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A guide to interpretation of iron studies

Overview

Iron studies are often ordered in the setting of suspected cases of iron deficiency or iron overload. Assessment of iron stores is helpful in the patient who presents with non specific symptoms of lethargy.

Depending on the laboratory platform, assessment of iron studies includes measurement of:

Test	Interpretation / Notes
Serum iron	Considerable variation occurs within a day in individuals and assessment of serum iron alone provides little helpful clinical information.
Serum transferrin (or total iron binding capacity; TIBC) / Transferrin saturation	Iron is bound to transferrin in the plasma. Total iron binding capacity (TIBC) is a direct measure of level of transferrin.Transferrin levels are reduced in inflammation. Level of transferrin saturation is particularly helpful if assessment of early stages of iron overload with levels > 55% for males and > 50% for females indicative of iron overload (should be fasting level for more accurate assessment)
Serum ferritin	Small amount of circulating serum ferritin reflects body iron stores. Is now well established in assessment of iron stores Normal range 15 – 300 ug/l (reference ranges vary depending on the method used) Levels < 15 ug/l reflect absent / reduced iron stores Elevated levels may reflect iron overload but will be increased in liver disease, inflammation or malignant disease. In the presence of inflammation, a level of > 100 ug/l generally excludes iron deficiency
Soluble transferrin receptor	Transferrin receptors are present on cell surfaces and are responsible for the internalization of transferrin resulting in intracellular release or iron. In the absence of adequate iron stores, expression of tranferrin receptors increases. The amount of soluble transferrin receptor closely reflects iron stores and is not affected by the inflammatory process. Increased levels of soluble transferrin receptor are also found in conditions of increased red cell turnover (e.g. haemolysis)

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Interpretation of iron studies can be confusing with a number of the measures affected by iron therapy and acute phase response. See table below. Suggestions for the "most helpful" test in the conditions described is in bold.

	Iron deficiency	*Anaemia of chronic disease*	*Iron deficiency and inflammation*	*Acute phase response*	*Iron overload*
Serum iron	Decreased	Decreased	Decreased	Decreased	Increased
Serum transferrin, Total iron binding capacity (TIBC)	Increased	Decreased	Decreased (low normal)	Decreased	Decreased or normal
Transferrin saturation	Decreased	Decreased	Normal or decreased	Decreased	**Increased**
Serum ferritin	**Decreased**	Normal (> 100 ug/l)	"Normal"	Increased	**Increased**
Soluble transferrin receptor	Increased	**Normal**	**Increased**	**Normal**	Decreased

Resources used to produce this information sheet.

- Dacie and Lewis Practical haematology, 10th edition Churchill Livingstone, Philadelphia, 2006
- Weiss G and Goodnough L, Anemia of Chronic Disease *N Engl J Med* 2005; 352:1011-1023

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