



BIOCHEMISTRY OF CANCER AND ASSOCIATED BIOMARKERS II

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Advance Clinical Biochemistry II (MA 406)

Summer Semester

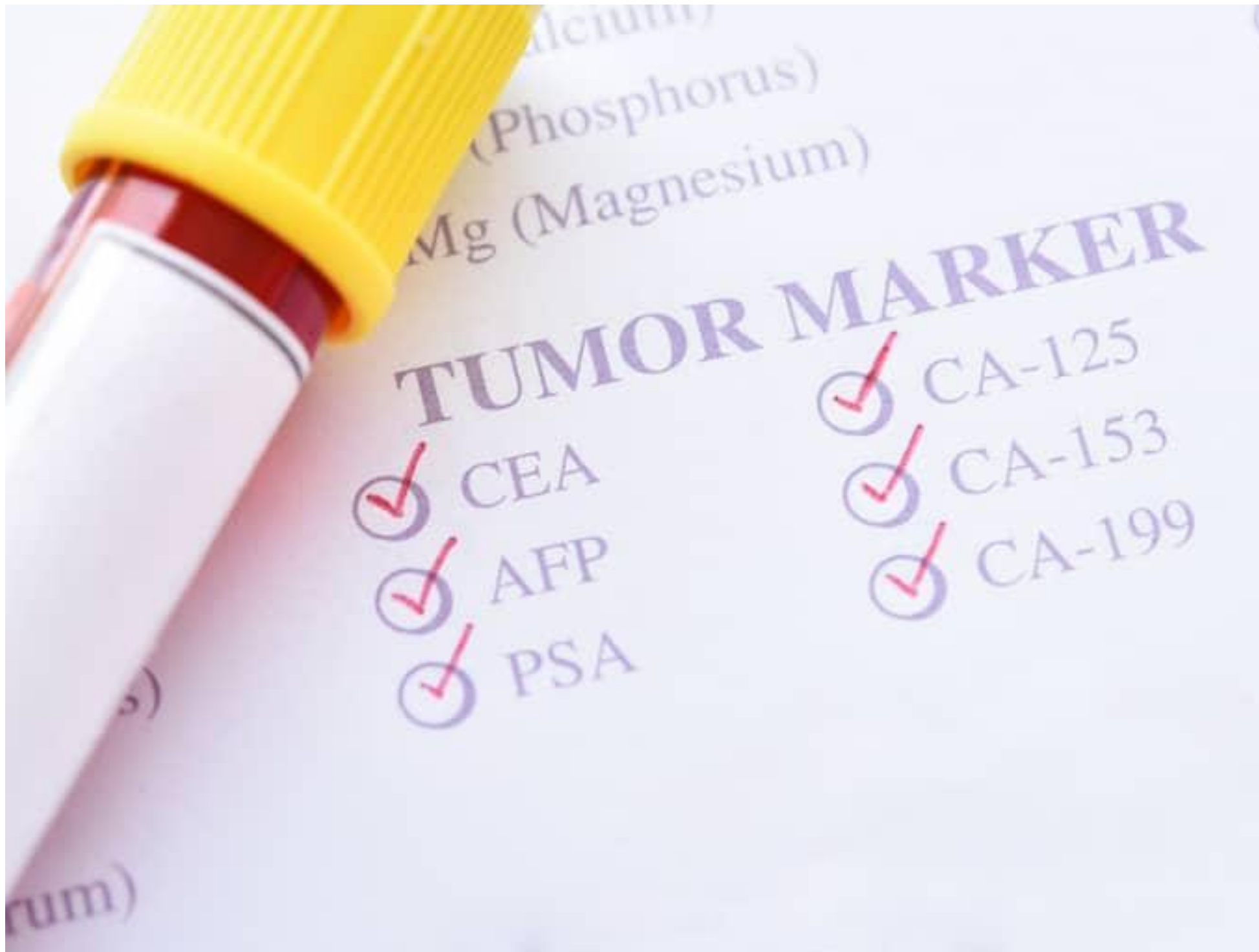
Lecture Eight

09/09/2025



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 in the measurements



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.

