THYROID PANEL
C-REACTIVE PROTEIN
ERYTHROCYTE SEDIMENTATION RATE

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- **A thyroid panel:** is used to evaluate thyroid function and/or help diagnose hypothyroidism and hyperthyroidism due to various thyroid disorders. The panel typically includes tests for:
- Thyroid-stimulating hormone (TSH)
- Free thyroxine (free T4)
- Total or free triiodothyronine (total or free T3)

T4 and T3 are hormones produced by the thyroid gland. They help control the rate at which the body uses energy, and regulated by a feedback system. TSH from the pituitary gland stimulates the production and release of T4 (primarily) and T3 by the thyroid. Most of the T4 and T3 circulate in the blood bound to protein. A small percentage is free (not bound) and is the biologically active form of the hormones. Normal value of

Thyroid stimulating hormone, serum	0.4 - 5.0 microU/ml
Thyroxine, free, serum	0.8 - 1.8 ng/dl

Thyroxine binding globulin, serum	age & sex dependent
Thyroxine, total (T4), ser	4.5 - 10.9 microgm/dl

Laboratory tests:

Typically, the preferred initial test for thyroid disorders is a TSH test. If the TSH level is abnormal, it will usually be followed up with a test for free T4. Sometimes a total T3 or free T3 will also be performed.

all three tests will be performed at the same time to get a more complete initial picture of thyroid function.

Signs and symptoms of hypothyroidism may include:

Weight gain, Dry skin, Constipation, Cold intolerance, Puffy skin, Hair loss, Fatigue, Menstrual irregularity in women

Signs and symptoms of hyperthyroidism may include:

Increased heart rate, Anxiety, Weight loss, Difficulty sleeping, Tremors in the hands, Weakness, Diarrhea, Puffiness around the eyes, dryness, irritation, or bulging of the eyes

If the feedback system involving the thyroid gland is not functioning properly due to one of a variety of disorders, then increased or decreased amounts of thyroid hormones may result. When TSH concentrations are increased,

TSH	T4	T3	INTERPRETATION
High	Normal	Normal	Mild (subclinical) hypothyroidism
High	Low	Low or normal	Hypothyroidism
Low	Normal	Normal	Mild (subclinical) hyperthyroidism
Low	High or normal	High or normal	Hyperthyroidism
Low	Low or normal	Low or normal	Non thyroidal illness; pituitary (secondary) hypothyroidism
Normal	High	High	Thyroid hormone resistance syndrome (a mutation in the thyroid hormone receptor decreases thyroid hormone function)

the thyroid will make and release inappropriate amounts of T4 and T3 and the person may experience symptoms associated with hyperthyroidism. If there is decreased production of thyroid hormones, the person may experience symptoms of hypothyroidism.

An individual person's total T4, free T4, total T3, free T3, and/or TSH results may vary and may be affected by:

1. Increases, decreases, and changes (inherited or acquired) in the proteins that bind T4 and T3
2. Pregnancy
3. Estrogen and other drugs
4. Liver disease
5. Systemic illness
6. Resistance to thyroid hormones
7. Pituitary dysfunction

The most common causes of thyroid dysfunction are autoimmune-related

. **Graves disease** causes hyperthyroidism and

- **Hashimoto thyroiditis** causes hypothyroidism.

Both hyper- and hypothyroidism can also be caused by thyroid cancer, and excessive or deficient production of TSH.

C-reactive protein (CRP) test :

is used by a health practitioner to detect inflammation. CRP is an acute phase reactant, a protein made by the liver normal value <0.8 mg/dl and increase released into the blood within a few hours after tissue injury, the start of an infection, or other cause of inflammation. The CRP test is not diagnostic of any condition, but it can be used together with signs and symptoms and other tests to evaluate an individual for an acute or chronic inflammatory condition.

CRP may be used to detect or monitor significant inflammation in an individual who is suspected of having an acute condition, such as:

A serious bacterial infection like sepsis, A fungal infection,

Pelvic inflammatory disease (PID)

- The CRP test is useful in monitoring people with chronic inflammatory conditions to detect flare-ups and/or to determine if treatment is effective. Some examples include: Inflammatory bowel disease, Some forms of arthritis, Autoimmune diseases, such as lupus or vasculitis.

CRP may sometimes be ordered along with an erythrocyte sedimentation rate (ESR), another test that detects inflammation.

A high or increasing amount of CRP in the blood suggests the presence of inflammation but will not identify its location or the cause. In people with chronic inflammatory conditions, high levels of CRP suggest a flare-up or that treatment has not been effective.

If the CRP level is initially elevated and drops, it means that the inflammation or infection is subsiding and/or responding to treatment. CRP levels can be elevated in the later stages of pregnancy as well as with use of birth control pills or

hormone replacement therapy (i.e., estrogen). Higher levels of CRP have also been observed in people who are obese.

C-reactive protein (CRP) assay:

This method quantifies C-reactive protein (CRP) by latex-enhanced nephelometry. Particle-enhanced assays are based on the reaction between a soluble analyte and the corresponding antigen or antibody bound to polystyrene particles. For the quantification of CRP, particles consisting of a polystyrene core and a hydrophilic shell are used in order to link anti-CRP antibodies covalently. A dilute solution of test sample is mixed with latex particles coated with mouse monoclonal anti-CRP antibodies. CRP present in the test sample will form an antigen-antibody complex with the latex particles. Light scattering, measured by a nephelometric procedure after 6 min, is proportional to the concentration of the analyte present in the sample. An automatic blank subtraction is performed. CRP concentrations are calculated by using a calibration curve.

Data reduction of the signals is performed by using a storable logit-log function for the calibration curve. These assays are performed on a Behring Nephelometer for quantitative CRP determination.

The erythrocyte sedimentation rate (ESR):

is a relatively simple, inexpensive, non-specific test that has been used for many years to help detect inflammation associated with conditions such as infections, cancers, and autoimmune diseases.

Erythrocyte sedimentation rate (ESR)

female	0 - 20 mm/hr
male	0 - 10 mm/hr

ESR is used to help diagnose certain specific inflammatory diseases, including temporal arteritis, systemic vasculitis and polymyalgia rheumatica.

A health practitioner may order an ESR when an individual has symptoms, such as headaches, neck or shoulder pain, pelvic pain, anemia, poor appetite, unexplained weight

loss, and joint stiffness. The ESR may also be ordered at regular intervals to assist in monitoring the course of these diseases.

The result of an ESR is reported as the millimeters of clear fluid (plasma) that are present at the top portion of the tube after one hour.

- A single elevated ESR, without any symptoms of a specific disease, will usually not give enough information to make a medical decision. Furthermore, a normal result does not rule out inflammation or disease.
- Moderately elevated ESR occurs with inflammation but also with anemia, infection, pregnancy, and with aging.
- A very high ESR usually has an obvious cause, such as a severe infection, marked by an increase in globulins, polymyalgia rheumatica or temporal arteritis. People with multiple myeloma or Waldenstrom's macroglobulinemia (tumors that make large amounts of immunoglobulins) typically have very high ESRs even if they don't have inflammation

When monitoring a condition over time, rising ESRs may indicate increasing inflammation or a poor response to a therapy; normal or decreasing ESRs may indicate an appropriate response to treatment.

Traditional ESR tests are read by a technician one hour after the test is started. Newer methods can be read at 20-30 minutes; and there are now commercial rapid tests available that use a centrifugal method and can be read five minutes after setup. This new method is being used more widely to shorten waiting times for patients, particularly in emergency departments.