



Overview of Cancer Screening

Dr Ahmed Kalebi

MBChB (Nbi), MMed Path (Nbi), FCPATH Anat Path (SA) FC Path (ECSA)

Consultant Pathologist & Group Managing Director, Lancet Group of Laboratories
Hon. President, East African Division, International Academy of Pathology
Honorary Lecturer, Department of Human Pathology, University of Nairobi

Declarations

- I'm a consultant pathologist in a private independent laboratory that offers referral laboratory services thus tests mentioned herein are of business interest to me.
- *However, my presentation is based on current scientific knowledge with **the aim of sharing information to promote rational use of tests** and not influenced by my practice's financial interests.*

About Lancet Group of Laboratories

- Established 1950s
- ~25 partners in SA
- >100 pathologists & PhD scientist
- >25000 patients' samples per day
- 3 reference labs SA and 3 outside
- >150 branch labs & >500 centres
- East Africa Group encompassing Kenya, Tanzania, Uganda and Rwanda with Nairobi as regional Hub
- **1 reference lab in Nairobi, 2 referral labs in Dar and Kampala**
- **50+ branch labs 50+ service centers in East Africa**



East African Foot Print



Footprint in East Africa

KENYA

- Nairobi (9)
- Mombasa (5)
- Nakuru (1)
- Kericho (1)
- Thika (1)
- Garissa (1)
- Eldoret (1)
- Kisumu (2)
- Malindi (2)
- Voi (2)

UGANDA

- Kampala (7)
- Mukono (1)
- Jinja (1)
- Entebbe (1)
- Entebbe Rd (1)
- Mbale (2)
- Gulu (1)
- Mbarara (2)
- Tororo(1)
- Fort Portal

TANZANIA

- Dar es Salaam (5)
- Kigamboni (1)
- Zanzibar (2)
- Dodoma (2)
- Arusha (2)

RWANDA

- Kigali (1)
- Rubavy/Gisenyi (1)

What we've developed

- Wider footprint in East Africa **>50 sites**
- Extensive test menu **>4300 tests**
- Excellent turnaround time
- Reliability & consistency
- Internationally accepted ISO15189 quality
- >100 pathologists/PhD scientists
- Electronic report delivery and report portals



Service Offering



Auto-email



MobileApp



PathPortal



Care Card

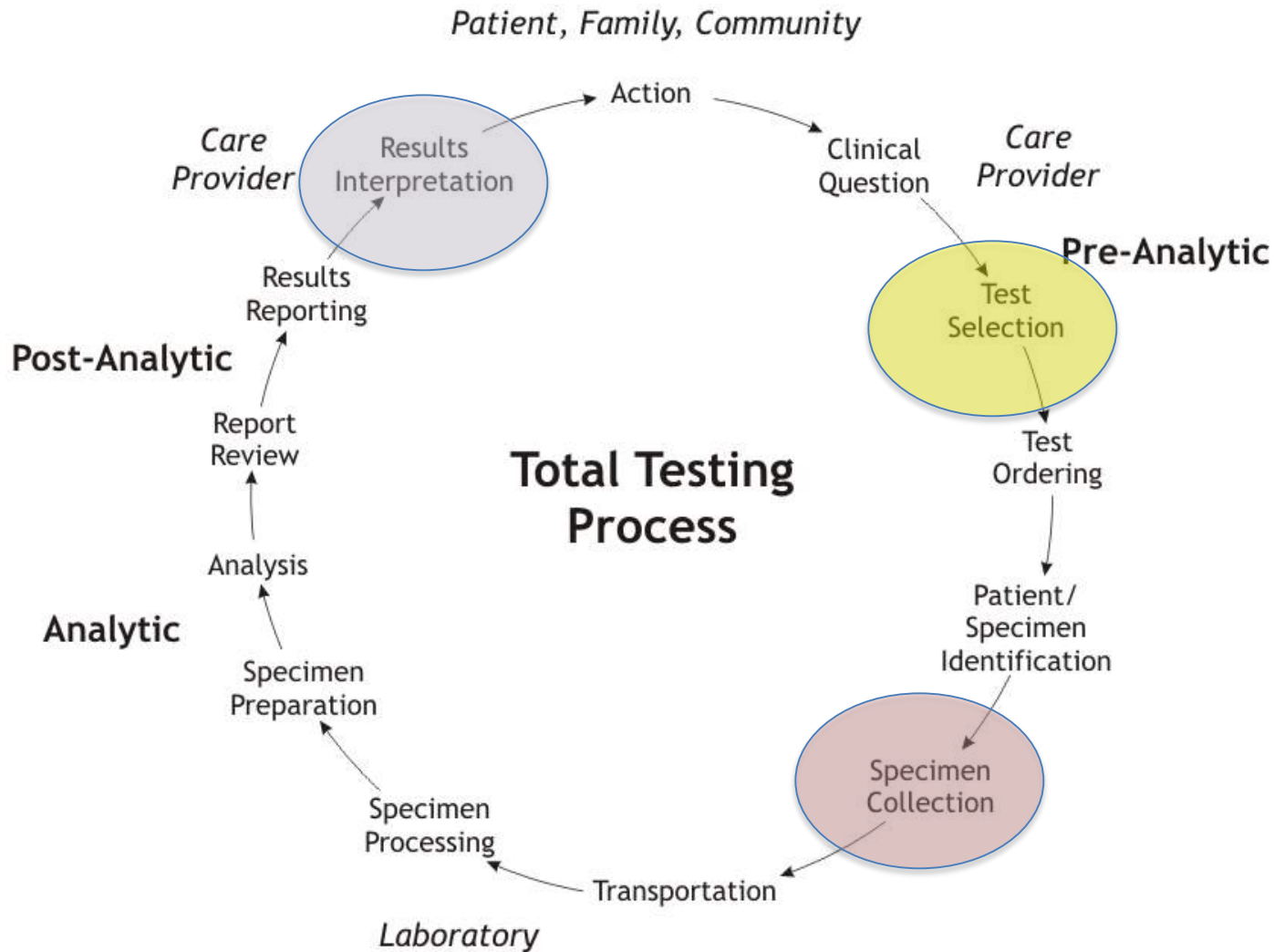
Test Offering

- Chemistry, Endocrinology & Serology
- Haematology
- Coagulation
- Microbiology
- Histology & Cytology
- Molecular Biology
- Cytogenetics
- Newborn screening
- Occupational health
- Clinical trial lab - BARC

Objective

- The aim of this presentation is share some basic overview of cancer screening
 - What cancer screening involves
 - How cancer screening is done
 - Which cancers can benefit from screening and those that can't be screened for
 - Examples of cancer screening

