BIOCHEMISTRY OF CANCER AND ASSOCIATED BIOCHEMICAL MARKERS I

Ass. Prof. Dr. Jaafaru Sani Mohammed

Advance Clinical Biochemistry II (MA 406)

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Lecture Seven

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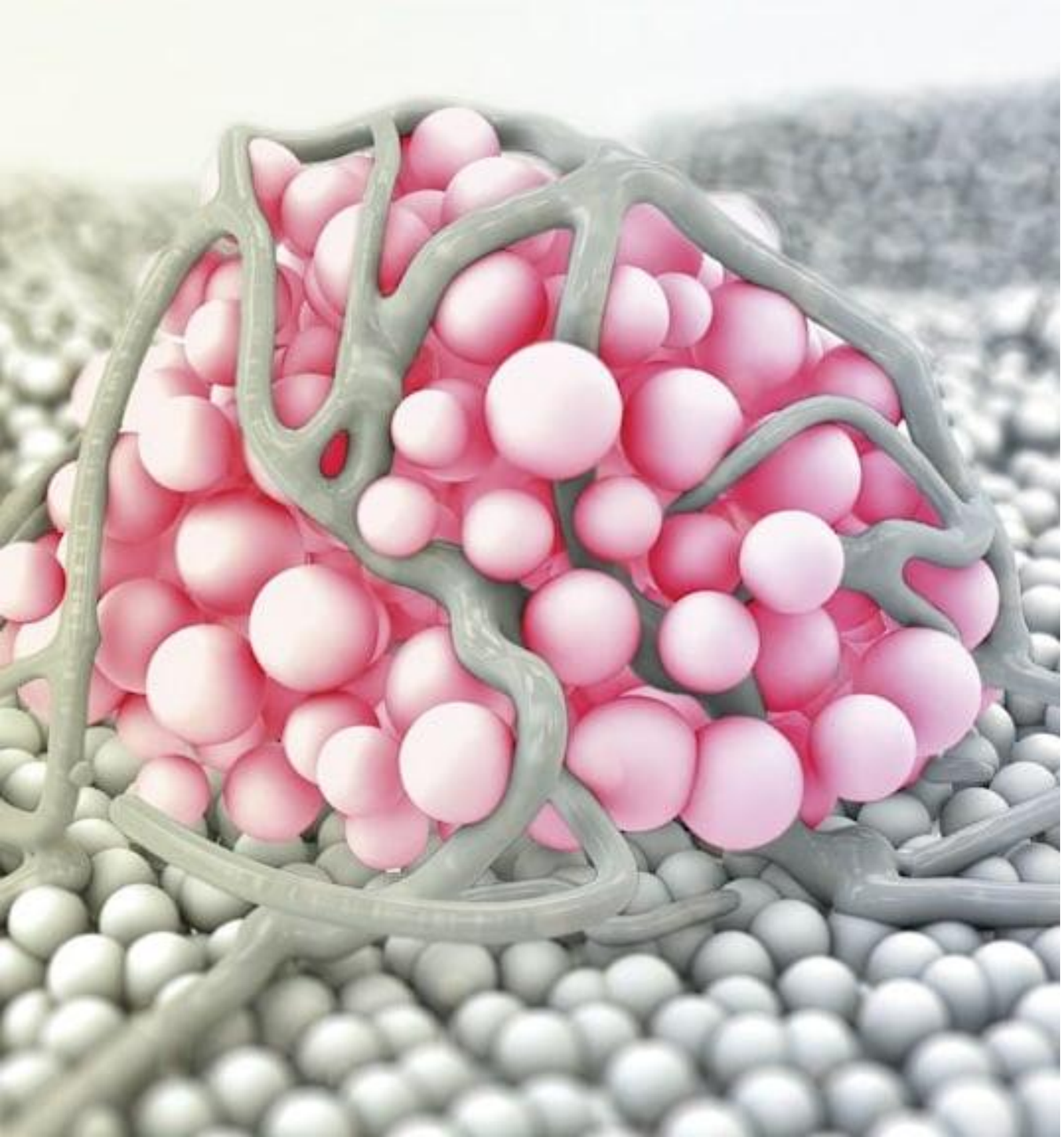
Learning Objectives