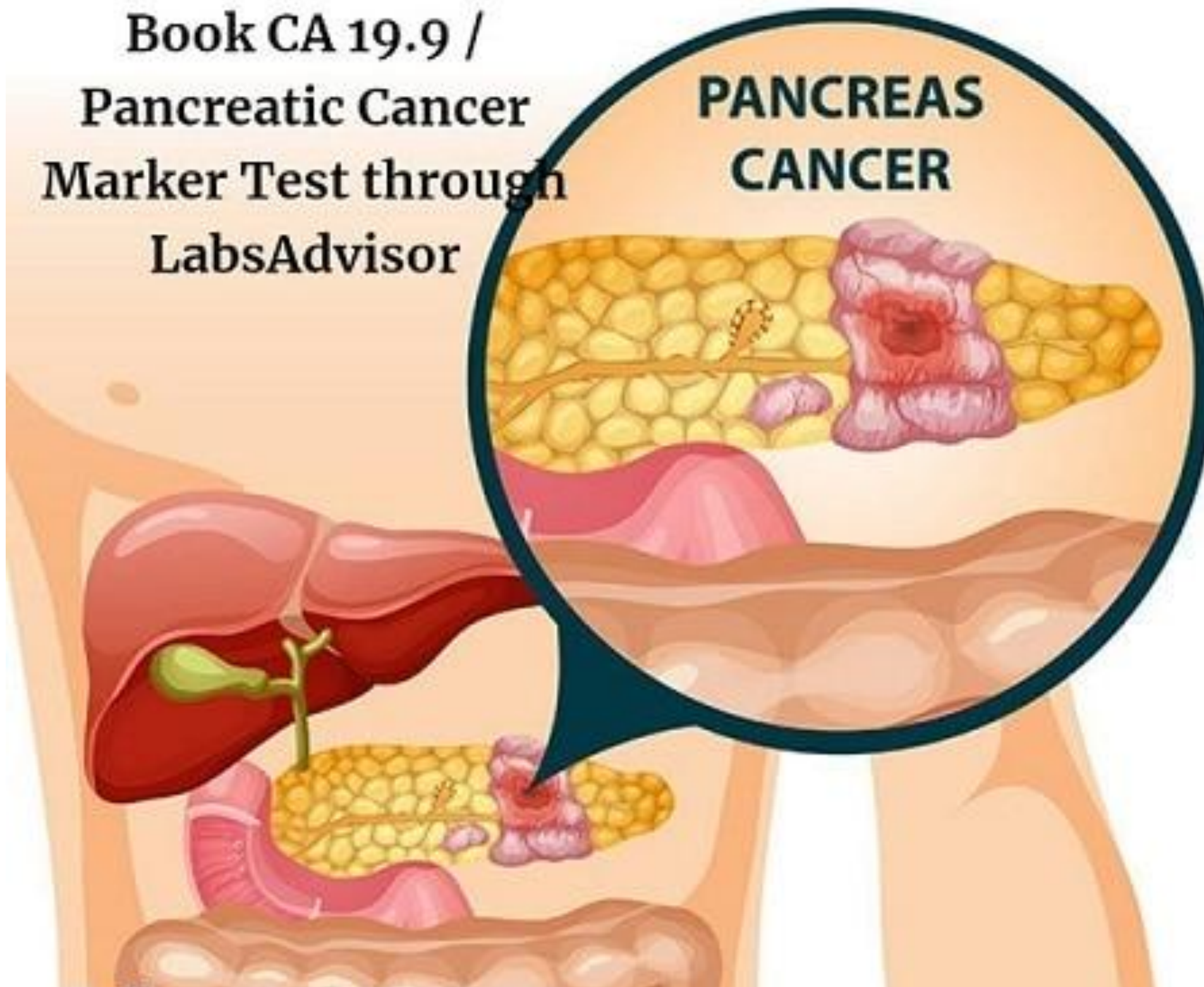
Cancer Antigen 19-9 (CA 19-9)

- CA19-9 is a **carbohydrate antigen** 19-9, also called cancer antigen 19-9.
- It is a cell surface glycoprotein complex associated with pancreatic ductal adenocarcinoma (PDAC).
- CA19-9 is the most commonly used and best-validated serum tumor marker for pancreatic cancer diagnosis.
- Especially in symptomatic patients and for monitoring therapy in patients with pancreatic adenocarcinoma.