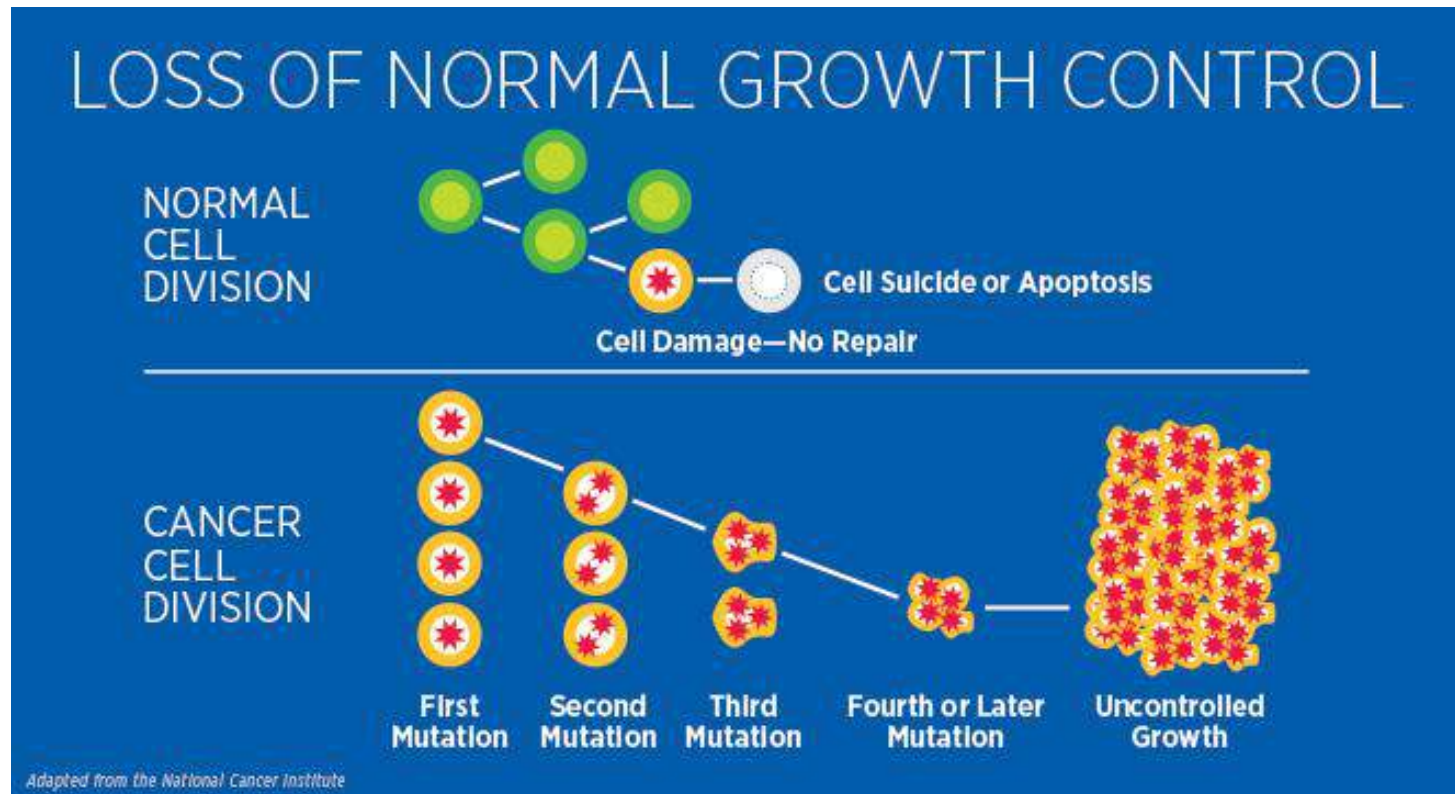
Laboratory Test Pathway



What is Cancer Screening?

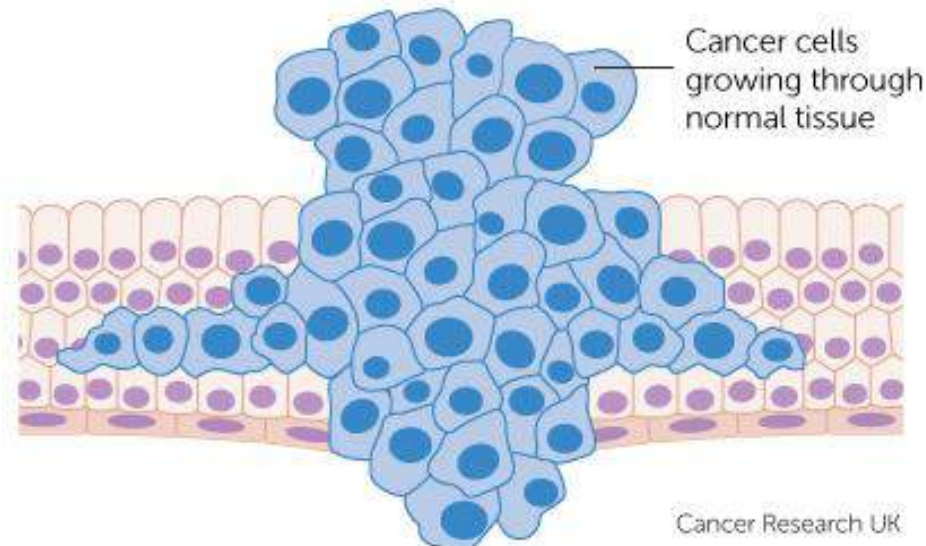
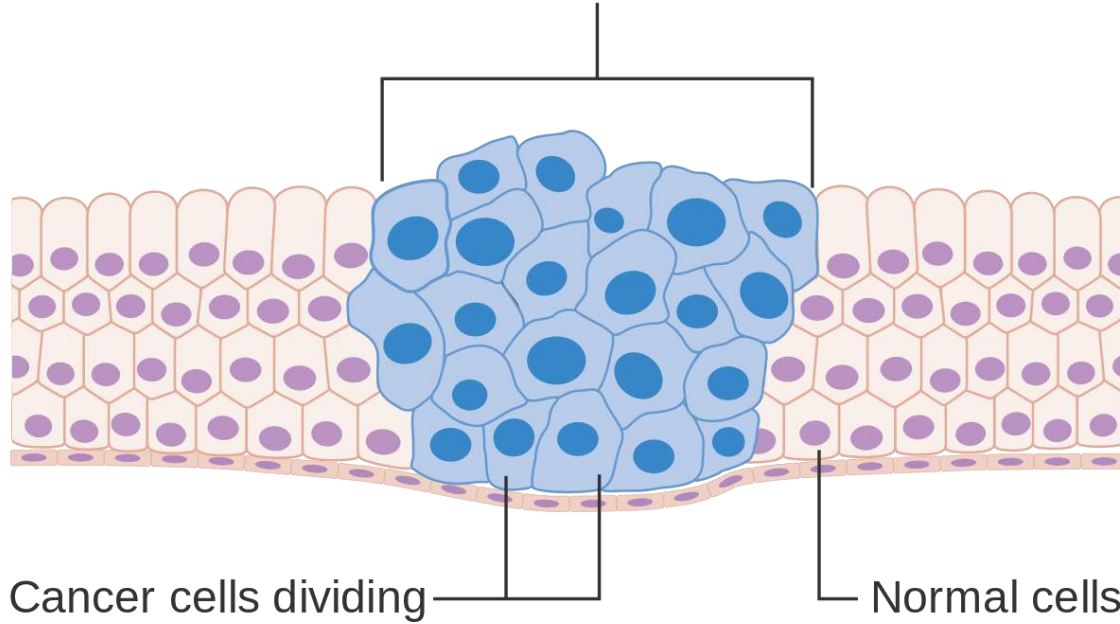
- **Cancer Screening** refers to checking the body for cancer **before** the cancer has fully developed so it can be treated early.
- Getting screening tests regularly may find **breast, cervical, and colorectal (colon) cancers** early, when treatment is likely to work best.
- Other targeted cancer screening for early detection can be done for **Prostate, Lung, Kidney, Bladder & Skin** cancers screening recommended for some people who are at high risk