- Students are to understand:
- Tumour and its types
- The hallmark of malignancy
- The clinical circumstances to request tumor markers
- The routine tumor markers and
- the limitations of such measurements

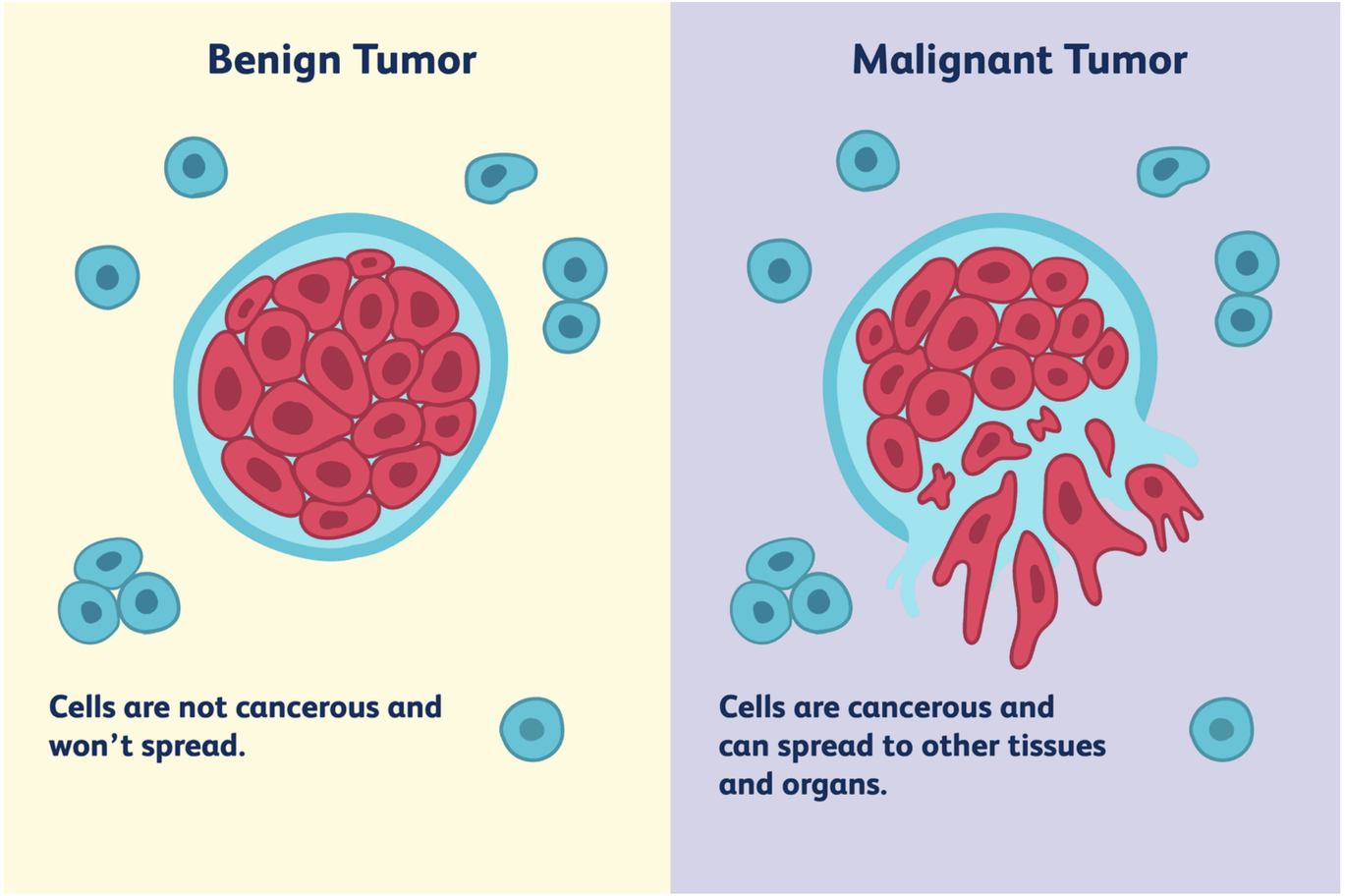


Introduction

- **Tumour:** It is an abnormal mass of tissue that forms when cells grow and divide uncontrollably.