Book CA 19.9 /
Pancreatic Cancer
Marker Test through
LabsAdvisor

PANCREAS CANCER



Cancer Antigen 19-9 (CA 19-9)

- CA 19-9 is primarily use as an indicator of post-operative monitoring of patients with pancreatic tumours.
- Conc. can also be increased in patients with colorectal or other GI malignancies.
- The usefulness of CA 19-9 is limited due to the few effective treatments available for the disease.
- CA 19-9 is useful for primary sclerosing cholangitis monitoring, It rises rapidly in cholangiocarcinoma Patients.

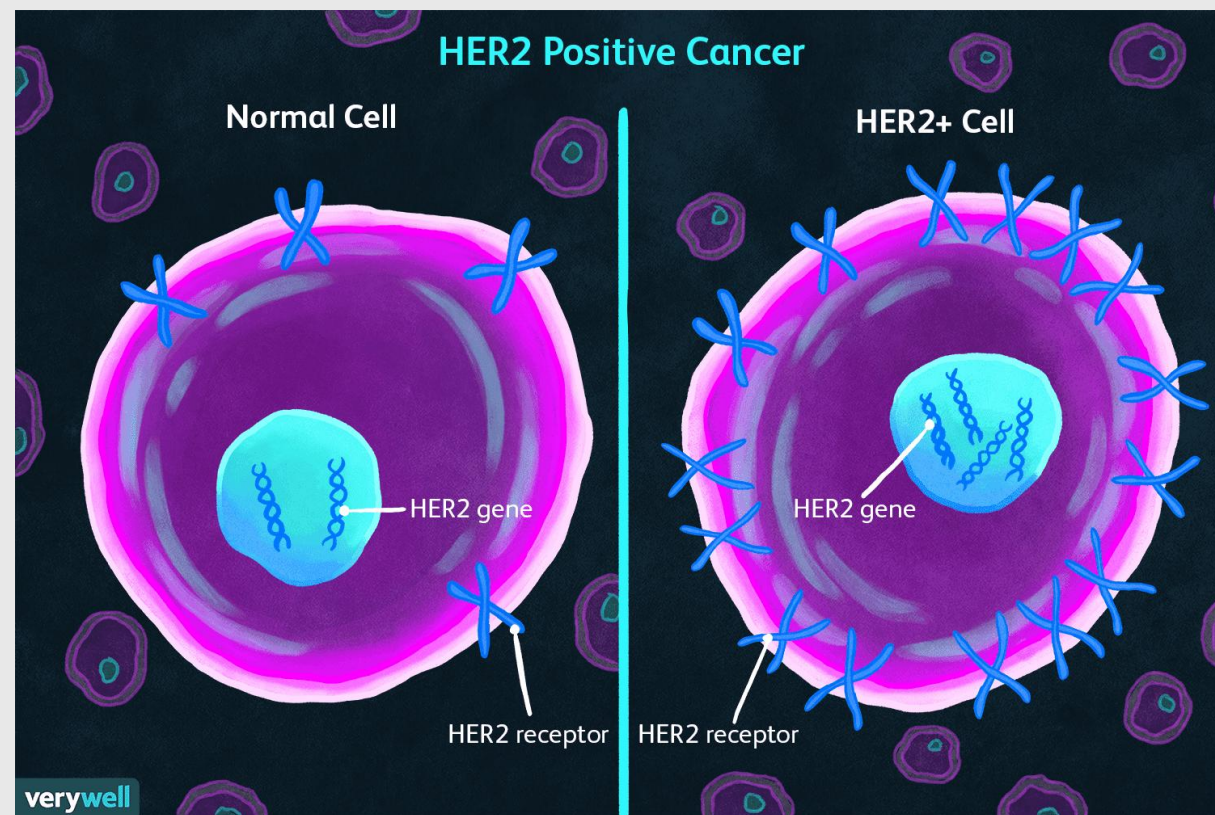


CA 15-3 and HER2/neu:

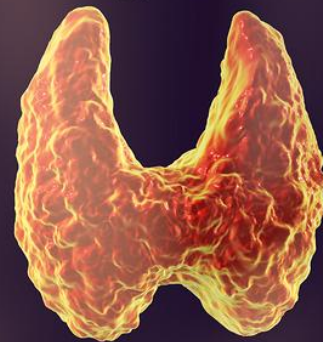
- CA 15-3 is a **mucin glycoprotein** that is used in monitoring **breast cancer patients**.
- CA 15-3 provides **prognostic information**, and **serial monitoring** in **detecting recurrent disease** and **evaluating response to treatment**.
- The marker may become more important when more effective treatments are developed to treat metastatic disease.

