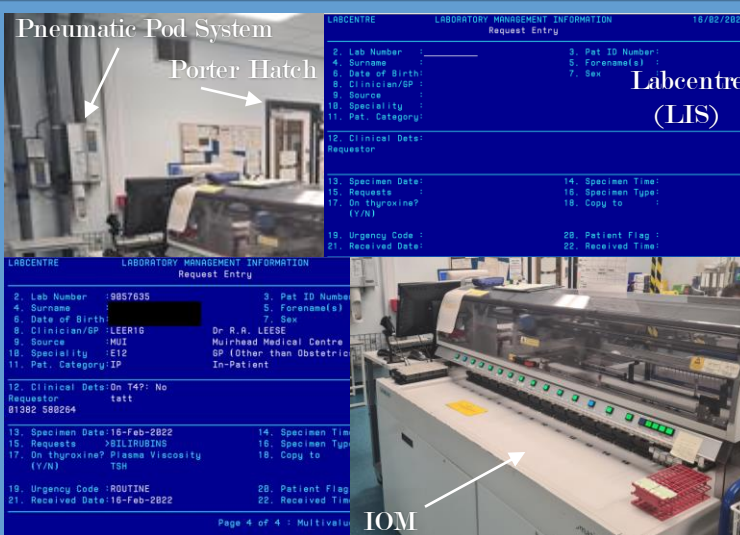




1. THE SAMPLE!

The blood sample is collected from the patient by a phlebotomist or nurse as requested by the clinician and sent with an electronic (barcode label) or paper request to the relevant laboratory; NHS Tayside Blood Sciences, Clinical Chemistry. We're going to follow the journey of the Gold top Serum Separator tube for thyroid stimulating hormone (TSH) analysis.



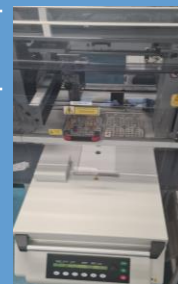
and sample processing and test requirements. The sample is then loaded onto the laboratories automated sample processing system at the Input/Output Module (IOM) of the Aptio track.

2. Arrival at the Laboratory

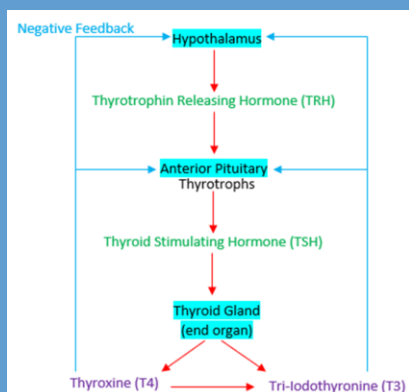
The sample arrives at the Laboratory via the pneumatic pod system from the hospital or the porter hatch from the wards, local GPs, hospitals and clinics and other laboratories. It is visually inspected by laboratory staff ensuring sample integrity, correct samples, matching patient information and all required patient information has been included. The sample is booked into our laboratory information system (LIS), where the information is checked again to ensure it matches. This is important to ensure that all sample results are returned to the correct clinician for the correct patient; ensuring patient safety and a high standard of patient care. During the booking in process each sample is given a unique lab number and barcode; This contains patient information

3. Pre-Analytical Processes

Once booked into Labcentre, the information is transmitted securely to Atellica Data Manager (ADM), the laboratory's information management system (LIMS), which controls the samples journey along the track. The samples first stop is the centrifuge. The gold top serum separator sample requires 30 minutes for the blood to clot prior to centrifugation; this separates the serum from the blood cells and clotting factors present in the blood for analysis. Once centrifuged the cap is then removed by the de-capper and is directed by the track towards the relevant analysers; the Atellica Solution, ready for analysis.



Thyroid Stimulating Hormone



The hypothalamus is induced by cold temperatures to produce thyrotrophin releasing hormone (TRH). TRH binds receptors on the surface of thyrotrophs within the anterior pituitary stimulating the production and secretion of thyroid stimulating hormone (TSH). TSH binds the receptors on the thyroid follicular cells stimulating the production of tri-iodothyronine (T3) and thyroxine (T4); which is released and converted to the more active form T3. T3 stimulates the increase in basal metabolic rate of almost all cells and therefore increasing the body's temperature. The thyroid hormones negatively feedback to suppress the action of the thyroid axis by inhibiting gene transcription of TRH and therefore TSH production and secretion.^[1]

Abnormalities in the production of any of these hormones can lead to various conditions, including: hypothyroidism and hyperthyroidism, which can result in serious complication if left undiagnosed and untreated.

4. Sample Analysis

The Atellica Solution is composed of three chemistry modules, which processes core chemistry tests such as electrolytes, renal function and liver function, and one immunoassay module, which processes more specialized investigations such as thyroid function, cardiac markers and tumour markers. These analysers are maintained, calibrated, quality controlled and operated by Biomedical Scientists within the department, ensuring they are producing results which a repeatable and reliable.

The sample is directed to the Atellica Immunoassay analyser for TSH analysis by capture immunoassay, using a cridinium ester labelled monoclonal antibodies which is detected by chemiluminescent technology.^[3] The assay determines the amount of TSH present in the sample and sends the result to ADM; TSH : 2.04mU/L. If the result is within the normal reference ranges, TSH ref. range: 0.4-4.0 mU/L, ADM auto-transmits the results to Labcentre for reporting. If the result obtained is out with normal reference range they are held in ADM for review by a Biomedical Scientist; this involves checking for errors/interferences in analysis, such as haemolysis or mis-sampling and released to labcentre if result is confirmed. Additional tests, T3 and T4, may cascade in response to abnormal results.



5. Sample Analysis Complete

Once sample analysis is complete, the sample is sealed by the tracked foil sealer and stored in the refrigerated storage module (RSM) for 3 days; this allows for additional or repeat analysis if required. Aliquots may be taken for further investigations by the specialist section or reference laboratories; this is performed automatically on completion of in-house analysis by the tracked aliquoter.

Biomedical Scientists review held results which are out with normal reference ranges, considering them along with the patients clinical history and previous results, where the results obtained are determined to be critical or unexpected, in accordance with RCPATH Guidance 2017, they are telephoned directly to clinical staff for immediate action.^[2] All other results are issued routinely via reports; electronically or printed.



References

- 1 Pirahanchi, Y., Toro, F. and Jialal, I. (2021) Physiology, Thyroid Stimulating Hormone. StatPearls Publishing.
- 2 NHS Tayside; Blood Science User Guide. Published: June 2021
- 3 Siemens Kit Insert: TSH3-UL Revision 4, 03/2021. Siemens Diagnostic Library