- **Types of Tumour:**
- benign (not cancer) or malignant (cancer).

- **Hallmark of tumour:**
- It constitutes an organizing principle for rationalizing the complexities of neoplastic disease.



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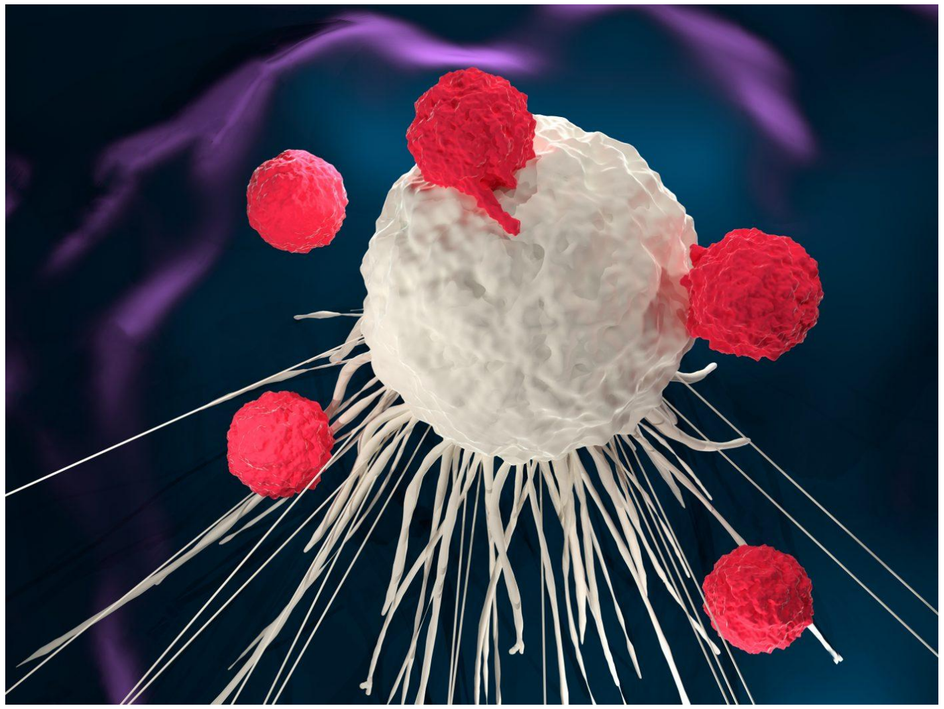
- Benign tumours may grow large spreading or invading nearby tissues or body parts.
- Tumours may secrete a wide range of substances into blood (hormones, enzymes and antigens), known as tumour markers.
- Tumour marker measurements can contribute to patient management in a number of ways.



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- When interpreting the results of serum tumour markers it is essential to remember the following:
- Concentrations within the reference range do not exclude malignancy.
- A rise in concentration within the reference range should raise the suspicion of tumour recurrence in previously diagnosed patients.
- Nonmalignant conditions may increase the concentration of some tumour markers.