Cont.

- HER2/neu is a cell surface receptor protein, a member of the epidermal growth factor receptor family.
- It is expressed in small amounts on the plasma membrane of normal cells.
- The protein appears to be involved in the growth and spread of breast cancer, with 25% of patients having high conc. of the protein.
- The presence of HER2/neu suggests an aggressive tumor and appears to provide a prognostic indicator.
- Patients with HER2/neu-positive tumors respond to treatment with monoclonal antibody therapy directed to the HER2/neu protein.

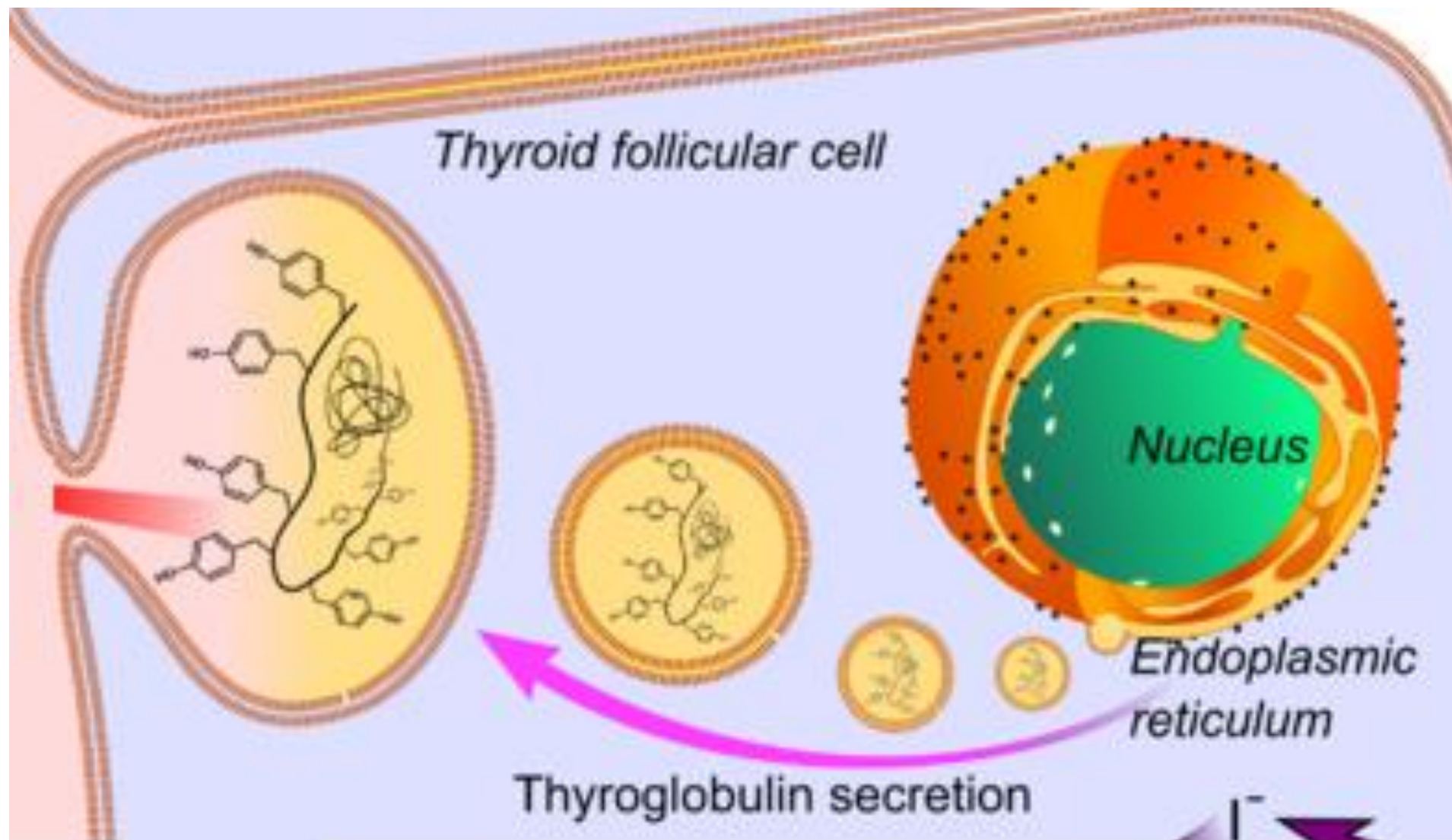


What is Thyroglobulin?



Thyroglobulin

- Thyroglobulin is a protein made by the thyroid gland and it is used for iodide storage and hormonogenesis.
- The thyroid uses it to make the hormones triiodothyronine (T3) and thyroxine (T4).
- These hormones help control metabolism and growth in humans.
