

Vitamin A

Vitamin A (retinol) is a fat soluble vitamin present in meat and fish (especially liver). In addition many plant carotenoids such as β carotene can be converted to Vitamin A by an oxygenase in the gut.

After absorption in the small intestine vitamin A is transported via chylomicrons to the liver where it is either stored as retinyl esters or exported from the liver bound to retinol binding protein (RBP).

As retinal, vitamin A forms an important part of the visual pigment system. It exists combined with opsin to form rhodopsin. Light causes a change in retinal from the cis to the trans conformation which results in the generation of an electrical signal. As retinoic acid Vitamin A interacts with nuclear receptors to modulate gene expression. Vitamin A plays a role in embryogenesis and in modulating the immune response.

Deficiency

Deficiency may lead to xerophthalmia and permanent eye damage. It is usually due to -

- Dietary lack
- Malabsorption
- Liver disease

Blood retinol has several disadvantages for the detection of Vitamin A deficiency -

1. Only decreases in severe deficiency – when hepatic reserves have fallen

2. Infection depresses blood retinol - negative acute phase response (check CRP). If Vitamin A $< 0.5 \mu\text{mol/L}$ though, check for clinical deficiency. Hepatic retinol represents storage vitamin A – but not practicable to measure directly! Other tests include the Relative Dose Response (RDR) test and conjunctival impression cytology. The RDR test and

Modified RDR test give an estimate of hepatic retinol.

Toxicity

Vitamin A tends to bioaccumulate.

Care is required in the dermatological use of retinoids due to the possibility of

- Teratogenicity
- Liver disease
- Musculoskeletal problems
- Raised intracranial pressure
- Hypercalcaemia
- Renal insufficiency

Reference ranges

Paediatric

Serum Vitamin A increases with age with children < 10 yrs having the lowest mean level. Suggested reference ranges –

< 1 yr	$0.5-1.5 \mu\text{mol/L}$
1-6yrs	$0.7-1.5 \mu\text{mol/L}$
7-12yrs	$0.9-1.7 \mu\text{mol/L}$
13-19yrs	$0.9-2.5 \mu\text{mol/L}$

Source Tietz, Clinical Guide to Laboratory Tests, 4th ed, 2006

Adult

$0.84-3.6 \mu\text{mol/L}$

Source: Local laboratory data performed as part of FIMLS dissertation 1989

For adults a result $< 0.5 \mu\text{mol/L}$ may indicate clinical deficiency and toxicity is likely when Vitamin A $> 5 \mu\text{mol/L}$.

Specimen type

Serum (also lithium heparin – **NOT EDTA plasma**)
Protect from light

Minimum volume $50 \mu\text{L}$ – done on dilution (ideally $> 100 \mu\text{L}$)
NOT haemolysed (haemolysed samples can falsely lower results)

Storage

Separate serum or plasma ASAP and freeze

Transport

First class post, ambient temperature.
Protect from light

Address for specimens

Department of Clinical Biochemistry
Rotherham Hospital
Moorgate Road
Rotherham, S60 2UD

Cost

Contact - neil.cuthbert@nhs.net

Method / Turnaround

Weekly HPLC assay

Accreditation

Accredited to UKAS ISO15189

External QA

UKNEQAS/Instand e.V.

Contact person

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