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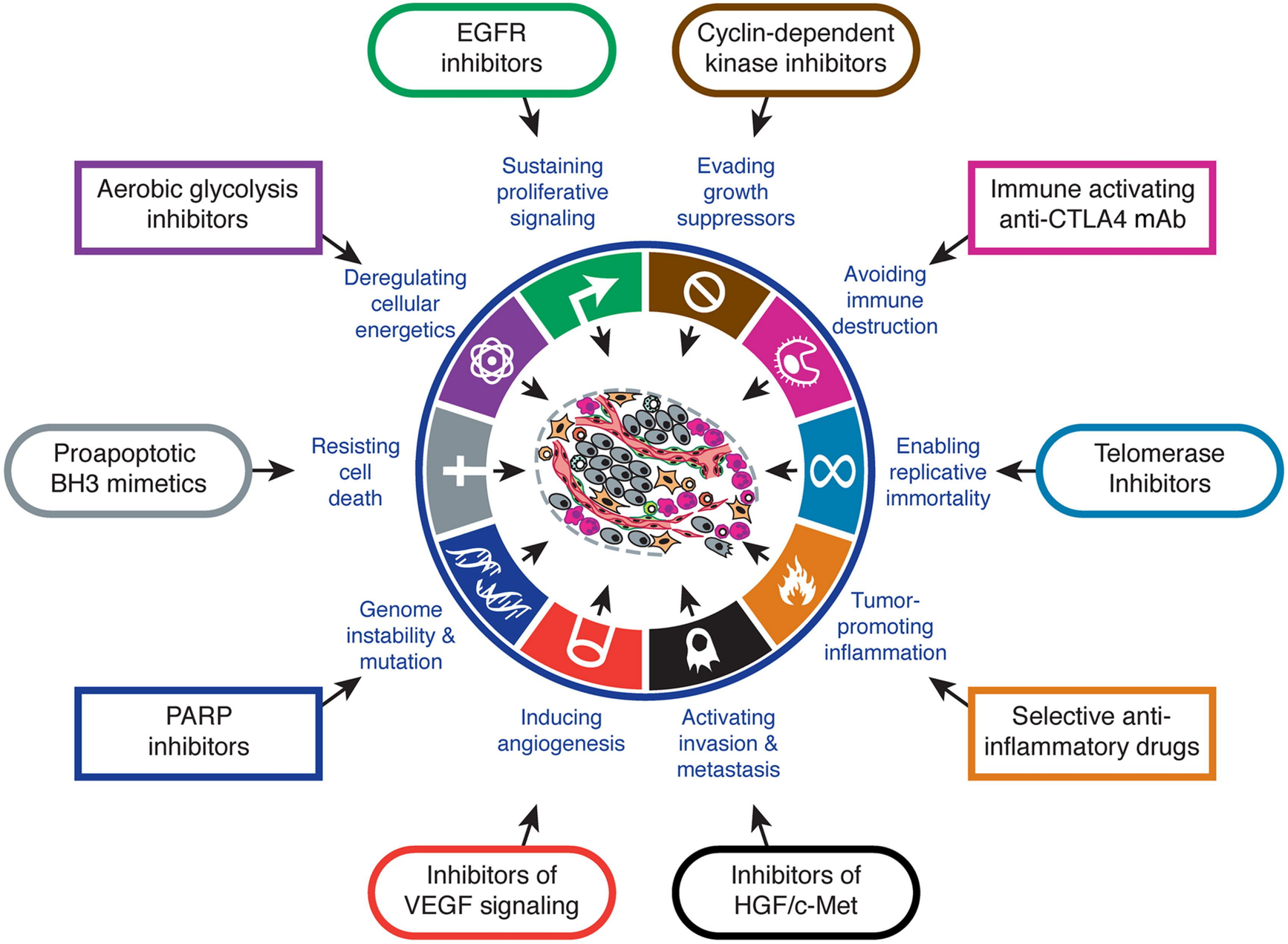
- Care must be taken when requesting for tumorur markers.
- Inappropriate requests can lead to unnecessary investigations, with the potential risk of harm (e.g. biopsy) and considerable patient anxiety.
- The screening of nonspecifically unwell patients with panels of tumour markers should be discouraged.
- This is due to the low diagnostic sensitivity and specificity under such circumstances.

