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CAPILLARYS HEMOGLOBIN(E)

Ref. 2007

CAPILLARYS 2 FLEX-PIERCING

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Người đại diện hợp pháp của cơ sở
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CAPILLARYS HEMOGLOBIN(E) PROCEDURE WITH THE CAPILLARYS 2 FLEX-PIERCING INSTRUMENT

INTENDED USE

The CAPILLARYS 2 FLEX-PIERCING System with the CAPILLARYS HEMOGLOBIN(E) kit demonstrates the separation of the normal hemoglobin (A, A2 and F) in human blood samples, and the detection of the major hemoglobin variants (S, C, E and D), by capillary electrophoresis in alkaline buffer (pH 9.4). The CAPILLARYS 2 FLEX-PIERCING System with the CAPILLARYS HEMOGLOBIN(E) kit is designed for laboratory use.
The CAPILLARYS 2 FLEX-PIERCING is an automated analyzer which performs a completed hemoglobin profile for the quantitative analysis of the normal hemoglobin fractions A, A2 and F and for the detection of major hemoglobin variants S, C, E and D. The assay is performed on the hemolysate of whole blood samples collected in tubes containing EDTA as anticoagulant. The measurement of the percent of Hb A2 and Hb F is effective in the diagnosis of thalassemias (i.e. hereditary hemolytic anemias characterized by decreased synthesis of one or more types of normal hemoglobin polypeptide chains) and this technique allows the detection of the major hemoglobin variants that are caused by different genotype combinations depending upon the geographical area.

For *In Vitro* Diagnostic Use.

This procedure must be performed with the components of the CAPILLARYS HEMOGLOBIN(E) kit.

PRINCIPLE OF THE TEST

Hemoglobin is a complex molecule composed of two pairs of polypeptide chains. Each chain is linked to the heme, a tetrapyrrolic nucleus (porphyrin) which chelates an iron atom. The heme part is common to all hemoglobins and their variants. The type of hemoglobin is determined by the protein part called globin. Polypeptide chains α, ß, δ and γ constitute the normal human hemoglobins:

- hemoglobin A ..... = α2 ß2
- hemoglobin A2 ..... = α2 δ2
- fetal hemoglobin F ..... = α2 γ2

The α-chain is common to these three hemoglobins.

The hemoglobin spatial structure and other molecular properties (like that of all proteins) depend on the nature and the sequence of the amino acids constituting the chains. Substitution of amino acids by mutation is responsible for formation of hemoglobin variants which have different surface charge and consequently different electrophoretic mobilities, which also depend on the pH and ionic strength of the buffer.
The resulting qualitative (or structural) abnormalities are called hemoglobinopathies [9, 10, 13]. Decreased synthesis of one of the hemoglobin chains leads to quantitative (or regulation) abnormalities, called thalassemias.

Hemoglobin electrophoresis is a well established technique routinely used in clinical laboratories for screening samples for hemoglobin abnormalities [1, 2, 3, 4, 12]. The CAPILLARYS 2 FLEX-PIERCING System has been developed to provide complete automation of this testing with fast separation and good resolution. In many respects, the methodology can be considered as an intermediary type of technique between classical zone electrophoresis and liquid chromatography [8, 11].
The CAPILLARYS 2 FLEX-PIERCING System uses the principle of capillary electrophoresis in free solution. With this technique, charged molecules are separated by their electrophoretic mobility in an alkaline buffer with a specific pH. Separation also occurs according to the electrolyte pH and electroosmotic flow [5].
The CAPILLARYS 2 FLEX-PIERCING System has capillaries functioning in parallel allowing 8 simultaneous analyses for hemoglobin quantification from whole blood sample. A sample dilution with hemolysing solution is prepared and injected by aspiration at the anodic end of the capillary. A high voltage protein separation is then performed and direct detection of the hemoglobins is made at 415 nm at the cathodic end of the capillary. Before each run, the capillaries are washed with a Wash Solution and prepared for the next analysis with buffer.
The hemoglobins, separated in silica capillaries, are directly and specifically detected at an absorbance wave length of 415 nm which is specific to hemoglobins. The resulting electrophoregrams are evaluated visually for pattern abnormalities.
Direct detection provides accurate relative quantification of individual hemoglobin fraction, with particular interest, such as A2 hemoglobin for ß thalassemia diagnostic. In addition, the high resolution of this procedure should allow the identification of hemoglobin variants, in particular, to differentiate hemoglobins S from D, and E from C.
The hemoglobin A2 quantification can also be performed when hemoglobin E is present.
By using alkaline pH buffer, normal and abnormal (or variant) hemoglobins are detected in the following order, from cathode to anode: δA'2 (A2 variant), C, A2/O-Arab, E, S, D, G-Philadelphia, F, A, Hope, Bart, J, N-Baltimore and H.
The carbonic anhydrase is not visualized on the hemoglobin electrophoretic patterns, this permits to identify hemoglobin A2 variants in this migration zone.

