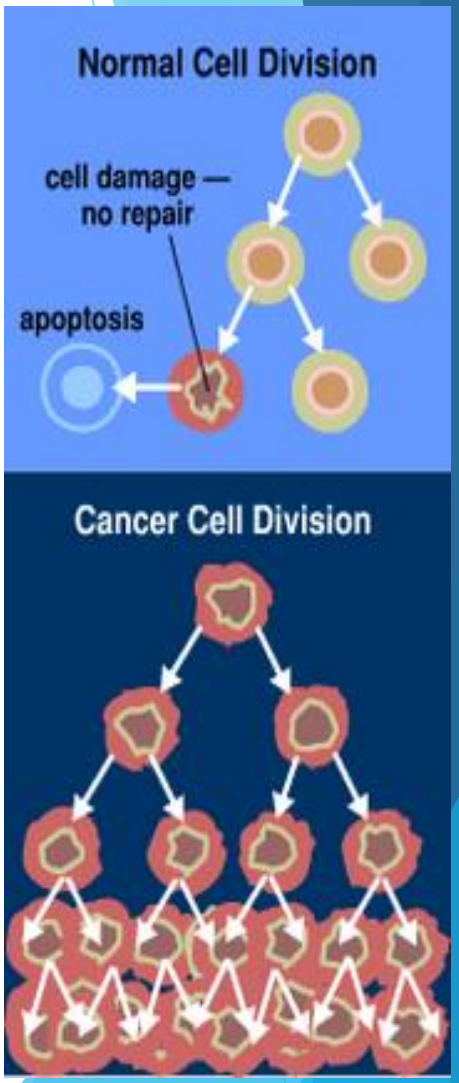
Lose abilities to regulate size, site and functional capabilities