Influencers of Cancerous Cells

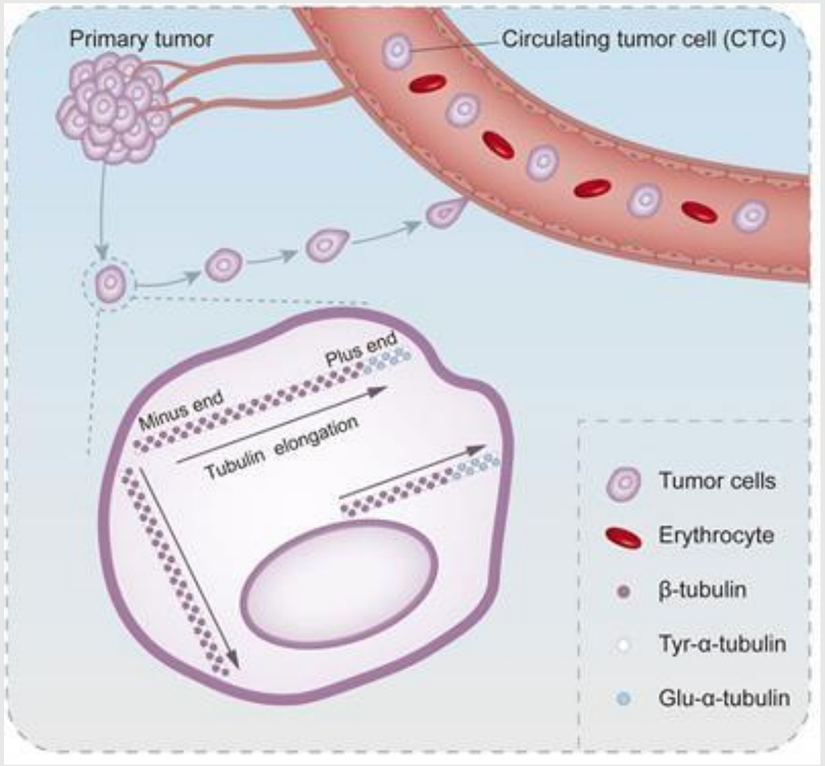


Tumour markers commonly used in clinical practice

- A tumor marker is anything present in or produced by cancer cells or other cells of the body.
- The marker could be produced in response to cancer or certain benign conditions.
- They provide information about a cancer, such as how aggressive it is, whether it can be treated with a targeted therapy, or whether it is responding to treatment.

Carcinoembryonic antigen (CEA)

- CEA is a high molecular weight glycoprotein, and its measurement remains the most widely used marker.
- It aid in the prognosis, surveillance and monitoring of patients with colorectal cancer.
- CEA measurements appear to define cancer patients that have poor prognosis and could benefit from adjuvant chemotherapy.
- CEA levels should return to normal post-operatively following successful surgical resection, failure to do so suggests residual or metastatic disease.



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- Serial monitoring with CEA can detect recurrent disease with a sensitivity of approximately 80% and specificity of approximately 70%.

- Patients monitored frequently with CEA have an improved 5-year survival rate.

- CEA testing is often carried out every 2–3 months for at least 3 years after the initial diagnosis.