REAGENTS AND MATERIALS SUPPLIED IN THE CAPILLARYS HEMOGLOBIN(E) KIT

REAGENTS REQUIRED BUT NOT SUPPLIED

WARNING : See the safety data sheets.

1. NORMAL Hb A2 CONTROL

Composition
The Normal Hb A2 Control (SEBIA, PN 4778) is obtained from a pool of normal human blood samples. The Normal Hb A2 Control is in a stabilized lyophilised form.

Intended use

The Normal Hb A2 Control is designed for the migration control before starting a new analysis sequence, after the analyses of 10 successive sample racks and at the end of an analysis sequence, and for the quality control of human hemoglobin A2 quantification with CAPILLARYS HEMOGLOBIN(E) electrophoresis procedure performed with the CAPILLARYS 2 FLEX-PIERCING system.

Use

IMPORTANT : For optimal use of the Normal Hb A2 Control with the CAPILLARYS 2 FLEX-PIERCING instrument, it is necessary to use one specific tube designed for blood controls and its corresponding cap (see "EQUIPMENT AND ACCESSORIES REQUIRED", Tubes and caps for Controls) and to identify this tube with the Normal Hb A2 Control bar code label.

- Reconstitute one lyophilized Normal Hb A2 Control vial with the volume of distilled or deionized water indicated in the instructions for use of the Normal Hb A2 Control. Allow to stand for 30 minutes and mix gently (avoid formation of foam).

  NOTE: The precision of the reconstitution volume to be maintained is ± 1.0 %.
- Apply the reconstituted Normal Hb A2 Control in a tube designed for blood controls and identified with a Normal Hb A2 Control bar code label (see the instructions for use of the Normal Hb A2 Control).
- Close the tube with its cap.

Migration control:

For the migration control, the recommendations to analyze the Normal Hb A2 Control are the following:

- Perform 1 series of analyses with the control:
  - before starting a new analysis sequence,
  - after the analyses of 10 successive sample racks,
  - at the end of an analysis sequence.
- Perform 2 successive series of analyses with the control:
  - after having changed the analysis buffer vial (even if the lot number is identical),
  - after having changed the technique,
  - after a capillary cleaning sequence with CAPICLEAN,
  - after a software upgrade,
  - after capillaries activation.
- Perform 3 successive series of analyses with the control:
  - for the first use of the "HEMOGLOBIN(E)" analysis program with the CAPILLARYS 2 FLEX-PIERCING instrument,
  - after a prolonged stoppage (over 1 week).