Abnormal proliferations

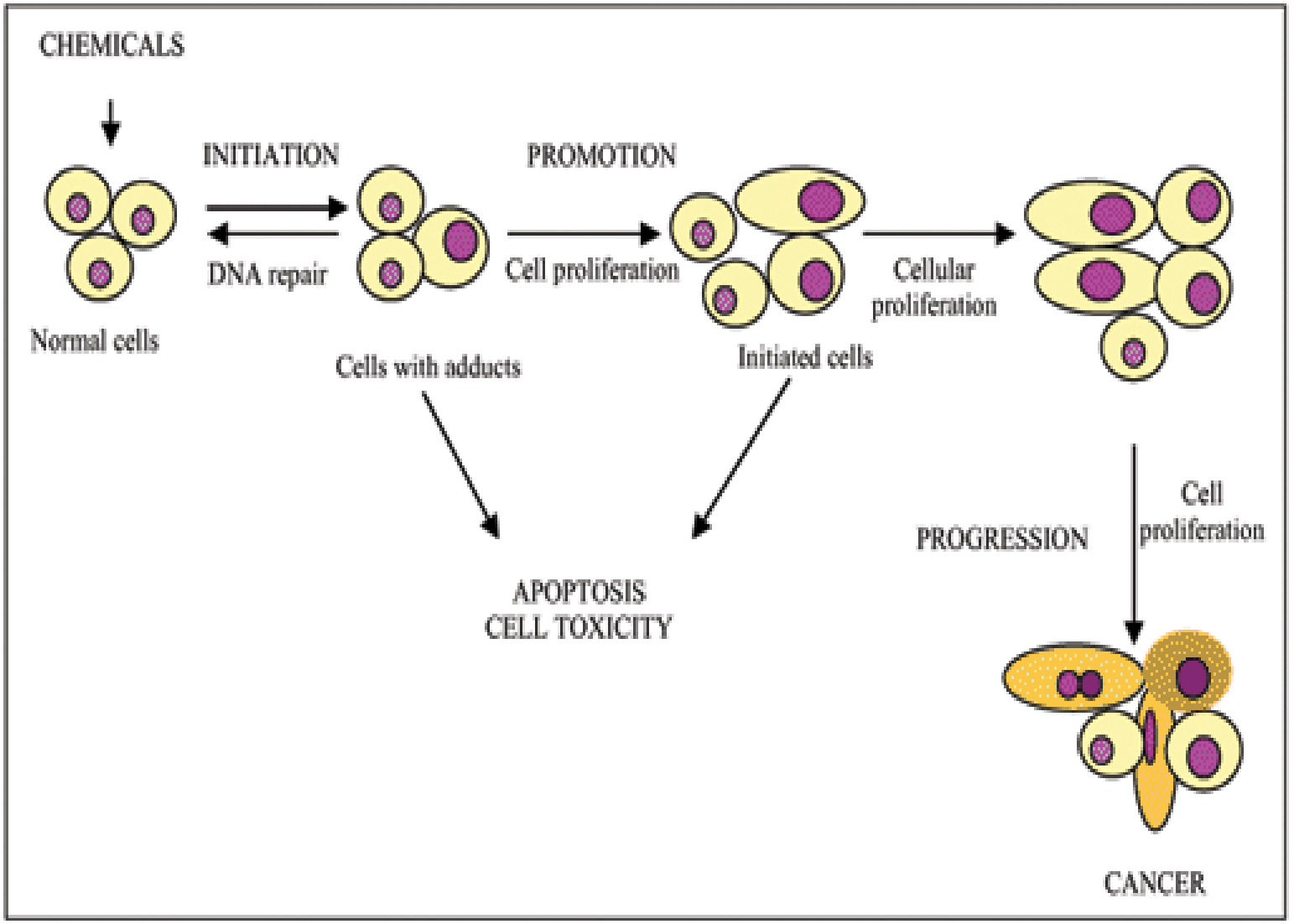
Avoid body's natural defense system

Alter microenvironment

Oncogenes



Stages of Carcinogenesis



Stages of Carcinogenesis

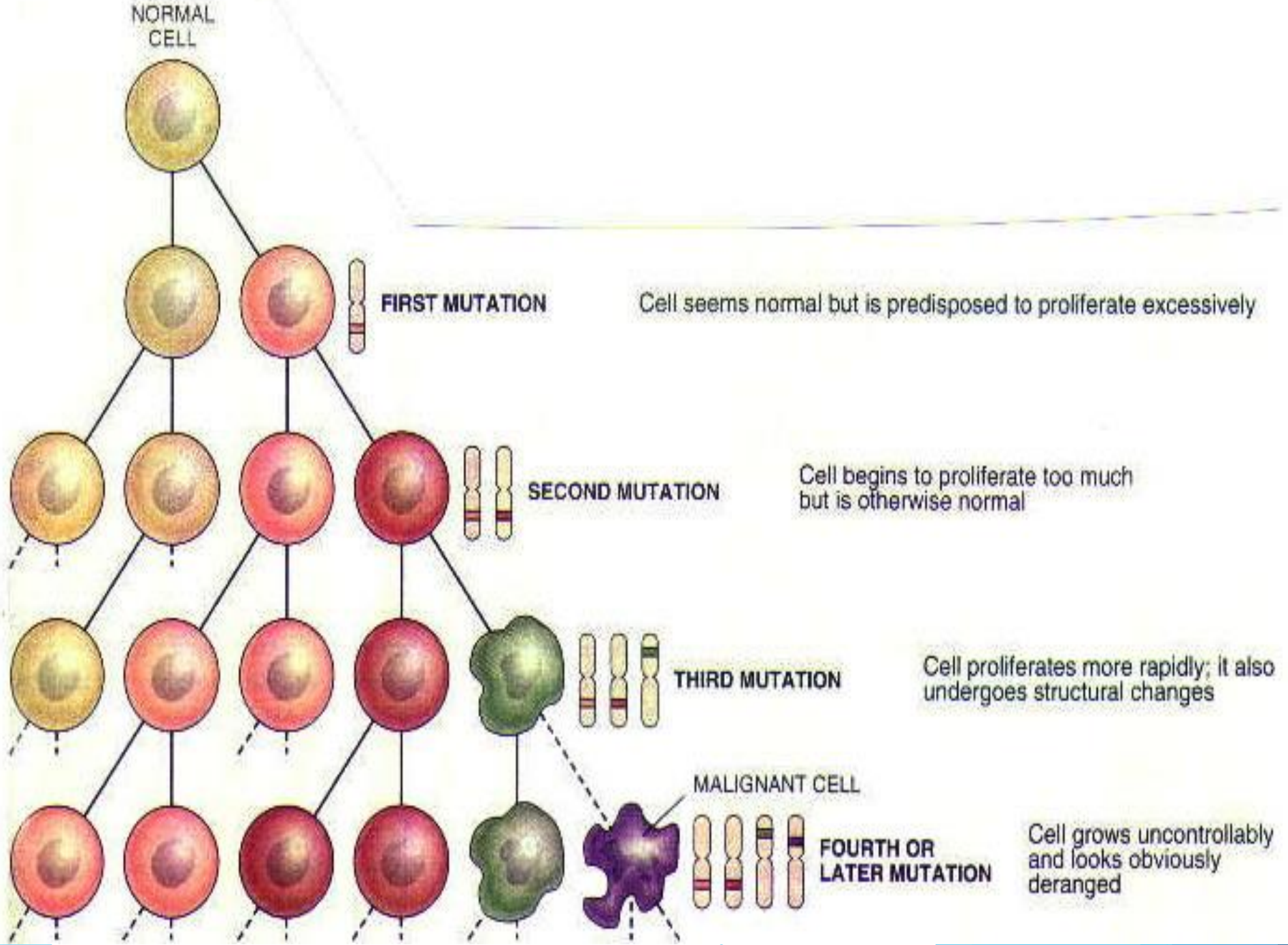
- **Initiation** - Initiators (Carcinogens) such as chemical, physical factors and biologic agents escape normal enzymatic mechanisms and alter the genetic structure of the cellular DNA.
  - Normally, these alterations are reversed by DNA repair mechanisms or the changes initiate programmed cellular death (apoptosis).