Cancer



Cancer refers to an abnormal division and multiplication of cells in an uncontrolled way which can invade and spread.

A tumour is forming



Cancer Research UK



Value of cancer screening

- Screening for the following cancers has been shown to reduce death (mortality) and morbidity
 - Cervix, Breast, Colon, Lung and Skin
- The following cancers are screened for people at risk but with no proven effect on overall mortality in the population
 - Prostate, Ovarian, Pancreatic, Testicular, Bladder & Thyroid
- Most other cancers cannot be screened for and only feasible option is early diagnosis e.g.
 - Endometrial, Stomach, Brain, Throat, Bone & Soft tissues

Benefit of cancer screening

- Checking those with pre-cancerous lesions to allow early treatment before the lesion progresses to cancer e.g. cervix and colon
- Early detection when the cancer can be easily managed e.g. breast, skin, thyroid, prostate
- Determining the nature of the cancer at an early stage and allowing targeted treatment e.g. lung cancer

**Just like cats are not all the same,
not all cancer type are the same**



Some may sound aggressive but are not



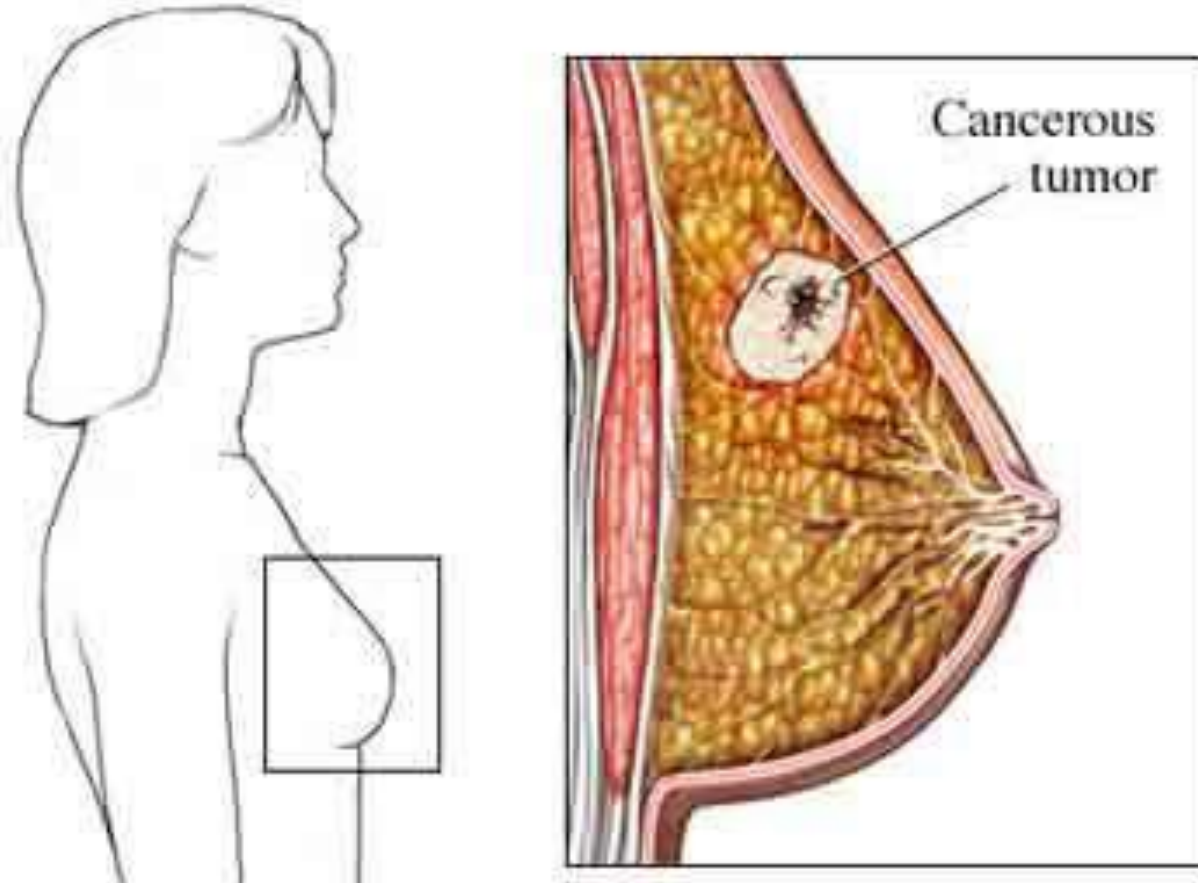
Others may look non-aggressive but are ferocious



How is cancer screening done?

- Physical examination
 - e.g. breast, testis, skin
- Radiological examination
 - Mammogram for breast
 - Ultrasound for ovarian cancer, thyroid and prostate
 - CT-Scan for lung cancer high risk patients
 - MRI for prostate cancer
- Laboratory tests
 - Blood tests, Stool tests, Urine Tests, Molecular and Genetic tests, Cytology, etc