- **Thyroxine** is then prescribed at doses that **suppress TSH** intending to impair the growth of any residual tumour.



Cont

- In patients with **low-grade disease**, complete suppression of TSH may **not be required**.
- Many of these tumors synthesize and secrete **thyroglobulin**, used in monitoring **disease progression** and **assessing response to treatment**.
- Patients with papillary or follicular **thyroid cancer** are usually treated by total **thyroidectomy** followed by **ablative doses of radioiodine**.

Thyroglobulin Test

Thyroglobulin Test used to measure levels of thyroglobulin, a protein produced by the thyroid gland to monitor thyroid health and detect thyroid cancer recurrence.

Thyroglobulin Test



Purpose | Preparation | Procedure | Results | Price

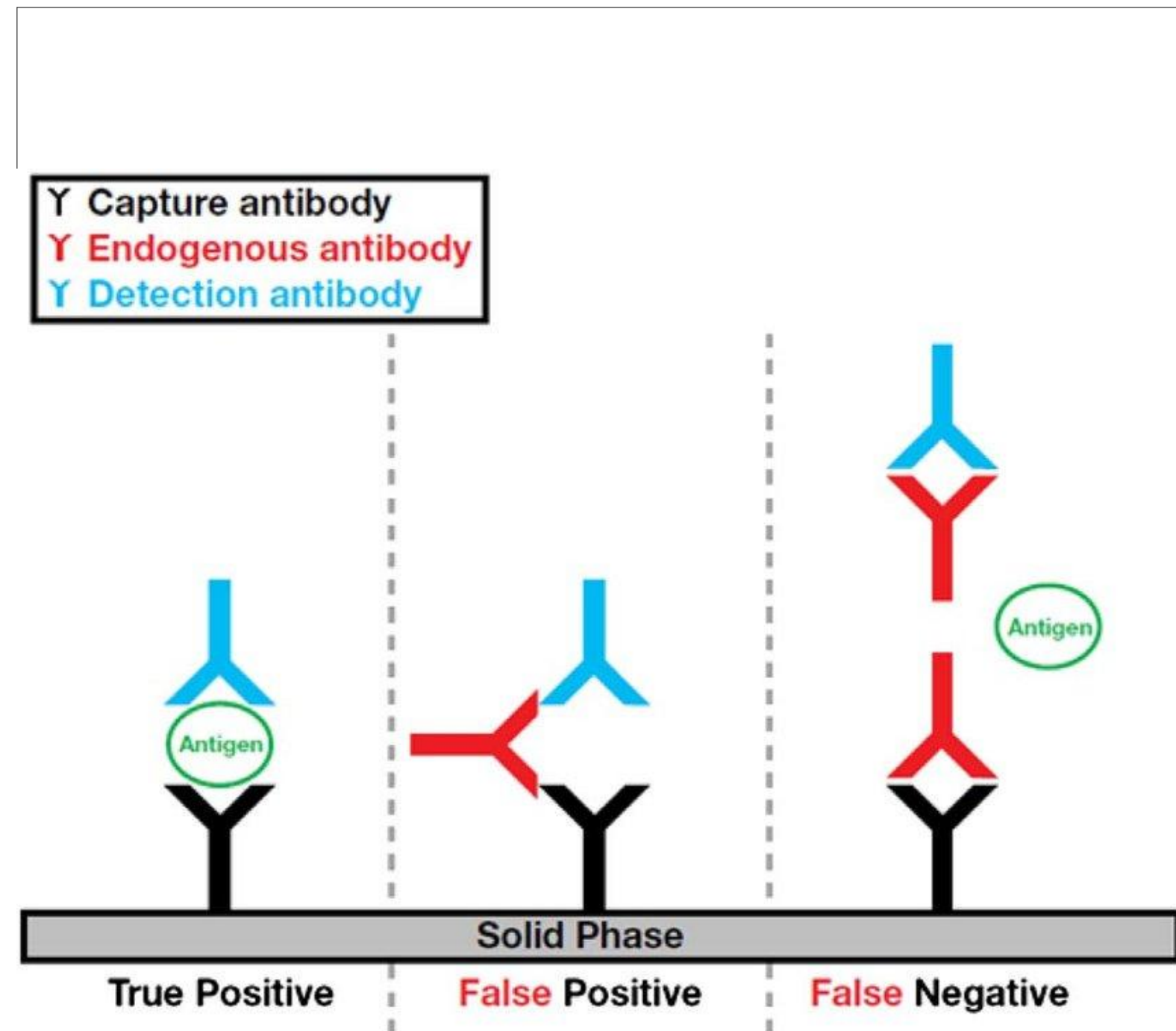
Cont.