- Place a wedge adapter for the blood control tube in position No. 1 on the CAPILLARYS 2 FLEX-PIERCING sample rack No. F0 intended for control blood samples, containing a new green dilution segment.
- Place the tube with the Normal Hb A2 Control (identified with the Normal Hb A2 Control bar code label) on the wedge adapter on the sample rack No. F0.
- Start the analysis:
  - To perform 1 series of analyses, slide the sample rack No. F0 into the CAPILLARYS 2 FLEX-PIERCING instrument, select "Automatic dilution" in the window called "Hb A2 Normal Control" which appears on the screen and validate.
  - To perform 2 or 3 series of analyses, slide in again immediately the same sample rack No. F0 with the same dilution segment containing the Normal Hb A2 Control, previously diluted during the previous series and an empty tube for control identified with the Normal Hb A2 Control bar code in position No. 1. In the window called "Hb A2 Normal Control" which appears on the screen, select "Manual dilution" and validate.

The results are then automatically considered by the software for the data analysis. On the review window and on the profile displayed in mosaic format, the symbol “a” indicates that the analysis of the migration control has been performed with an automatic dilution. The symbol “m” indicates that the analysis has been performed with a manual dilution by sliding in again immediately the same sample rack with the same dilution segment that has previously been analyzed.

IMPORTANT: The Hb A fraction of the Normal Hb A2 Control must show a minimal optical density (OD) of 0.10. Under this value, the recentering of the electrophoretic pattern will not occur correctly. When analysing samples, the identification of hemoglobin fractions, Hb A, Hb F, Hb A2 and Hb C and the determination of the migration zone of other variants, may be impossible or wrong (see the paragraph "RESULT ANALYSIS").

NOTE: After the installation of the CAPILLARYS 2 FLEX-PIERCING instrument, during the first sequence of blood sample analysis, a red warning signal may appear if Hb A is absent in one sample (and the recentering of the electrophoretic pattern will not be possible, see paragraph "Result analysis"). It is then recommended to analyze a blood sample with Hb A on the concerned capillary and to analyze again the sample without Hb A by placing it in a position corresponding to a capillary which has already detected Hb A.

Quality control:

It is recommended to include one analysis of Normal Hb A2 Control into each run of samples. It should be used as a normal human blood.
After reconstitution, analyze directly the Normal Hb A2 Control as a blood sample to analyze on a sample rack. It will be automatically diluted with hemolysing solution.
The Normal Hb A2 Control may also be analyzed with the sample rack No. F0, see paragraph before (Migration control).
The values obtained must fall within the range provided with each batch of Normal Hb A2 Control.

IMPORTANT: For optimal use of the Normal Hb A2 Control placed on a sample rack, it is necessary to use one bar code label intended to identify the tube for control which contains the Hb A2 Control (close the tube with its specific cap before using it and place it on a wedge adapter on the sample rack).

Utilization of a wedge adapter for conical tubes intended for controls :
This wedge adapter is intended to support the conical tubes for blood controls on a sample rack No. F0 or on a rack for samples of the CAPILLARYS 2 FLEX-PIERCING system. It presents 2 markers which allow estimating of the volume of blood control available to perform the analysis:
- when the tube is supported by the wedge adapter, the upper marker is located at the top of the wedge adapter and corresponds to a volume of about 250 µL of blood control in the tube. When the volume of blood control reaches this level or is higher, it is sufficient to perform the complete analysis of this blood control with the sample rack No. F0.
- when the tube is supported by the wedge adapter, the lower level is located at the bottom of the crenellations and corresponds to a volume of about 100 µL of blood control in the tube. When the volume of blood control reaches this level or is comprised between the 2 markers of the wedge adapter, it is sufficient to perform one analysis of this blood control on a sample rack.

Storage, stability and signs of deterioration

See the Normal Hb A2 Control package insert.

NOTE: For optimal use with the CAPILLARYS 2 FLEX-PIERCING system, it is recommended to split the Control into 4 aliquots of 400 µL in microtubes before freezing.

No test method can provide an absolute assurance of the absence of HIV, hepatitis B and C or other infectious agents. Therefore, handle the Normal Hb A2 Control as a hazardous biological material.
This lot of control blood was found negative on assays approved by FDA or EU equivalent regulatory agency:
- against hepatitis B surface antigen ;
- for antibody to HCV ;
- for antibody to HIV1 and HIV2.