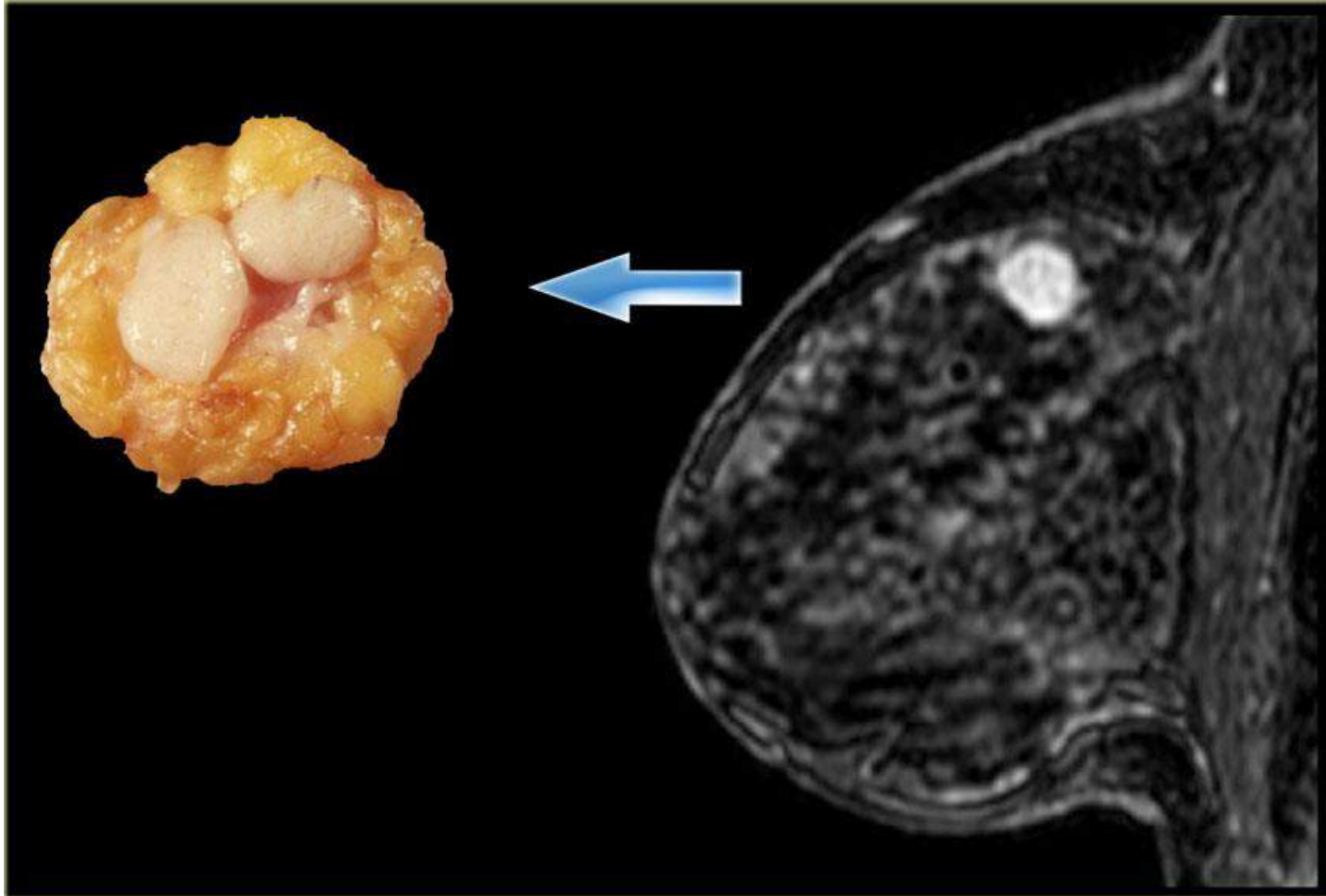
Breast Cancer



Breast cancer screening

- Breast cancer screening is recommended for women who are 50 to 74 years old and are at average risk for breast cancer, through physical exam and mammogram
- Mammogram is a specialized x-ray for breast imaging
- Recommended interval for mammogram is every 2 years.
- Women who are 40 to 49 years old can also have mammogram if at high risk considering the benefit.
- Ultrasound also be used for earlier age & breast types
- Breast exam allows early detection for early treatment



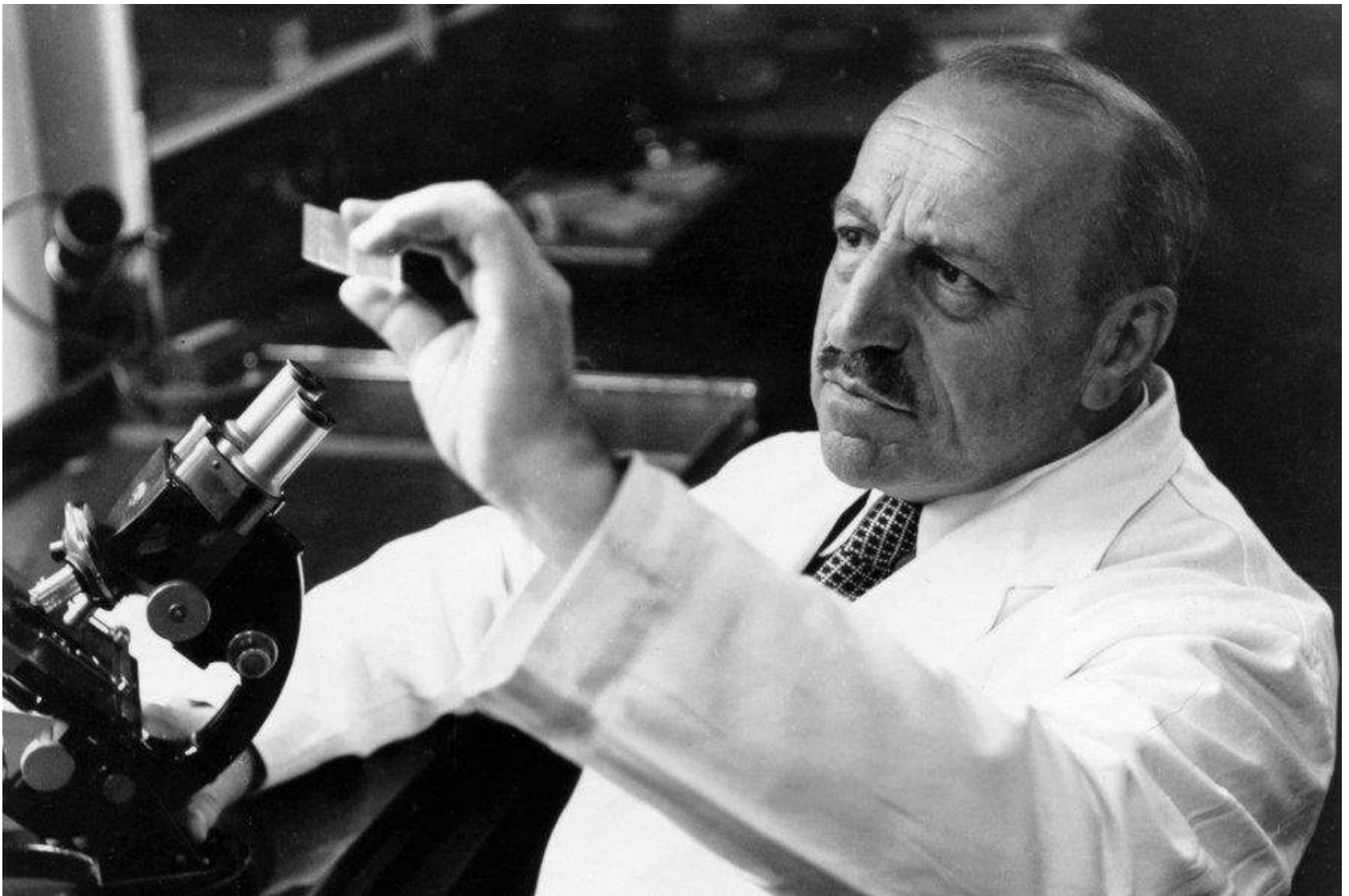


Cervical cancer

- Cervical cancer is the easiest cancer to prevent, with regular screening tests and follow-up.
- The screening tests include Pap smear, HPV Test and VIA which all allow for detection at pre-cancerous stage
- Pap smear has been the most successful cancer screening worldwide with 100% success rate if regularly done and has markedly reduced mortality
- HPV Test allows detection of high-risk Human Papilloma Virus that causes cancer, and is the new technology replacing Pap smear worldwide

