

carotenes into vitamin A is determined by the existing concentration of vitamin A, with excess carotene being excreted.

Carotenes have been used as a malabsorption screen because it appears ubiquitously in the diet and is absorbed with intestinal fat. As there are no stores of carotenoids in the body, dietary deficiency can deplete serum carotenoid levels in 3-4 weeks.

## References

- Thurnham DI, Smith E, Flora PS. Concurrent liquid chromatography assay of retinol, alpha-tocopherol, beta-carotene, alpha-carotene, lycopene and beta-cryptoxanthin in plasma with tocopherol acetate as internal standard. *Flora Clin Chem* 1988; 34/2: 377-381.
- Ford L T, Hill F, Saiyed T & Berg J. (2006). Vitamin D, A, E and alpha and beta Carotenes: What are the best conditions for sample storage and transport? *Proc ACB Nat. Meeting*. Abstract Th79, 143
- Ford L, Farr J, Morris P & Berg J. The value of measuring serum cholesterol-adjusted vitamin E in routine practice. *Ann Clin Biochem* 2006 43/2: 130-134.
- Barron J. Fat soluble anti-oxidant vitamins A, E and carotenoids. *CPD Clinical Biochemistry*. 2001; 3(3) 82-86.

## Contact Points

### Dr Nicola Barlow

Consultant Clinical Scientist  
Tel: 0121 5072947

Email: [nicola.barlow1@nhs.net](mailto:nicola.barlow1@nhs.net)

### Dr Jonathan Berg

Head of Department

Email: [Jonathanberg@nhs.net](mailto:Jonathanberg@nhs.net)

### Main Laboratory

Tel: 0121 507 5889

Fax: 507 3253

### Mailing Address

Department of Clinical Biochemistry  
City Hospital  
Dudley Road  
Birmingham  
B18 7QH

[www.cityassays.org.uk](http://www.cityassays.org.uk)

 CPA Accredited Laboratory



Where  
**EVERYONE**  
Matters



A Teaching Trust of The University of Birmingham  
Incorporating City, Sandwell and Rowley Regis Hospitals

© Sandwell and West Birmingham Hospitals NHS Trust

ML3471

Issue Date: August 2017  
Review Date: August 2020

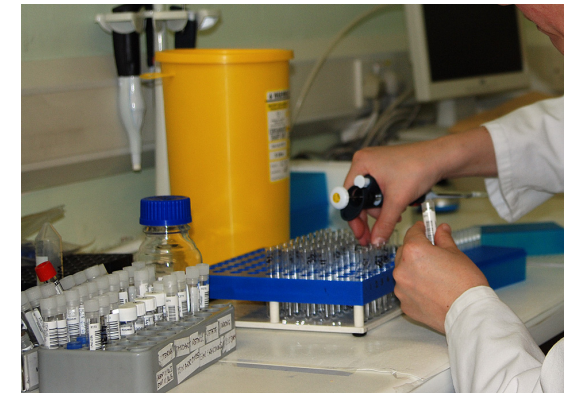
**NHS**

Sandwell and West Birmingham Hospitals  
NHS Trust

# Serum Vitamin A, E and Carotenes

*Vitamins Laboratory*

## Clinical Biochemistry



Where  
**EVERYONE**  
Matters



## Sending Specimens for Analysis

**Sample requirement: minimum of 0.5 ml of serum or plasma.** Please contact the laboratory if you would like to send a smaller volume of sample.

- Samples should be stored at 4°C prior to dispatch. There is no need to protect samples from light e.g. wrap in foil
- Send samples by first class post at ambient temperature to the address on the back of this leaflet

## Reference Ranges

**Our reference intervals were established locally and are as follows:**

### Vitamin A (µmol/L)

Up to 7 years	0.70-1.50
From 7 years up to 13 years	0.90-1.70
From 13 years up to 20 years	0.90-2.50
Adult female (≥ 20 years)	0.99-3.35
Adult male (≥ 20 years)	0.77-3.95

### Vitamin E (µmol/L)

Up to 1 year	11.5-24.4
From 1 year up to 7 years	7.0-21.0
From 7 years up to 13 years	10.0-21.0
From 13 years up to 20 years	13.0-24.0
Adults (≥ 20 years)	9.5-41.5

### Vitamin E Lipid Ratios (all ages)

Vitamin E/Cholesterol ≥2.22 µmol/mmol

### α Carotene

All ages ≤0.25 µmol/L

### β Carotene

All ages 0.19 – 0.89 µmol/L

## Factors Affecting Measurement of Vitamins & Carotenes

- If possible vitamin supplements should be stopped two days prior to collecting samples, since vitamins can appear in the blood up to 32 hours after ingestion<sup>1</sup>
- Our own studies have shown that vitamin A and E concentrations are stable for 14 days at room temperature. Carotenes are less stable, after 14 days concentrations can fall by >30% even when stored at -20°C regardless of light exposure<sup>2</sup>
- Serum vitamin E is altered by serum lipid content, and vitamin E deficiency may be missed if circulating lipid levels are high, or overestimated when serum lipid concentrations are low. Therefore when interpreting vitamin E results it is preferable to also take into account lipid status<sup>3</sup>

## Clinical Use

### Vitamin A, E:

In the UK where most individuals are well nourished, Vitamin A and E

deficiency is confined to individuals with malabsorption, due to small intestinal disease, pancreatic insufficiency e.g. Cystic Fibrosis, or alcoholic and biliary cirrhosis<sup>4</sup>

Vitamin A is required for normal vision and is essential for cell division and differentiation. Symptoms of deficiency include: xerophthalmia, keratomalacia, weight loss, diarrhoea, reduced libido and gum disease. Premature and low birth weight infants have low body stores of vitamin A and are often deficient. Xerophthalmia and keratomalacia can occur in the first year of life amongst artificially fed infants.

Vitamin E is a potent antioxidant, protecting against damage caused by free radicals. Vitamin A and E toxicity is rare and is mainly associated with abuse of supplements.

### Carotenoids:

The determination of carotenoids is useful in patients (mainly children) who ingest large quantities of carotenoid rich processed food e.g. carrot puree in baby foods, coloured fruit drinks, and can appear jaundiced due to carotenoid deposition in the skin (carotenodermia). It is not possible to become vitamin A toxic from ingesting large doses of carotenes since transformation of

