

Importance of a haematocrit (HCT) corrected CRP value.

In general, C-reactive protein (CRP) whole blood point-of-care tests are calibrated in a way that the CRP values measured from whole blood correlate with the corresponding serum/plasma level. Additionally, CRP test systems which have no automated haematocrit (HCT) correction are most of the time calibrated against a HCT value of 40 % as this is the mean normal range for adults.



Fig 1.1 Eurolyser CUBE-S instrument

In daily routine this means that deviations from HCT 40 % need to be corrected by using a haematocrit correction factor. However, in point-of-care settings the HCT value is usually unknown. As the user is not prepared or trained to recalculate the CRP results, potentially false CRP values are generated. This is especially true for paediatric blood samples:

Typical range of a newborn's HCT values:	55 % - 68 %
Typical range of a toddler's HCT values:	29 % - 41 %

Therefore "normal" HCT values can range from **29 % - 68 %** in paediatric samples.

Considering these differences in HCT values within normal range of pediatric samples, CRP measurements from whole blood show a significant deviation if the HCT is uncorrected.

Here are some examples for false CRP values of sample with HCT 29 % and HCT 68 % if HCT is uncorrected:



Fig 1.2 Eurolyser CRP test kit

CRP (HCT 40 %)	CRP (HCT 29 % uncorrected)	CRP (HCT 68 % uncorrected)
1.00 mg/dl	1.18 mg/dl	0.53 mg/dl
5.00 mg/dl	5.92 mg/dl	2.67 mg/dl
10.00 mg/dl	11.83 mg/dl	5.33 mg/dl

This table shows the deviation (false CRP results) if HCT values are not corrected on samples with 1.00 / 5.00 and 10.00 mg/dl for patients with 29 % or 68 % HCT.

In addition to the deviation of HCT values of paediatric samples, there are plenty of other causes for abnormal haematocrit values:

Causes for low haematocrit values:

- Bleeding (ulcers, trauma, colon cancer, internal bleeding)
- Destruction of red blood cells (sickle cell anaemia, enlarged spleen)
- Decreased production of red blood cells (bone marrow suppression, cancer, drugs)
- Nutritional problems (low iron, B 12, folate and malnutrition)
- Overhydration (polydipsia, intravenous overhydration)

Causes of a high haematocrit include:

- Dehydration (heat exhaustion, no available source of fluids)
- Low availability of oxygen (smoking, high altitude, pulmonary fibrosis)
- Genetic (congenital heart diseases)
- Erythrocytosis (overproduction of red blood cells by the bone marrow or polycythemia vera)
- Cor pulmonale (COPD, chronic sleep apnoea, pulmonary embolisms)

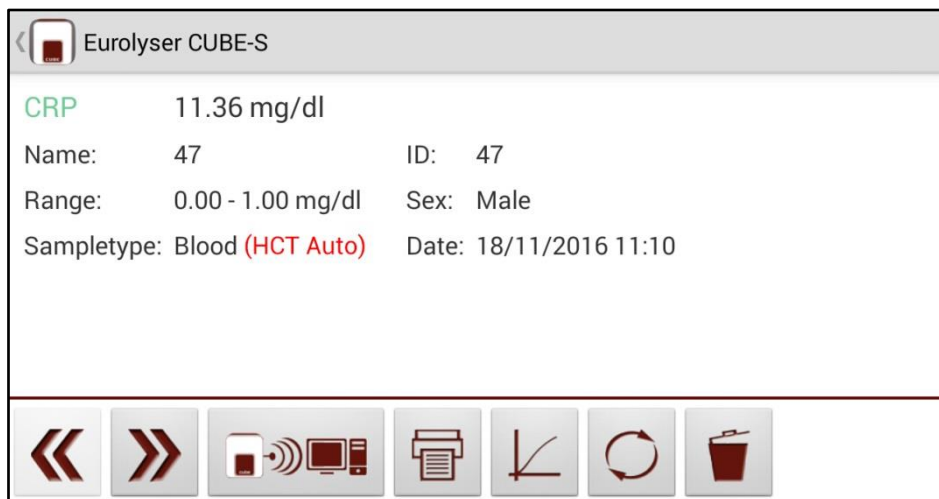


Fig 2.1 Result screen: CRP test result with automatic haematocrit correction

The automated haematocrit correction is mandatory to avoid false CRP results in samples with haematocrit values different from 40%.

It is highly recommended to use instruments and test kits that allow the correction of the haematocrit value. Please be aware that – up to the date of publishing this article – only liquid based cartridges are potentially able to perform this correction. Lateral flow based test methods are technically not suited to do this correction automatically.