Pap smear



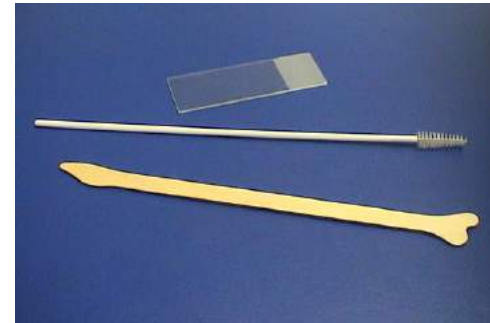
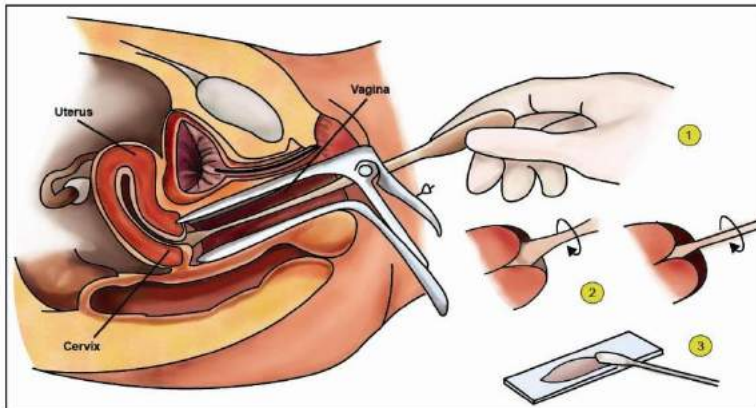


Georgios Nikolaou Papanikolaou vs George Nicholas Papanicolaou 1883-1962



Pap Smear/Cytology

- Traditionally used to screen for cervical cancer
- Looks for cellular changes associated with progression to cancer



Cytology

- Limitations of Pap smear:
 - It is subjective
 - It has relatively low sensitivity for high-grade dysplasia and invasive cancer.
 - It identifies women who already have high-grade dysplasia rather than identifying those at greatest risk for developing high-grade dysplasia **BEFORE** it develops

Australia could become first country to eradicate cervical cancer

Free vaccine program in schools leads to big drop in rates, although they remain high in the developing world

● **Ian Frazer: Eliminating cervical cancer globally is within reach**



▲ Australia's free HPV vaccine program in schools has led to a dramatic decline in future cervical cancer rates.
Photograph: Voisin/Phanie / Rex Features

Australia could become the first country to eradicate cervical cancer, according to an announcement from the International Papillomavirus Society.

New research, published on Sunday, reveals that Australia's free HPV vaccine program in schools has led to a dramatic decline in future cervical cancer rates.

Within 40 years, the number of new cases is projected to drop to "just a few", professor Suzanne Garland from the Royal Women's Hospital, who led the research, said.

HPV (human papillomavirus) is a sexually transmitted infection that causes 99.9% of cervical cancers. In 2007, the federal government began providing the vaccine for free to girls aged 12-13 years, and in 2013, it extended the program to boys.

Cervical cancer breakthrough: Australian scientists come up with ground-breaking vaccine that will **ERADICATE** the killer disease worldwide

- Australia may be the first country to eliminate cervical cancer due to a vaccine
- Rates of cervical cancer may drop from around the current 1000 to just a few
- Expert Professor Suzanne Garland heralded Australia's immunisation program
- The International Papillomavirus Society predicts the cancer will be eradicated

By AUSTRALIAN ASSOCIATED PRESS and MONICA O'SHEA

PUBLISHED: 23:13 GMT 3 March 2018 | UPDATED: 23:58 GMT 3 March 2018

Human papillomavirus (HPV) and cervical cancer

Fact sheet

Updated June 2016

Key facts

- Human papillomavirus (HPV) is a group of viruses that are extremely common worldwide.
- There are more than 100 types of HPV, of which at least 13 are cancer-causing (also known as high risk type).
- HPV is mainly transmitted through sexual contact and most people are infected with HPV shortly after the onset of sexual activity.
- Cervical cancer is caused by sexually acquired infection with certain types of HPV.
- Two HPV types (16 and 18) cause 70% of cervical cancers and precancerous cervical lesions.
- There is also evidence linking HPV with cancers of the anus, vulva, vagina and penis.
- Cervical cancer is the second most common cancer in women living in less developed regions with an estimated 445 000 new cases in 2012 (84% of the new cases worldwide).
- In 2012, approximately 270 000 women died from cervical cancer; more than 85% of these deaths occurring in low- and middle-income countries.
- Vaccines against HPV 16 and 18 have been approved for use in many countries.

News Releases



ASCO Issues Global Recommendations to Increase Cervical Cancer Screening

FOR IMMEDIATE RELEASE

October 12, 2016

Contact

Lada Krilov

571-483-1377

Lada.Krilov@asco.org

Cervical screening to change to HPV test

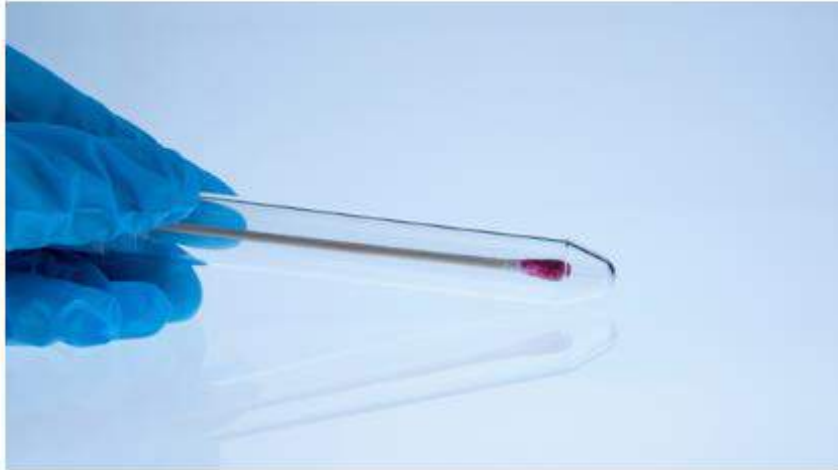
8:40 PM Wednesday Mar 9, 2016

Health Health & Wellbeing Politics Public Healthcare

SHARE: Facebook Twitter Google+

BREAKING NEWS Prakash was reported earlier this year to have been killed in an air strike in Mosul

Print Email Facebook Twitter More



The test will change from every 3 years to every 5 years. Photo / iStock

The three-yearly primary cervical screening test is set to change to screening for human papillomavirus (HPV) every five years.