Stages of Carcinogenesis

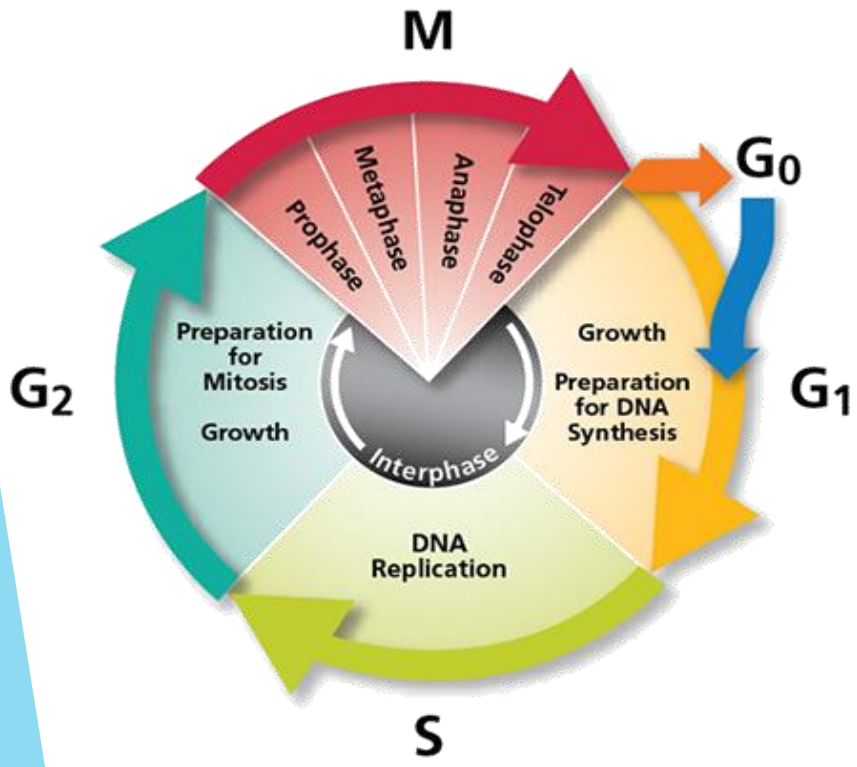
- **Promotion** - repeated exposure to promoting agents (co-carcinogens) causes the expression of the abnormal or mutant genetics information even after long latency periods.
  - **Proto-oncogenes** - act as an “on-switch” for cellular growth
  - **Tumor-suppressor genes** - “turn off” unneeded cellular growth
    - **P53 - frequenty mutated in cancers**

Stages of Carcinogenesis

- **Progression** - the cellular changes formed during initiation and promotion exhibit increased malignant behavior.


NORMAL CELL
FIRST MUTATION
Cell seems normal but is predisposed to proliferate excessively
SECOND MUTATION
Cell begins to proliferate too much but is otherwise normal
THIRD MUTATION
Cell proliferates more rapidly; it also undergoes structural changes
MALIGNANT CELL
FOURTH OR LATER MUTATION
Cell grows uncontrollably and looks obviously deranged

Normal cell Cycle division



Cyclins

-Cell cycle regulator

- checkpoints to ensure that division occurs after sufficient growth and faithful DNA replication, and only when favorable conditions exist.

- Activates cyclin-dependent kinases (CDKs)

Cyclins and Cell Cycle Control in Cancer and Disease

Mathew C. Casimiro, Marco Crosariol, Emanuele Loro, Zhiping Li, and Richard G. Pestell

Abstract

Go to:

Cyclin D1 overexpression is found in more than 50% of human breast cancers and causes mammary cancer in transgenic mice. Dysregulation of cyclin D1 gene expression or function contributes to the loss of normal cell cycle control during tumorigenesis. Recent studies have demonstrated that cyclin D1 conducts additional specific functions to regulate gene expression in the context of local chromatin, promote cellular migration, and promote chromosomal instability. It is anticipated that these additional functions contribute to the pathology associated with
the functional roles that cy

Cell cyclins: triggering elements of cancer or not?

Michael Stamatakos,[1] Victoria Palla,[1] Ioannis Karaiskos,[2] Konstantinos Xiromeritis,[3] Ioannis Alexiou,[4] Ioannis Pateras,[2] and Konstantinos Kontzoglou[4]