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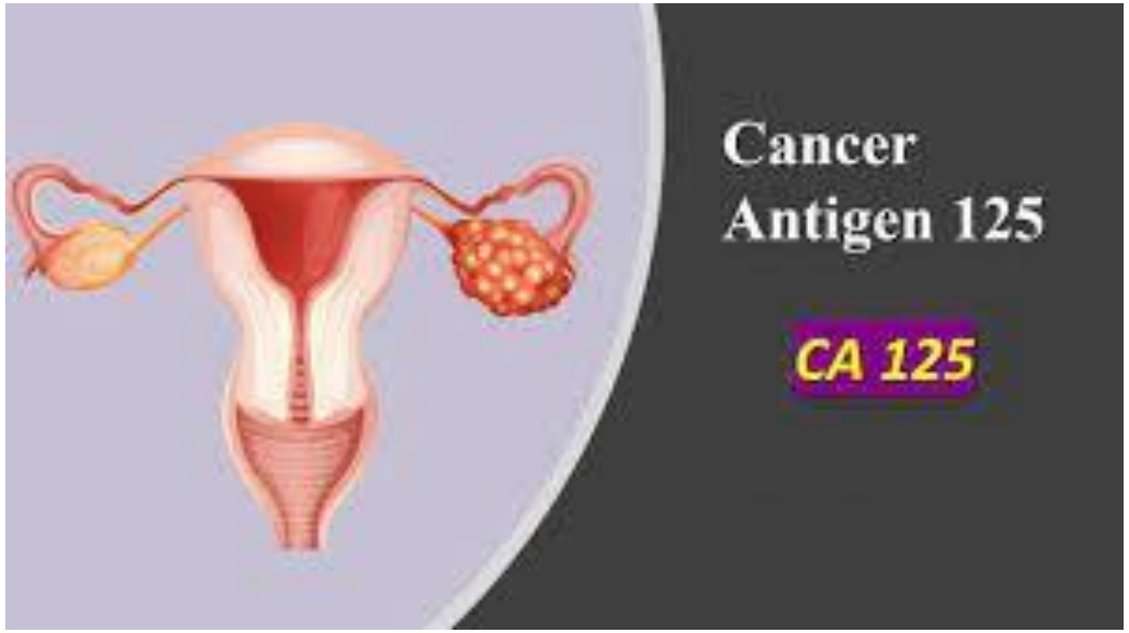
- Monitoring the response to chemotherapy using CEA is also desirable, with measurements being taken every 2–3 months of active treatment.
- Smaller but persistent incremental rises in CEA should also prompt further investigation.
- Significant percentage of patients with early colorectal cancer have elevated CEA.



Cancer antigen 125 (CA-125)

- CA-125 is a high molecular weight glycoprotein that has a well-defined role in the screening and monitoring of ovarian carcinoma.
- The majority of ovarian cancers are diagnosed in women >45 years, with the highest rates in the 60–64 year age group.
- The CA-125 is found on the endothelium of the fallopian tubes, endocervix and endometrium.

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- Serum CA-125 is elevated when there is vascular invasion, tissue destruction and inflammation associated with malignancy.
- It is increased in over 90% of women with advanced ovarian cancer disease and in 40% of patients with advanced abdominal malignancy.
- However, serum CA-125 can also be increased during menstruation and pregnancy.
- Values in patients with ascites can be particularly high, regardless of whether malignancy is present or not.