Cervical cancer study backs Government plan to begin screening women later using HPV test

By Siobhan Fogarty

Posted 18 Oct 2016, 4:11pm

A new study supports a move to start screening women for cervical cancer from age 25, rather than between the ages of 18 and 20.

The research by the Cancer Council of New South Wales backs the Federal Government's renewed National Cervical Screening Program (NCSP) which will come into effect in May 2017.

A human papilloma virus (HPV) test will replace the current pap smear examination.

The HPV test will be conducted every five years, compared to the pap smear which is presently carried out every two years.

The study's author Megan Smith said cervical cancer was rare for women under the age of 25, many of whom were now vaccinated against HPV.

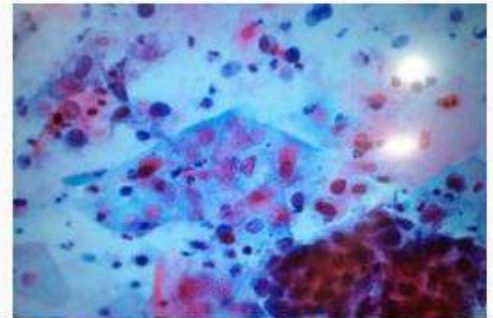


PHOTO: Screening women aged 20 to 24 has no significant impact on cancer rates, a study shows. (ABC News: Jessica van Vonderen)

RELATED STORY: Cervical cancer screening rates among Indigenous women 'show no improvement'

MAP: Australia

Australia's cervical cancer screening self-collection program a world first

Craig Bust, Health Reporter

SHARE TWEEET MORE

Women who have refused to get pap smears will be able to collect their own tissue samples for testing under world-first changes to Australia's cervical cancer screening program.

Program committee member Louise Farrell said the option to avoid the invasive test would encourage indigenous women, victims of sexual abuse and those reluctant to get pap smears for cultural reasons to get screened.



Tablia Meredith has recovered from cervical cancer thanks to early screening. Photo: Simon O'Dwyer

Right now, a hungry family needs you.

Donate food today!

WFP World Food Programme wfp.org

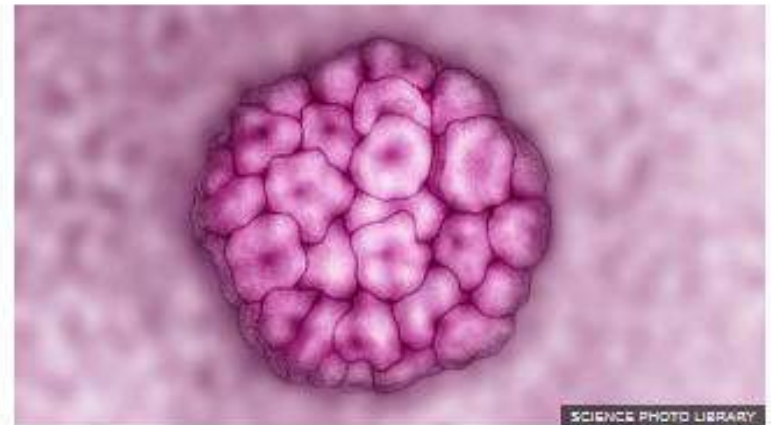
NEWS

Health

HPV cervical cancer test introduced in England

4 July 2015 Health

Share



SCIENCE PHOTO LIBRARY

The NHS in England is introducing a "superior" test for cervical cancer, following a successful pilot programme.

Experts say it is a switch that could pick up an extra 600 cancers a year.

Women invited for a routine smear test will now automatically be checked for an infection called HPV (Human Papilloma Virus), which has been strongly linked to cervical cancer.

Until now, an HPV test has only been done if doctors noticed abnormal cells in the smear sample.

Scotland, Wales and Northern Ireland are currently considering whether to introduce routine HPV testing into its cervical screening programme.

Self – collection sampling

- Biggest breakthrough for people who cannot access proper medical care.
- Evalyn Brush - Lancet V-Brush
- Self collected sample using the V-Brush has been confirmed to be as accurate as cervical sample collected by a gynaecologist or a nurse. (*Lancet Oncol 2014 15: 172-83*)



Self-collection for HPV PCR

Journal of Clinical Virology 54 (2012) 147–151



ELSEVIER

Contents lists available at SciVerse ScienceDirect

Journal of Clinical Virology

journal homepage: www.elsevier.com/locate/jcv



Brush-based self-sampling in combination with GP5+/6+-PCR-based hrHPV testing: High concordance with physician-taken cervical scrapes for HPV genotyping and detection of high-grade CIN

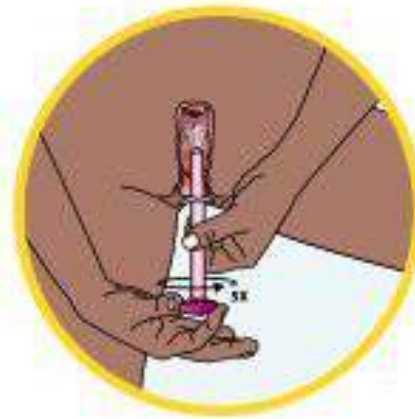
Maaïke G. Dijkstra^a, Daniëlle A.M. Heideman^a, Folkert J. van Kemenade^a, Kees J.A. Hogewoning^b, Albertus T. Hesselink^a, Muriël C.G.T. Verkuijten^c, W. Marchien van Baal^d, Gatske M. Nieuwenhuyzen-de Boer^e, Peter J.F. Snijders^a, Chris J.L.M. Meijer^{a,*}

U How do I use the Lancet V-Brush*



1

Remove the V-Brush from the packaging. Do not throw the packaging away, as it is necessary for sending the V-Brush to the laboratory after usage.



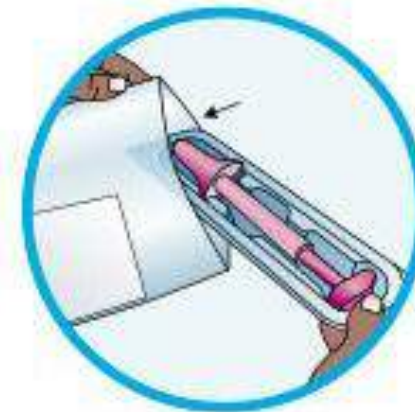
3

Insert the V-brush up to the wings, push the plunger rotate x 5. Carefully remove the V-brush and replace the pink cap.