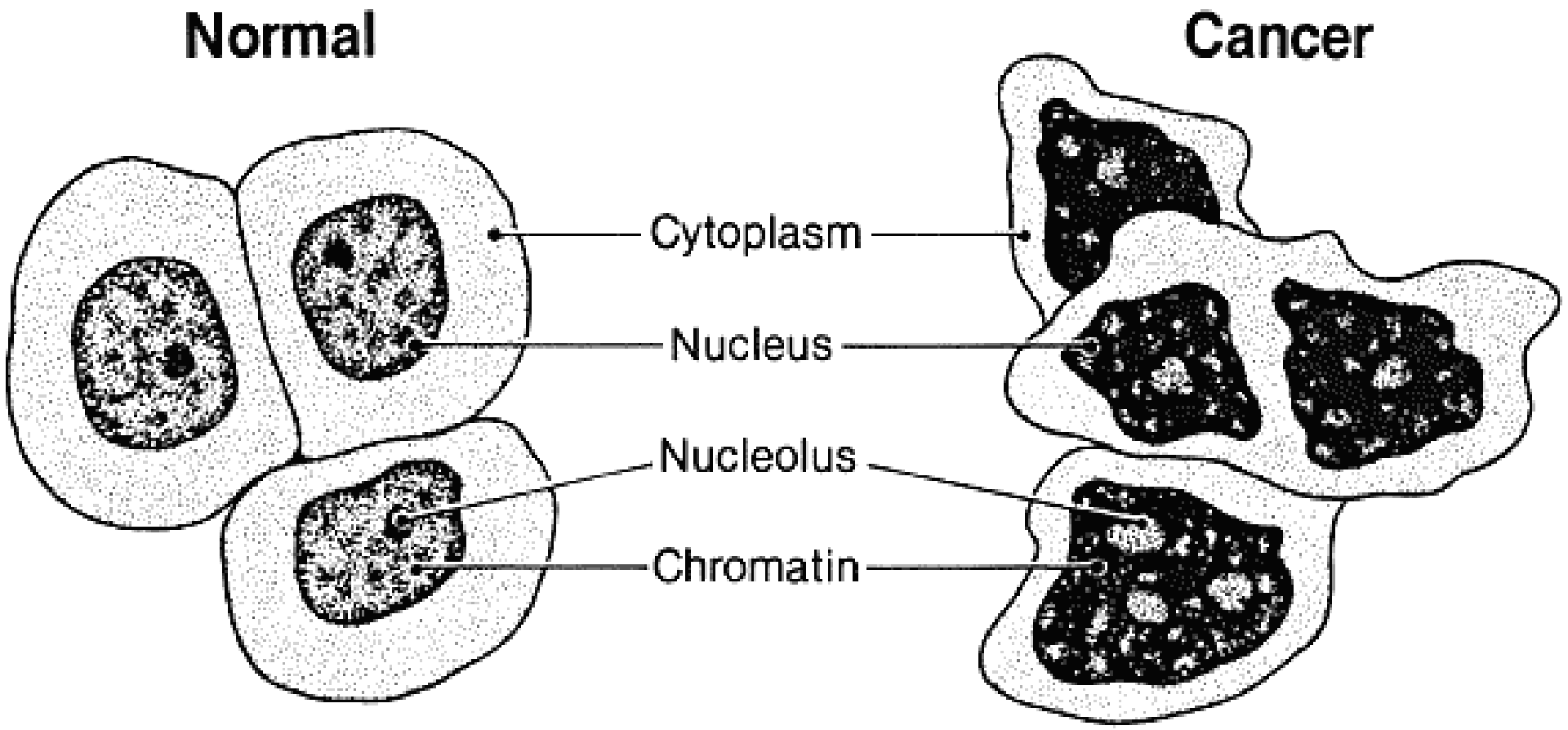
Abstract

Go to:

Cyclins are indispensable elements of the cell cycle and derangement of their function can lead to cancer formation. Recent studies have also revealed more mechanisms through which cyclins can express their oncogenic potential. This review focuses on the aberrant expression of G1/S cyclins and especially cyclin D and cyclin E; the pathways through which they lead to tumour formation and their involvement in different types of cancer. These elements indicate the mechanisms that could act as targets for cancer therapy.

Normal and Cancer Cells

Structure



— Large cytoplasm
— Single nucleus
— Single nucleolus
— Fine chromatin

— Small cytoplasm
— Multiple nuclei
— Multiple and large nucleoli
— Coarse chromatin

Characteristics of Cancer Cells

- All cancer cells are **GENETICALLY UNSTABLE**
  - Continue to mutate and adapt because of other mutational events , resulting to a **several lines of cellular clones** prior to becoming detectable cancer cells (Vinceis, Mutallo, & Manuguerra , 2003)
  - No two cancer are genetically or phenotypically alike (Lonardo & Dean)

Characteristics of Cancer Cells

- self-sufficient
- have angiogenesis
- Have their own growth signals --> loss of growth control
- insensitive to the anti-growth signals
- avoid apoptosis

- Cancer cells = malignant neoplasms

Characteristics of Cancer Cells

FEATURES	BENIGN	MALIGNANT
Structure	Resemblance to normal cells (well differentiated)	Abnormal; less similarity to normal cells (anaplastic)
Growth rate	Slow	Rapid
Mitoses	Few	Relatively common
Growth	Usually expansive	Invasive
Growth duration	May stop growing	Rarely stop growing
Encapsulation	Usually	Rarely
Metastasis	None	Frequent
Effect on host	Slight harm, due to location or complication	Significant harm, due to invasion & metastasis

ETIOLOGY OF CANCER

- **Genetics & Familial Factors**
- **Viruses & Bacteria**
  - Epstein-Barr virus (Burkitt Lymphoma, nasopharyngeal carcinoma and some types of non-Hodgkin's lymphoma and Hodgkin's disease)
  - Herpes simplex virus II
  - Cytomegalovirus
  - HPV (cervical cancer)
  - Hepatitis B virus (liver cancer)
  - Human immunodeficiency virus (Kaposi's sarcoma)

ETIOLOGY OF CANCER

- **Physical Agents**
  - exposure to sunlight
  - exposure to radiation
- **Chemical Agents**
  - tobacco use
  - alcoholic beverage drinking
  - recreational drug use
  - hazardous chemicals (occupation)

The Smoker's Body

Every 6.5 seconds someone dies from tobacco use, says the World Health Organization. Research suggests that people who start smoking in their teens (as more than 70 percent do) and continue for two decades or more will die 20 to 25 years earlier than those who never light up. It is not just lung cancer or heart desease that cause serious health problems and death. Below, some of smoking's less publicized side effects - from head to toe.