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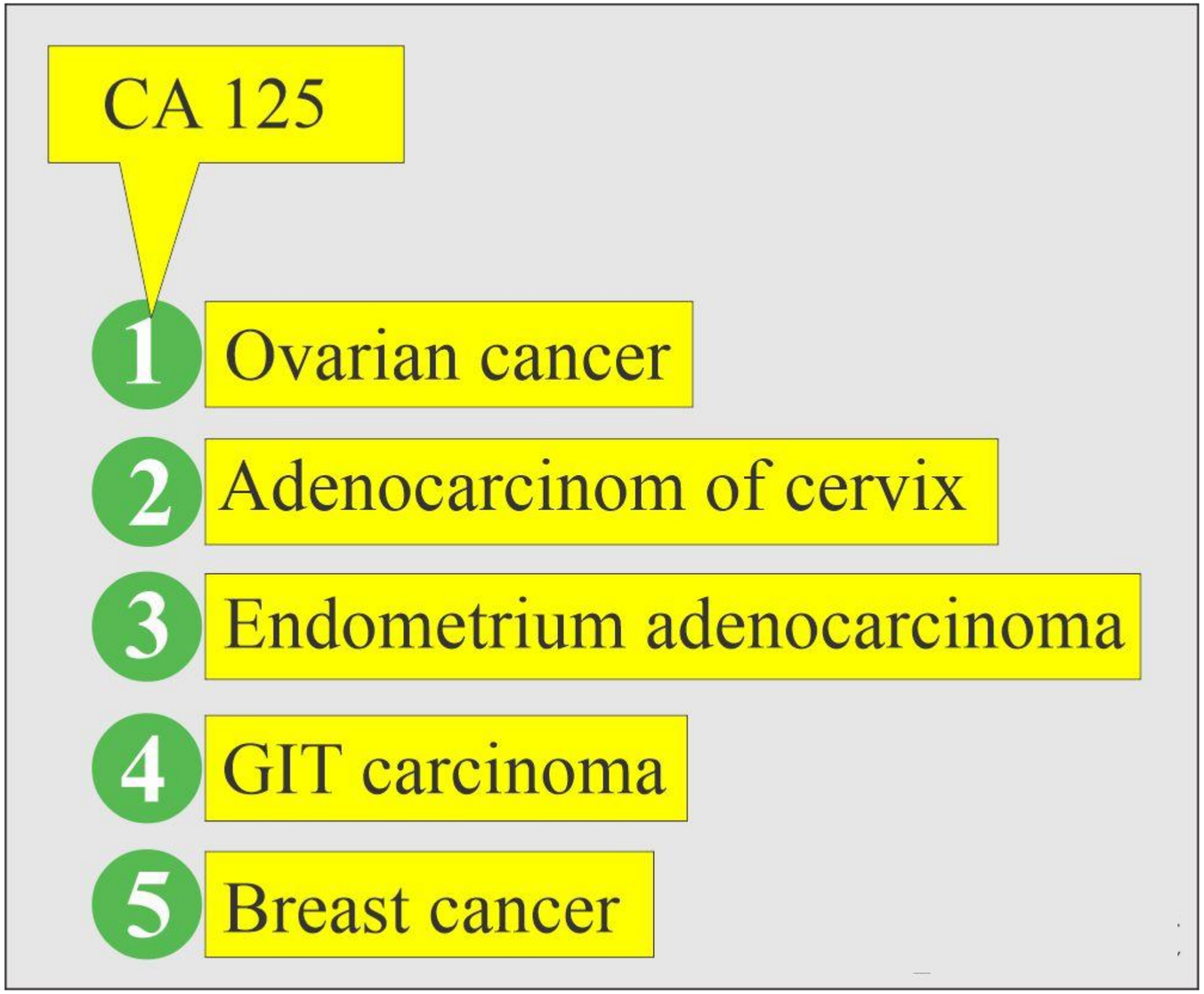
- National Institute for Health and Excellence (NICE) in UK recommends that serum CA-125 in women with persistent symptoms should be measured.
- If the CA-125 conc. is >35 kU/L, pelvis and abdomen ultrasound should be performed, and calculate the risk of malignancy index (RMI).
- Patients who have a score >250 kU/L should be referred for specialist investigation.



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- Important points:
- CA-125 is only elevated in 50% of cases in stage 1 of ovarian cancer.
- Result within the ref. range shouldn't be used to exclude ovarian cancer.
- Rise in CA-125 is not only due to malignancy (pre-menopausal women).
- Rise in CA-125 due to ovarian malignancy increases with age.
- CA-125 is a reliable marker of response to treatment and progression.

Prostate-specific antigen (PSA)

- PSA is a glycoprotein used as a tumour marker to aid diagnosis and to monitor patients with prostatic cancer.
- PSA is detectable in the serum of healthy men and the concentration rises with age; thus age-related reference ranges are useful.
- Most PSA circulates in plasma bound to α1-antichymotrypsin, but a small fraction circulates unbound to any protein (free PSA).
- Patients with prostate cancer have higher ratio of bound and free PSA than patients with benign hypertrophy.

❑ Important points on PSA

- Approximately 50% of men with prostatic cancer who have a PSA between 4 and 10 µg/L will have severed disease.
- Approximately 15% of patients diagnosed with prostatic malignancy will have a PSA between 3 and 4 µg/L.
- Bone metastases are unlikely in patients with a PSA below 4 µg/L.

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- The value of screening asymptomatic patients remains controversial.
- If performed, screening should only be done after appropriate counseling.
- Studies indicate that the 10-year survival rates for males with early-stage prostate cancer detected by PSA testing
- That does not differ between those given treatment and those that undergo active monitoring.


Questions
Comments
Feedback