- In patients who have been treated with total **thyroidectomy**, serum **thyroglobulin is usually undetectable**.
- The **sensitivity of serum thyroglobulin measurements** for detecting **recurrence** is enhanced by an **elevated TSH concentration**.
- The introduction of **high-sensitive automated thyroglobulin assays** is essential for hastening the process.



Cont.

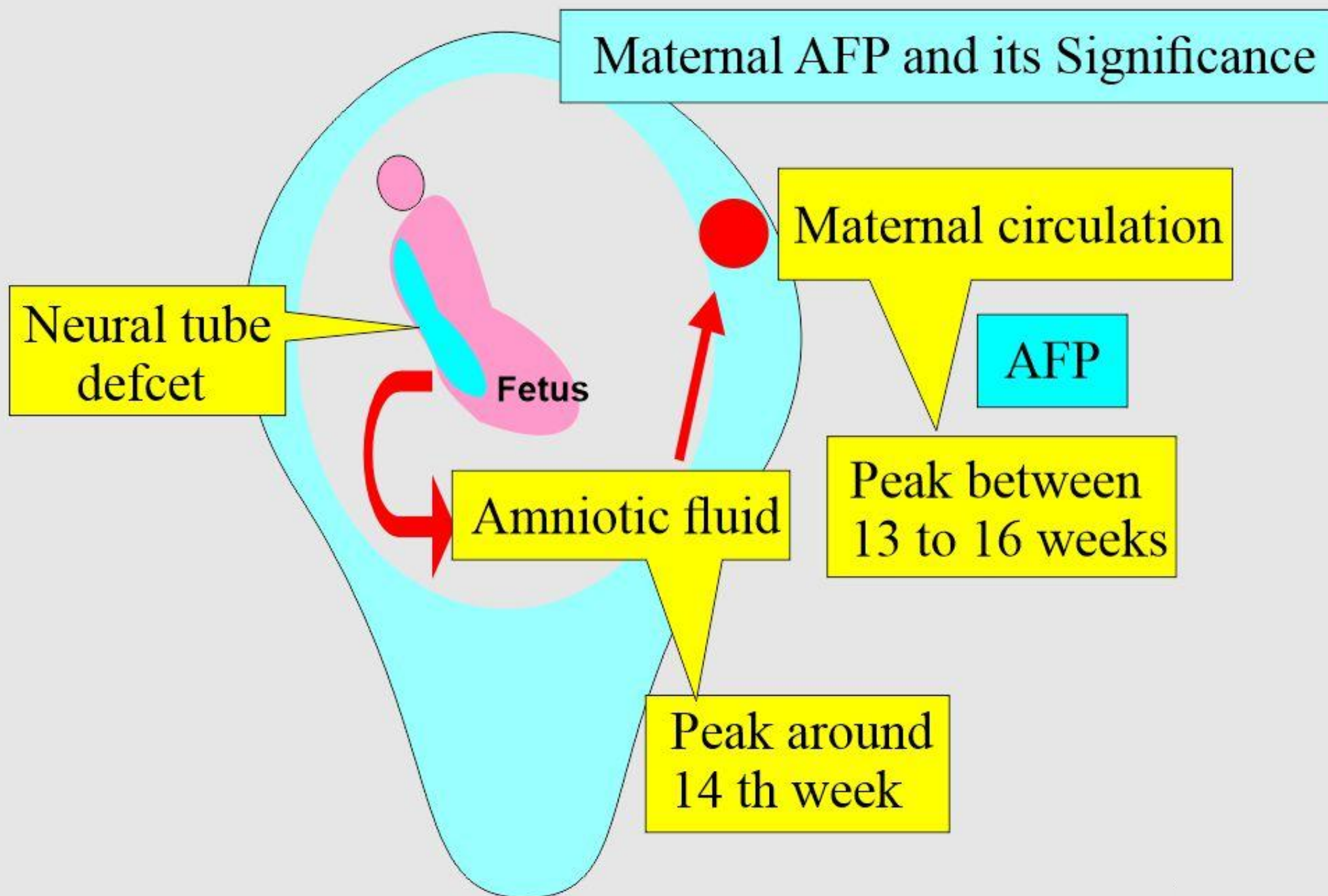
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Cont.