1. Psoriasis Smokers seem to be more likely to develop psoriasis, a noncontagious inflammatory skin condition that leaves itchy, oozing red patches all over the body.

3. Wrinkling Smoking prematurely ages skin by wearing away proteins that give it elasticity, depleting it of vitamin A and restricting blood flow. Smokers' skin is dry, leathery and etched with tiny lines, especially around the lips and eyes.

5. Cancer More than 40 chemicals in tobacco smoke have been shown to cause cancer. Smokers are some 20 times more likely to develop lung cancer than non-smokers. Smoking causes about 90% of lung cancers in men and 80% in women 5a and according to many studies, the longer one smokes, the greater the risk of developing cancers at several sites, including a two-fold risk of developing cancer of the nasal and paranasal cavities 5b; cancer of the oral cavity 5c (4 to 5 times); two-fold risk of developing cancer of nasopharynx; oro and hypopharynx (4 to 5 times); larynx (10 times); oesophagus (2 to 5 times); stomach 5d (2); pancreas 5e (2 to 4 times) and kidney 5f. Some recent studies have also suggested a link between heavy smoking and breast cancer 5g, and smoking cessation substantially reduces the risk for most of the above-mentioned smoking related cancers.

7. Emphysema In addition to lung cancer, smoking causes emphysema, a swelling and rupturing of the lung's air sacs that reduces the lungs' capacity to take in oxygen and expel carbon dioxide. In extreme cases, a tracheotomy allows patients to breathe. An opening is cut in the windpipe and a ventilator to force air into the lungs (see image). Chronic bronchitis (not shown) creates a build-up of pus-filled mucus, resulting in a painful cough and breathing difficulties.

9. Heart disease One out of three deaths in the world is due to cardiovascular diseases. Smoking is one of the biggest risk factors for developing cardiovascular diseases. These diseases kill more than a million people a year in developing countries. Smoking-related cardio vascular diseases kill more than 600,000 people each year in developed countries. Smoking makes the heart beat faster, raises blood pressure and increases the risk of hypertension and clogged arteries and eventually causes heart attacks and strokes.

11. Discoloured fingers The tar in cigarette smoke collects on the fingers and fingernails, staining them a yellowish-brown.

13. Deformed sperm Smoking can deform sperm and damage its DNA, which could cause miscarriage or birth defects. Some studies have found that men who smoke have an increased risk of fathering a child who contracts cancer. Smoking also diminishes sperm count and reduces the blood flow to the penis, which can cause impotence. Infertility is more common among smokers.

2. Cataracts Smoking is believed to cause or worsen several eye conditions. Smokers have a 40 percent higher rate of cataracts, a clouding of the eye's lens that blocks light and may lead to blindness. Smoke causes cataracts in two ways: by irritating the eyes and by releasing chemicals into the lungs that then travel up the bloodstream to the eyes. Smoking is also associated with age-related macular degeneration, an incurable eye disease caused by the deterioration of the central portion of the retina, known as the macula. The macula is responsible for focusing central vision in the eye and controls our ability to read, drive a car, recognize faces or colours, and see objects in fine detail.

4. Hearing loss Because smoking creates plaque on blood vessel walls, decreasing blood flow to the inner ear, smokers can lose their hearing earlier than non-smokers and are more susceptible to hearing loss caused by ear infections or loud noise. Smokers are also three times more likely than non-smokers to get middle ear infections.

6. Tooth decay Smoking interferes with the mouth's chemistry, creating excess plaque and yellowing teeth. There is some evidence that smoking contributes to tooth decay. Smokers are one and half times more likely to lose their teeth.

8. Osteoporosis Carbon monoxide, the main poisonous gas in car exhaust fumes and cigarette smoke, binds to blood much more readily than oxygen, cutting the oxygen-carrying power of heavy smokers' blood by as much as 15 percent. As a result, smokers' bones lose density, fracture more easily and take up to 80 percent longer to heal. Smokers may also be more susceptible to back problems: one study shows that industrial workers who smoke are five times as likely to experience back pain after an injury.

10. Stomach ulcers Smoking reduces resistance to the bacteria that cause stomach ulcers. It also impairs the stomach's ability to neutralize acid after a meal, leaving the acid to eat away the stomach lining. Smokers' ulcers are harder to treat and more likely to recur.

12. Cervical cancer and miscarriage Besides increasing the risk of cancer of the uterine cervix, smoking can lead to fertility problems for women and complications during pregnancy and childbirth. Smoking during pregnancy increases the risk of low weight babies and future ill health consequences. Miscarriage is 2 to 3 times more common in smokers, as are stillbirths due to fetal oxygen deprivation and placental abnormalities induced by carbon monoxide and nicotine in cigarette smoke. Sudden infant death syndrome is also associated with smoking. In addition, smoking can lower estrogen levels causing premature menopause.

14. Buerger's disease Buerger's disease, also known as thromboangiitis obliterans, is an inflammation of the arteries, veins, and nerves in the legs, principally, leading to restricted blood flow. Left untreated, Buerger's disease can lead to gangrene (death of body tissue) and amputation of the affected areas.

