HumaMeter Hb\textsuperscript{Plus}

Lab in your palm for rapid hemoglobin testing

› Fast and flexible operation
› Patient-, user- and eco-friendly
› Reliable, robust and cost-efficient

Hemoglobin Measurement
Anemia and Hemoglobin

Importance of hemoglobin determination

Clinical background
Anemia is a condition when blood does not contain sufficient functional erythrocytes or hemoglobin. The principal function of hemoglobin, the main protein component of the erythrocytes, is the transport of oxygen and carbon dioxide. Hemoglobin (Hb) transports oxygen from the lungs into the body. Hb also brings waste products such as carbon dioxide from the body to the lungs.

Anemia
Patients with anemia have not enough erythrocytes or hemoglobin. As a result, their body cells, tissues and organs will not receive enough vital oxygen. The related common symptoms of anemia are e.g. fatigue, weakness, dizziness, cold extremities or insomnia. Iron deficiency is one of the most common preventable causes of anemia next to nutritional deficiencies including lack of vitamins (e.g. vitamin A, vitamin B12, folate), chronic inflammation or parasitic infections.

Anemia prevalence: Who is affected?
Anemia is the most common blood disorder in most countries, it can affect up to one out of four people. Pregnant women and children younger than five years do have the highest prevalence, almost twice as high, besides humans with chronic diseases. 1, 2

<table>
<thead>
<tr>
<th>Population group</th>
<th>Prevalence of anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt; 5 years</td>
<td>47.4 %</td>
</tr>
<tr>
<td>Children 5 - 15 years</td>
<td>25.4 %</td>
</tr>
<tr>
<td>Non-pregnant women</td>
<td>30.2 %</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>41.8 %</td>
</tr>
<tr>
<td>Men</td>
<td>12.7 %</td>
</tr>
<tr>
<td>Elderly</td>
<td>23.9 %</td>
</tr>
<tr>
<td>Total population</td>
<td>24.8 %</td>
</tr>
</tbody>
</table>

Table 1: Global anemia prevalence and number of individuals affected. 2 (Adapted version)
**Malaria and anemia**
Malaria parasites are transmitted into the blood by mosquito bites. These parasites invade the erythrocytes and cause their hemolysis at the end of the infection cycle. This reduces the number of erythrocytes and can lead to severe anemia. Anemia is a major driver of patient hospitalization, mortality and is seen as a critical factor influencing patient outcomes. Therefore, it is important to provide access to reliable anemia screening to easily identify patients at risk.³

**Pregnancy and anemia**
With an estimated global prevalence of over 40 %, anemia is the most common disorder in pregnancy. Blood loss associated with child delivery may worsen an existing anemia. Consequences of anemia include intrauterine fetal death, premature birth, low birth weight and other adverse neonatal outcomes. For the mother these are e.g. breathlessness, lethargy, infection or lactation failure.⁴,⁵

**Hb testing at the point of need**
There are several methods to test hemoglobin. Point-of-care testing gaining ground because it provides immediate results. In addition, it enables testing and screening independent of a patient’s access to complex clinical laboratory technology. Hemoglobin testing is probably the most performed point-of-care test in hematology.

**Anemia: Definition by Hb thresholds**
According to WHO, Hb concentration is the most reliable indicator of anemia. Table 2 shows the hemoglobin threshold used for anemia definition in different population groups.⁶

<table>
<thead>
<tr>
<th>Age or gender group</th>
<th>Hemoglobin threshold (g/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt; 5 years</td>
<td>≤ 110 g/l</td>
</tr>
<tr>
<td>Children 5 - 11 years</td>
<td>≤ 115 g/l</td>
</tr>
<tr>
<td>Children 12 - 15 years</td>
<td>≤ 120 g/l</td>
</tr>
<tr>
<td>Non-pregnant women &gt; 15 years</td>
<td>≤ 120 g/l</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>≤ 110 g/l</td>
</tr>
<tr>
<td>Men ≥ 15 years</td>
<td>≤ 130 g/l</td>
</tr>
</tbody>
</table>

*Table 2: Hemoglobin concentrations for the diagnosis of anemia and assessment of severity.⁶*
The HumaMeter HbPlus system uses the AHD method (Alkaline Haematin Detergent), an internationally recognized reference method. The AHD process is free of toxic cyanide. In addition, it provides reliable results for blood samples with e.g. erythrocyte stroma, elevated leukocytes and/or thrombocytes, triglycerides or protein coagulations.

The frequently used azide methemoglobin method as an example can overestimate Hb values under these conditions.

**HumaMeter HbPlus**

**Lab in your palm for rapid hemoglobin testing**

Fast and flexible operation
- Lab quality results in less than 10 seconds
- Samples: capillary, venous or arterial blood
- Testing where needed: portable system, mains operation or with batteries

Patient-, user- and eco-friendly
- Only 20 μl sample volume
- Simple, intuitive operation
- Factory-calibrated, ready-to-use
- Unique cyanide-free AHD method

Reliable, robust and cost-efficient
- Robust design with modern, extremely durable optics
- Reagent and control shelf life up to 3 years
- Reagent storage at up to 40°C

Reliable results in four simple steps

1. **Blood collection, 20 μl capillary, venous or arterial blood**
2. **Addition of the sample into the cuvette and mixing with capillary or pipette**
3. **Insert the cuvette into the HumaMeter HbPlus**
4. **Results in 10 seconds**
HumaMeter Hb^Plus

Lab in your palm for rapid hemoglobin testing

Technical Data

- Sample volume: 20 μl
- Measuring range: 0.5 – 30 g/dl (5 – 300 g/l)
- Wavelength: 574 nm-specific LED
- Photodiode detector: Recording range 200 – 1000 nm
- Measuring principle: Absorption
- Memory: Up to 1,000 results incl. date/time
- Power: Rechargeable batteries or power supply
- Interface: USB Port 1.1
- Reagent Cuvettes: Cuvettes prefilled with 3 ml
- Method: AHD (Alkaline Haematin Detergent)
- Calibration: Precalibrated
- Quality control: 2-level control

HumaMeter Hb^Plus

Portable system for hemoglobin determination

System Reagents

- Reagent Hb – 100 prefilled cuvettes
- Reagent Hb – 25 prefilled cuvettes
- Calibrator Set Hb 6 x 1.5 ml
- Control Set Hb (2 level) 2 x 1.5 ml

Consumables

- End-to-end capillaries 20 μl 100 pcs.

AHD (Alkaline Haematin Detergent)

The only recognized Hb reference method

In contrast to most other methods and systems for the determination of Hb in blood, the AHD method does not contain any toxic cyanide. Moreover, what is known to-only a few experts, in the AHD method all corpuscular parts and lipid components are solubilized, preventing contrary to all other methods, the overestimation of hemoglobin concentrations. Due to this, AHD is the only internationally recognized reference method for the determination of hemoglobin (DIN 58931). 7