2

Press the sides of the pink cap with your thumb and index finger to remove the pink cap from the V-Brush. Ensure that you do not touch the white fibres of the V-Brush with your hands!



4

Place the V-Brush back inside the original package. Put the package containing the V-Brush into the plastic bag provided, seal it then submit to the laboratory.

To Your Health

HPV test is better than Pap smear at detecting precancerous cervical changes, study says

July 3, 2018

By Laurie McGinley July 3 Email the author



A new study found that the HPV test was better than the Pap smear in detecting precancerous changes that can lead to cervical cancer. (iStock)

A test for HPV detects precancerous changes of the cervix earlier and more accurately than the Pap smear, according to a large clinical trial published Tuesday.

The randomized, controlled [study](#) — the kind of trial considered the “gold standard” of research — showed that the human papillomavirus test is more sensitive than the Pap smear, a widely used test that has been a standard part of women’s preventive health care for decades but has drawbacks.

Several experts predicted the results would spur efforts to entirely replace the Pap test with the HPV test. “It’s an important study,” said Jason Wright, a gynecologic oncologist at NewYork-

*The decade-long study, which appeared in the **Journal of the American Medical Association**, involved about **19,000 women** who were placed in two groups: one using the HPV test to screen for cervical cancer, and the other using Pap cytology. In 2017, the researchers running the study reported that **there were significantly more cases of precancerous lesions detected early in the trial among the women in the HPV-tested group, compared with the Pap cytology group.***



July 3, 2018

More▼

Effect of Screening With Primary Cervical HPV Testing vs Cytology Testing on High-grade Cervical Intraepithelial Neoplasia at 48 Months

The HPV FOCAL Randomized Clinical Trial

Gina Suzanne Ogilvie, MD, FCFP, DrPH^{1,2}; Dirk van Niekerk, MB, ChB, Mmed, FFPATH, LMCC, FRCPC^{3,4}; Mel Krajden, MD, FRCPC^{1,2}; [et al](#)

» [Author Affiliations](#)

JAMA. 2018;320(1):43-52. doi:10.1001/jama.2018.7464

HPV and Cervical Cancer

WHO Fact Sheet

- HPV is a group of viruses that are extremely common worldwide prevalent in 5% – 20% of HIV-ve people.
- There are >100 types of HPV, of which at least 14 are cancer-causing (high risk type or HR-HPV).
- HPV is mainly transmitted through sexual contact and most people are infected with HPV shortly after the onset of sexual activity.
- **>99.9% of all cervical cancer** is caused by sexually acquired infection HR-HPV.
- Two HPV types (16 and 18) cause 70% of cervical cancers and precancerous cervical lesions.

... HPV and Cancer

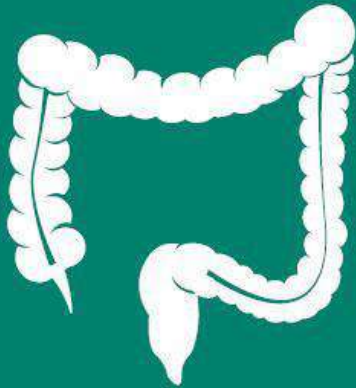
- HR-HPV is also linked with oropharyngeal, anal, vulval, vaginal and penile.
- Cervical cancer is the second most common cancer in women living in less developed regions with an estimated 445 000 new cases in 2012 (84% of the new cases worldwide).
- In 2012, approximately 270 000 women died from cervical cancer; more than 85% of these deaths occurring in low- and middle-income countries.
- Vaccines against HPV 16 and 18 have been approved for use in many countries

Colorectal cancer

- Colorectal cancer almost always develops from *precancerous polyps* (abnormal growths)
- Screening for colorectal cancer involves tests to find precancerous polyps, so that they can be removed before they turn into cancer.
- Screening tests also helps find colorectal cancer early, when treatment works best.
- Recommended for 50-75 years unless high risk then earlier e.g. family history, IBD, genetic risks
- Tests includes stool test (FIT), colonoscopy & CT-scan

Colon Cancer

SCREENINGS



Scope



Scan



Stool

Lung cancer

- The only recommended screening test for lung cancer is low-dose CT scan, or LDCT.
- CT-scan is a form of X-ray machine scans the body and uses low doses of radiation to make detailed pictures of the lungs.
- Lung cancer is the leading cause of cancer deaths worldwide for both men and women
- Screening is recommended for those at risk including heavy smokers of 30 pack years and industrial exposed workers



LUNG CANCER SCREENING CRITERIA

Our patients must be:

55-77
years old



CURRENTLY
smoke

or

QUIT
in the last
15 YEARS

Have at least a

30-PACK-YEAR
smoking history



X

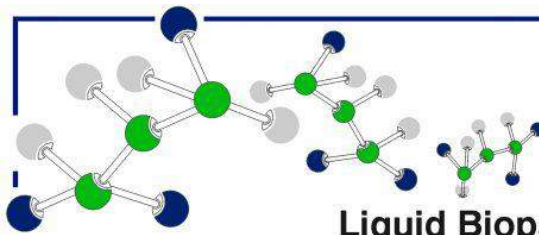


=

30
pack-year
history

2 packs per day

15 years

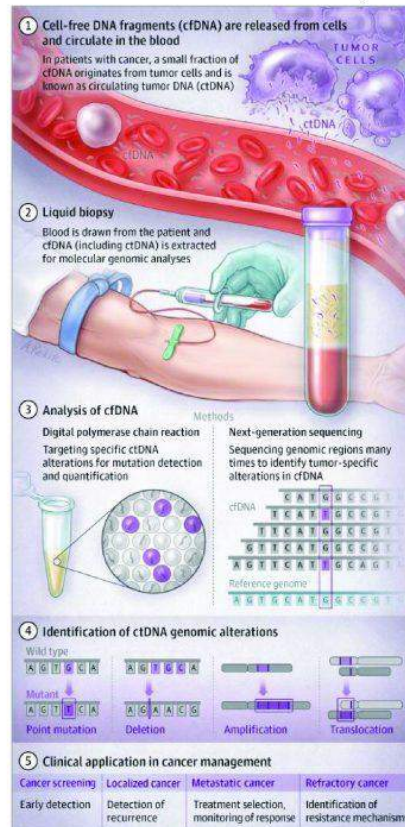


Liquid Biopsy

Prepared by Dr. Rabia Mukadam

What is liquid biopsy and how it works

A liquid biopsy is a test that is performed on a sample of blood or other body fluids to detect for the presence of traces of cancer DNA. The cancer DNA can either be derived from circulating tumor DNA (ctDNA) that arise as a result of tumor cell apoptosis and necrosis or circulating tumor cells (CTC's) that have shed from the primary tumor and are carried around the in circulation (see figure below)