This poster is an updated reproduction of "The smoker's body" originally produced by COLORS magazine, issue 21, July-August 1997.

The Cancer Council ACT

Quitline 137848

ETIOLOGY OF CANCER

- **Dietary Factors**
  - fats
  - alcohol
  - salt-cured or smoked meat
  - nitrite- or nitrate- containing food
  - GMOs
- **Hormonal Agents**
  - Diethylstilbestrol (vaginal carcinoma)
  - Oral contraceptives (hepatocellular carcinoma, breast cancer, and endometrial but decreases risk of ovarian cancer)

CARCINOGENS AROUND US

HOME AND ENVIRONMENT

- PESTICIDE
- AEROSOLS
- UV RAYS
- RADON
- VEHICULAR EMISSION

FOODS

- PRESERVATIVES
- SWEETENED JUICE
- DIETARY FAT
- HIGHLY SPICY FOOD
- FERMENTED FOOD

LIFESTYLE

- TOBACCO CHEWING
- BODY PIERCING
- TAR FROM SMOKING

INDUSTRY

- VINYL IN PAINT
- GAMMA RADIATION
- ASBESTOS
- SAND DUST
  RAW DUST
  WOOD DUST

VIRUS

- HERPES VIRUSES
- HEPATITIS B & C
- HPV
- H. PYLORI

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ROLE OF THE IMMUNE SYSTEM

The immune system can detect the development of malignant cells and destroy them before cell growth becomes uncontrolled.

Patients who are immunoincompetent have increased incidence of cancer.

Immunotherapy - a type of targeted therapy

Monoclonal Antibodies (Pertuzumab, Trastuzumab)

- These are proteins that bind to cancer-cell specific targets called antigens to induce an immunologic response against the cancer cell.

DIAGNOSTIC AIDS USED TO DETECT CANCER

- Tumor marker specification
- Ultrasound
- Computed Tomography (CT scan)
- Magnetic Resonance Imaging (MRI)
- Fluoroscopy
- Endoscopy
- Nuclear medicine imaging
- Positron Emission Tomography (PET)
- PET fusion
- Radioimmunoconjugates

TUMOR STAGING & GRADING

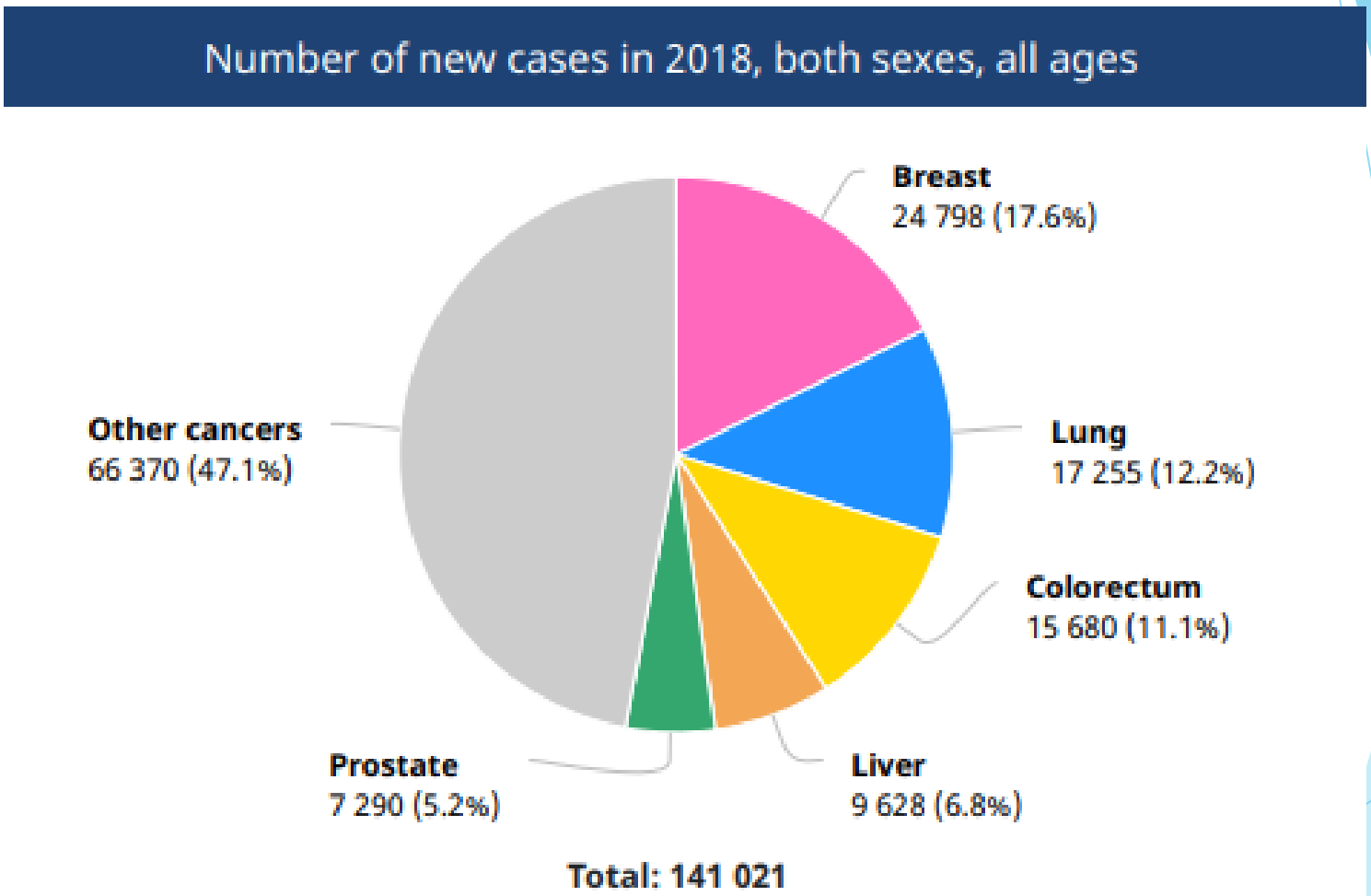
- **Staging** - determines the size of the tumor and the existence of metastasis.
  - Example: TNM system