- Endogenous thyroglobulin antibodies are present in up to **20% of patients with thyroid cancer**. Which **interferes** with the assays, leading to **misdiagnosis**.
- In the immunometric assays (used by most laboratories), **antibody interference can lead to false-negative results**.
- Thyroglobulin results should be **interpreted** with the **knowledge of the thyroglobulin antibody status of the patient**.

Maternal AFP and its Significance



α -Foetoprotein (AFP)

- Alpha-fetoprotein is a protein that in humans is encoded by the **AFP gene**.
- Maternal AFP serum level is used to **screen for Down syndrome, neural tube defects, and other chromosomal abnormalities**.
- High levels of AFP can be a sign of **cancer of the liver, ovaries, or testicles**.



Cont.

- Patients with cirrhosis, haemochromatosis, and persistent infection with hepatitis B and C are at high risk of liver cancer development.
- Measurement of serum AFP regularly (every 6–12 months) is of value and allows early detection of tumor.
- Those with a conc. greater than 40 kU/L require close monitoring.



Alpha-Fetoprotein test

What & Why , Range

Cont.

- serum AFP is of value both for monitoring response to treatment and potential recurrence.
- Measurement of serum AFP is also important in the investigation of patients presenting with potential germ-cell tumors.
- AFP concentrations increased at pre- or post-gestational period.
- Values in premature neonates may be as much as 105-fold normal adult values.

What is this Beta –HCG?

Tumor marker you must know..