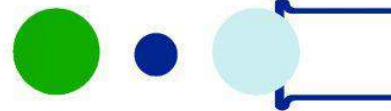
Husain H, Vekatescu VE. Cancer DNA in the Circulation The Liquid Biopsy. JAMA. 2017;318(13):1272-1274

It is a minimally invasive technique that yields highly important genetic information that can be used for:

1. **Targeted therapies** – such as EGFR testing, where a mutation in the gene can confer sensitivity to EGFR tyrosine kinase inhibitors like gefitinib in patients with advanced non-small-cell lung cancer.
2. **Improved diagnosis** - the presence of cancer DNA can be detected in blood and other body fluids and from tumor tissue allowing precise diagnosis.
3. **Determining prognosis** – certain gene mutations can be used to classify how aggressive the cancer is likely to behave and predict their outcome.
4. **Determination of risk** – various genes such as BRCA1 and BRCA2, if present in an individual increase the risk of getting certain cancers, e.g., for breast and ovarian cancers. The detection of these genes in an individual allows for preventive measures.

What are the advantages of Liquid biopsy?

- Unlike tissue biopsies, liquid biopsies make use of fresh material from the tumor that is free of preservatives.
- It's a minimally invasive procedure which means cancer genotyping and early resistance monitoring can still be performed for patients who cannot have tissue biopsies performed due to safety concerns, or where insufficient sample for genotyping has been collected.
- ctDNA can be detected much earlier than radiographic detection of cancers. Sometimes by more than 6 months. This makes it possible to start treatment much earlier, for a better prognosis.



Prostate cancer



Tumor markers

- A tumor marker is a substance produced by a tumor (benign or malignant), or by the host in response to a tumor, that is used to determine the presence of a tumor based on measurements in the blood or secretions.
- Such substances are measured qualitatively or quantitatively by chemical, immunological or molecular diagnostic methods
- The word biomarkers is being used preferentially for these biological substances not always produced by tumors

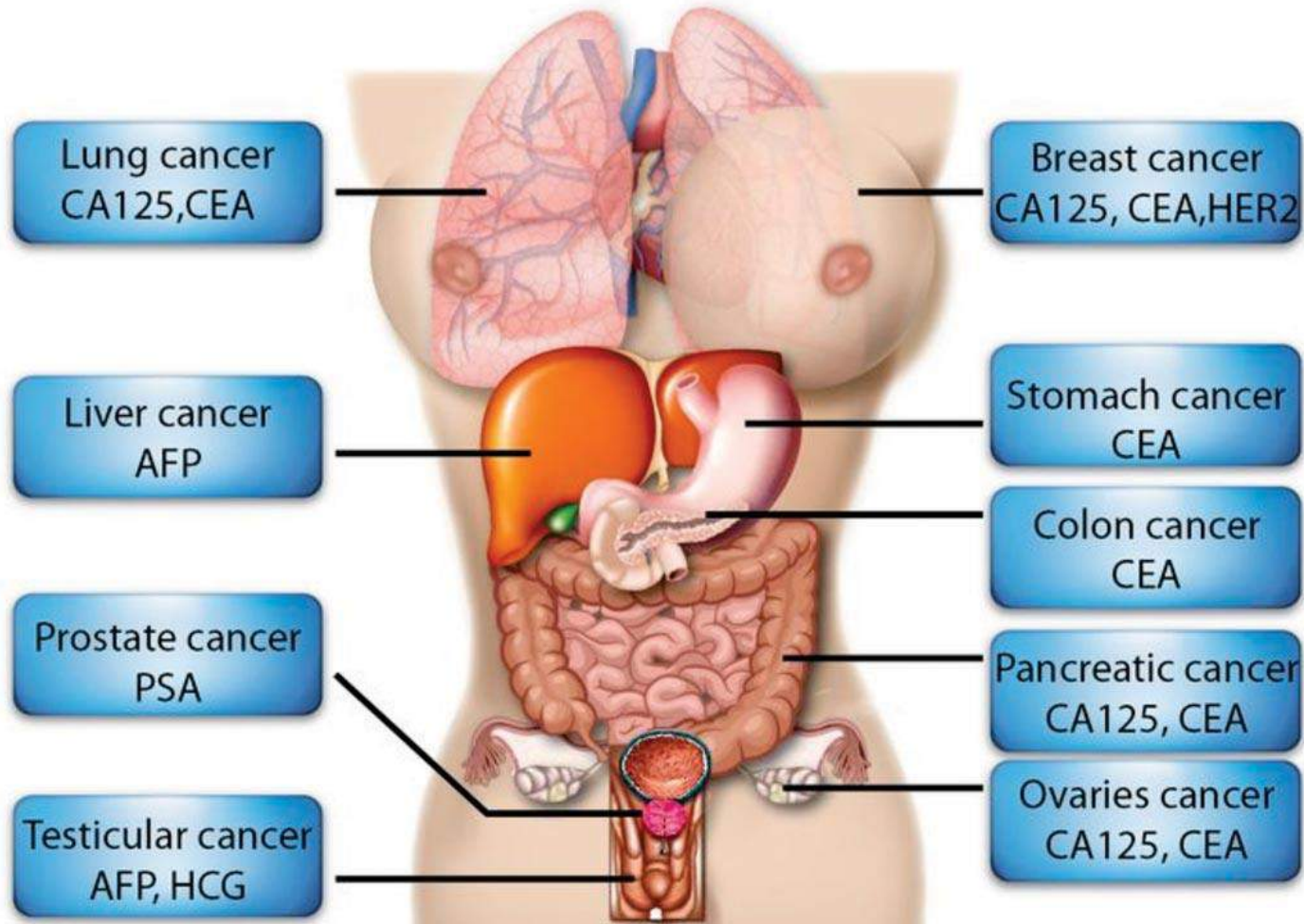
Characteristics to consider

- Some tumor markers are specific for one type of cancer (e.g. PSA and prostate), while others are seen in several cancer types (e.g. AFP in liver and germ cell tumors)
- Many are seen in both cancerous and non-cancerous conditions (e.g. CEA, PSA, CA125).
- Consequently they are not diagnostic for cancer.
- However in many cases blood concentrations of tumor markers reflect tumor activity and volume

The ideal tumor marker

- An ideal tumor markers should be both **specific** for a given type of cancer and **sensitive** enough to detect small tumors to allow early diagnosis or use in screening.
- *Tumor specific markers* – specific for single individual tumor
- *Tumor associated markers* – found with different tumors of the same tissue type

Tumor markers



Summary

- Cancer screening involves tests and examination to detect cancers before the cancer develops or to allow early detection that can enable treatment that will make a difference in outcome
- Some cancers can be screened but most can't.
- The common cancers successfully screened include cervix, breast and colon which saves lives
- Other cancers screened include prostate, lung & skin
- Targeted screening also includes ovary, thyroid, etc

Thank You!