- **Grading** - refers to the classification of the tumor cells. It seeks to define the type of tissue from which the tumor originated and the degree to which the tumor cells retain the functional and histological characteristics of the tissue of origin.

TUMOR STAGING & GRADING

T classification	**Primary tumour**
TX	Primary tumour cannot be assessed
T0	No evidence of primary tumour
Tis	Carcinoma *in situ*: intraepithelial or invasion of lamina propria
T1	Tumour invades submucosa
T2	Tumour invades muscularis propria
T3	Tumour invades through the muscularis propria into pericolorectal tissues
T4a	Tumour penetrates to the surface of the visceral peritoneum
T4b	Tumour directly invades or is adherent to other organs or structures
N classification	**Regional lymph nodes**
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in 1-3 regional lymph nodes
N1a	Metastasis in one regional lymph node
N1b	Metastasis in 2-3 regional lymph nodes
N1c	Tumour deposit(s) in the subserosa, mesentery, or nonperitonealised pericolic or perirectal tissues without regional nodal metastasis
N2	Metastasis in 4 or more regional lymph nodes
N2a	Metastasis in 4-6 regional lymph nodes
N2b	Metastasis in 7 or more regional lymph nodes
M classification	**Distant metastasis**
M0	No distant metastasis
M1	Distant metastasis
M1a	Metastasis confined to one organ or site (e.g., liver, lung, ovary, nonregional node)
M1b	Metastases in more than one organ/site or the peritoneum

Philippine Statistics



Source: Globocan 2018.

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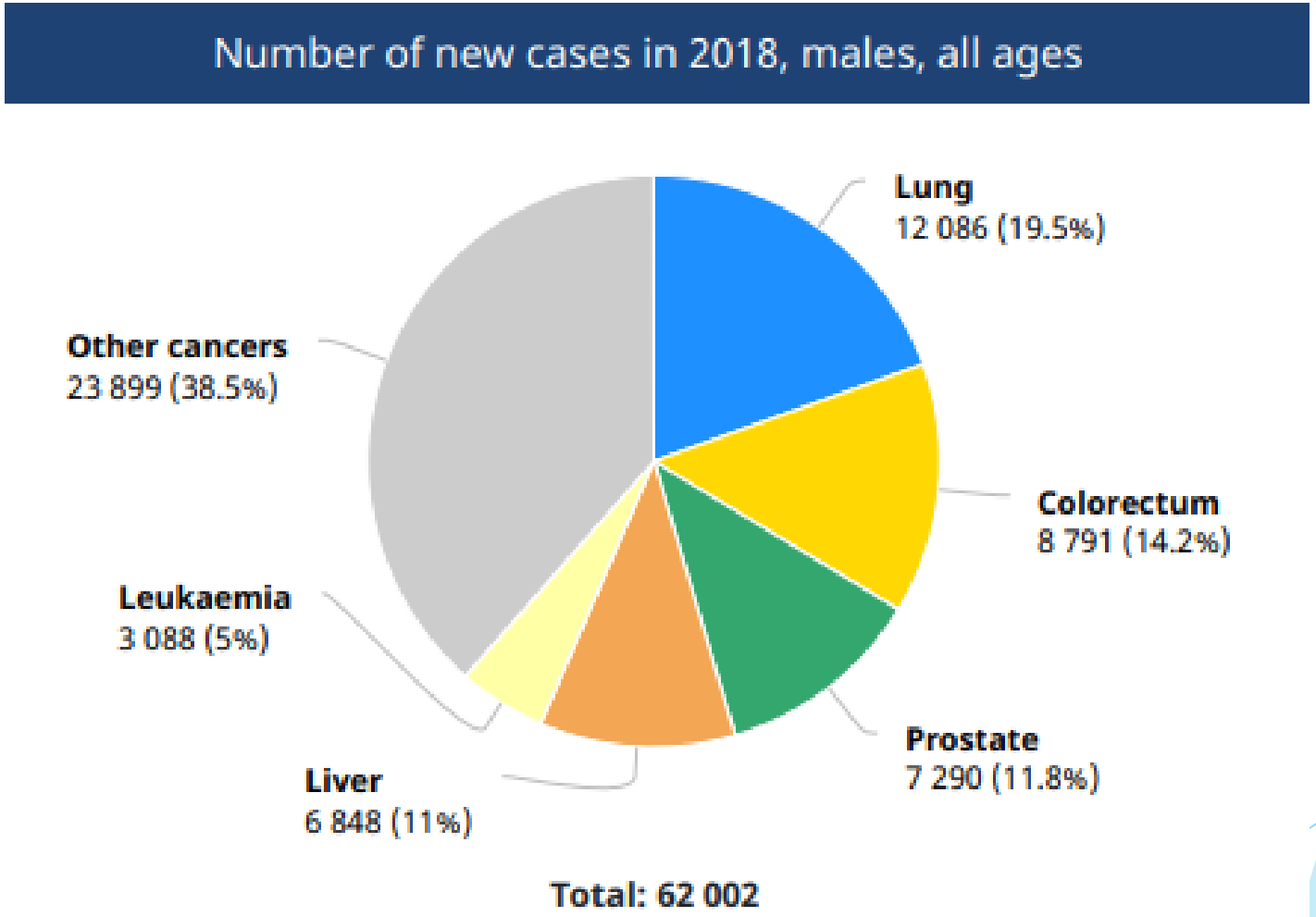