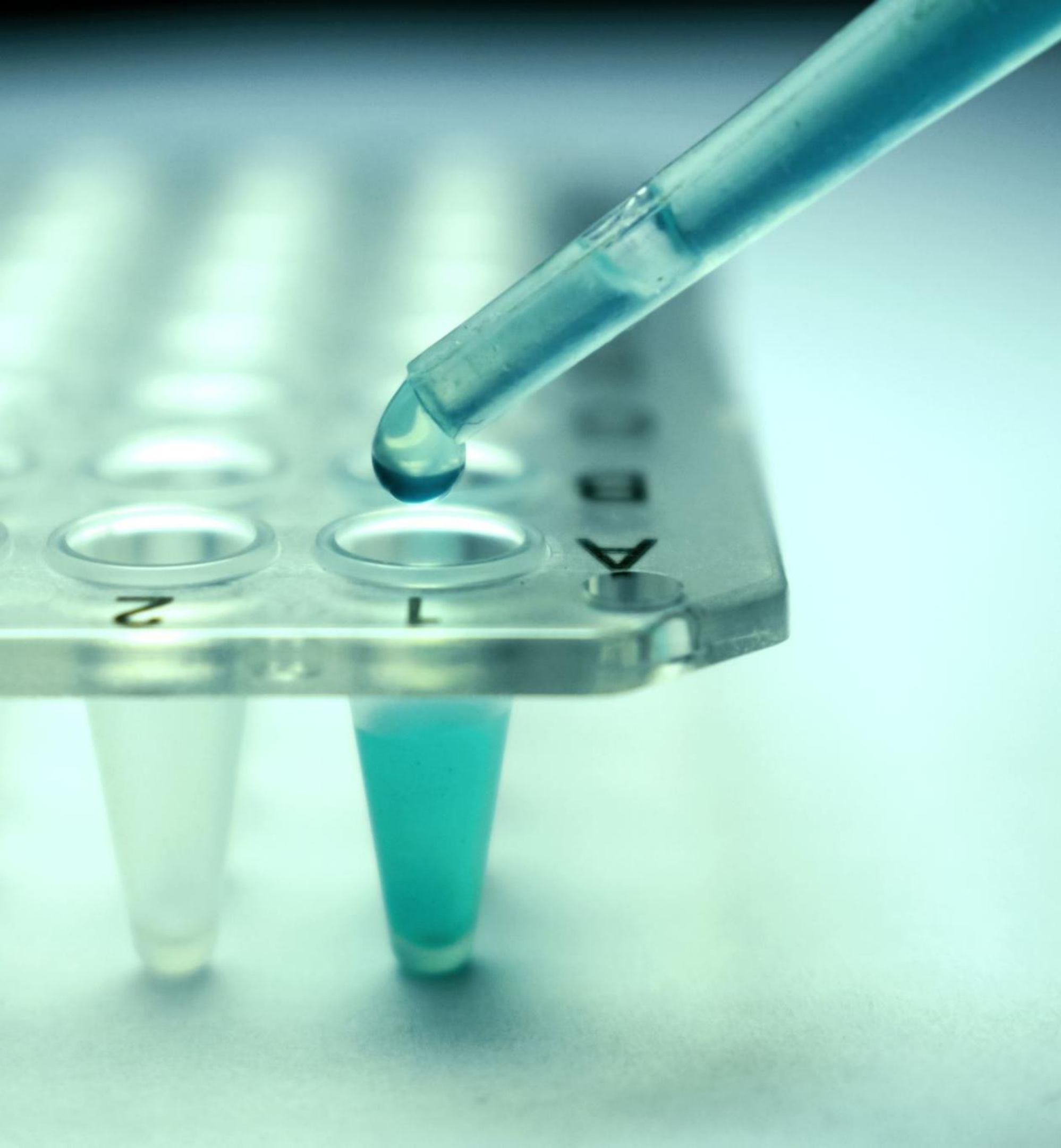
Human chorionic gonadotrophin (hCG):

- Human chorionic gonadotropin (hCG) is a hormone, made up of an **alpha and beta subunit**.
- It is produced by the **placenta** and normally is only **measurable during pregnancy**.
- Some abnormal **tissues, tumors, and cancers**, however, may also **produce hCG**.
- This makes the hCG test useful **as a tumor marker**



Cont.

- Patients presenting with a lump in the testes or malignancy of unknown origin should have hCG measured alongside AFP.
- The presence of hCG denotes the presence of trophoblastic tissue.
- Combination of hCG testing with AFP unveils elevated levels of tumor markers in patients with non-seminomatous germ-cell tumors.



Cont.

- Due to the existence of multiple forms of hCG in serum (intact, free β -subunit, nicked and hyperglycosylated).
- It is important that the laboratory hCG assay used for oncological purposes detects all possible forms of hCG.
- One of the best-defined applications of tumour marker screening is the measurement of hCG in patients with gestational trophoblastic disease.

The background of the image features a close-up of a silver, mesh-covered microphone on the right side. To the left of the microphone, there are three white speech bubbles of different shapes. The top-left bubble contains the word 'Questions', the top-right bubble contains 'Comments', and the bottom-left bubble contains 'Feedback'. The entire scene is set against a dark, textured background.

Questions

Comments

Feedback