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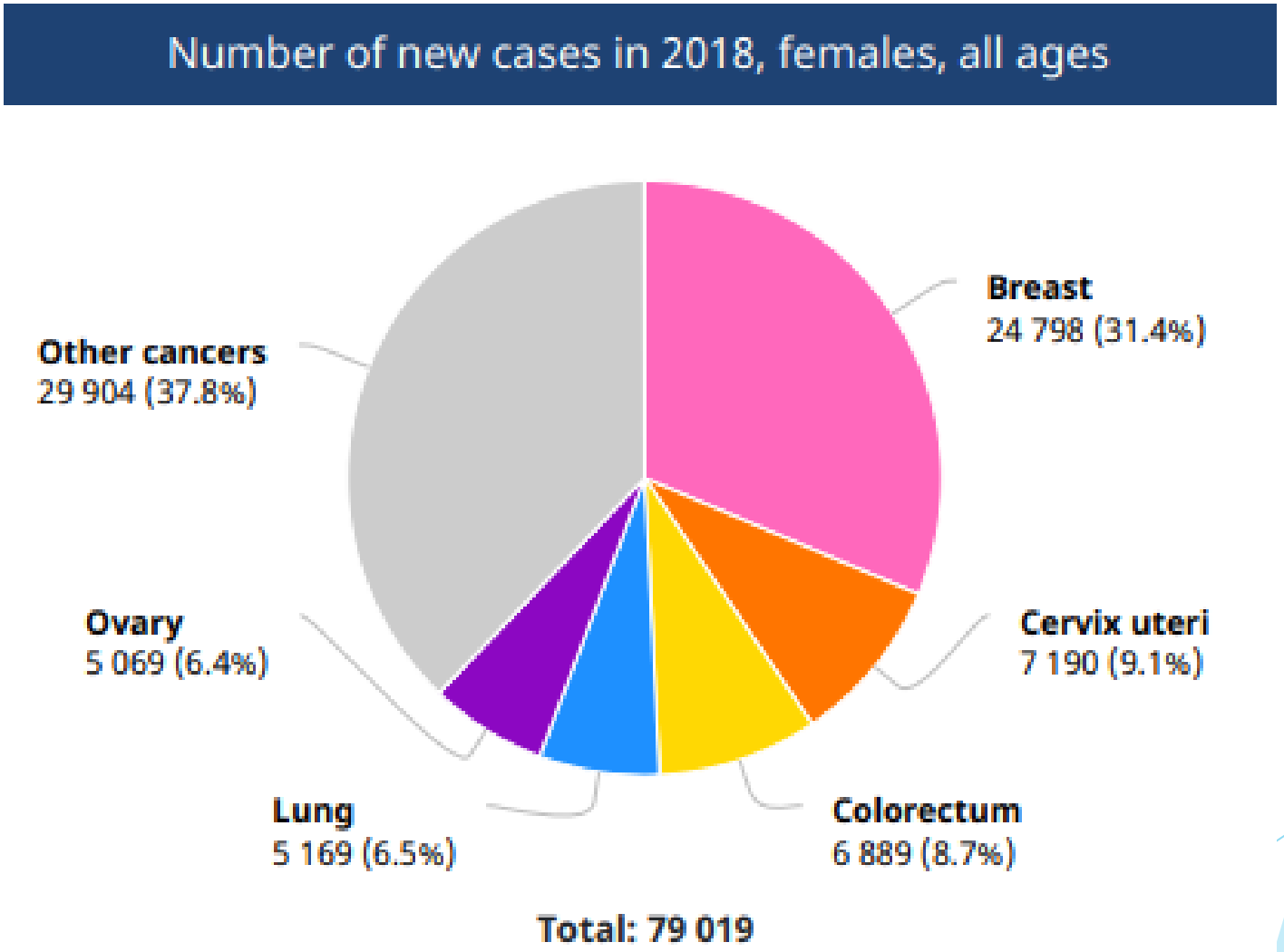

Source: Globocan 2018.

ANY QUESTIONS?

THANK YOU!

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