2. DISTILLED OR DEIONIZED WATER

Use

For rinsing capillaries in automated system CAPILLARYS 2 FLEX-PIERCING, SEBIA, for capillary electrophoresis.
It is recommended to use filtered distilled or deionized water (on a filter with a porosity ≤ 0.45 µm) and with a conductivity lower than 3 µS/cm, which corresponds to a resistivity higher than 0.33 MΩ.cm.
To prevent microbial proliferation, change the water every day.
For optimal operation, add CLEAN PROTECT (SEBIA, PN 2059, 1 vial of 5 mL) in distilled or deionized water (see the instructions for use of CLEAN PROTECT) or use directly the ready to use CAPIprotect* solution (SEBIA, PN 2061 : 2 containers of 5 L of distilled water with CLEAN PROTECT).

IMPORTANT : Before filling the rinse container, it is recommended to wash it with plenty of distilled or deionized water.

** NOTE : The CAPIprotect solution can also be used to dilute the stock wash solution. Then, in that case, the diluted wash solution may show a transient more or less marked yellow colour without any adverse effects on its performance.*

3. CAPICLEAN

Composition

The vial of CAPICLEAN concentrated solution (SEBIA, PN 2058, 25 mL) contains : proteolytic enzymes, surfactants and additives nonhazardous at concentrations used, necessary for optimum performances.

Use

For sample probe cleaning in automated system CAPILLARYS 2 FLEX-PIERCING, SEBIA, for capillary electrophoresis, during the CAPICLEAN cleaning sequence.

IMPORTANT :
- When less than 500 samples are analyzed within a week, launch a CAPICLEAN cleaning sequence at least once a week.
- When less than 500 samples are analyzed within a day but more than 500 samples are analyzed within a week, launch a CAPICLEAN cleaning sequence after every 500 analyses.
- When more than 500 samples are analyzed within a day, launch a CAPICLEAN cleaning sequence once a day.

See the instruction sheets of CAPICLEAN, SEBIA.

IMPORTANT: Do not re-use the dilution segment after sample probe cleaning.

Storage, stability and signs of deterioration

Store CAPICLEAN refrigerated (2 – 8 °C). It is stable until the expiration date indicated on the vial label. DO NOT FREEZE.
Precipitate or combined particles in suspension (floccules) may be observed in the CAPICLEAN vial without any adverse effects on its utilization.
Do not dissolve this precipitate or these particles. It is recommended to collect only the supernatant.

4. SODIUM HYPOCHLORITE SOLUTION (for sample probe cleaning)

Preparation

Prepare a sodium hypochlorite solution (2 % to 3 % chloride) by diluting 250 mL 9.6 % chloride concentrated solution to 1 liter with cold distilled or deionized water.

Use

For the sample probe cleaning in the CAPILLARYS 2 FLEX-PIERCING System (weekly maintenance in order to eliminate adsorbed proteins from the probe).

See the instruction sheets of CAPILLARYS 2 FLEX-PIERCING, SEBIA.

- Use the sample rack designed for the maintenance (No. 100).
- Place a tube containing 2 mL diluted chlorinated solution previously prepared, in position No. 1 on this sample rack.
- Slide the sample rack No. 100 for maintenance in the CAPILLARYS 2 FLEX-PIERCING System.
- In the "MAINTENANCE" window which appears on the screen, select "Launch the probe cleaning (chlorinated sodium hypochlorite solution)" and validate.

Storage, stability and signs of deterioration

Store the working chlorinated solution at room temperature (15 to 30 °C) in a closed container, it is stable for 3 months. Avoid storage in sunlight, close to heat and ignition source, and to acids and ammonia.

5. CAPILLARYS / MINICAP WASH SOLUTION

Preparation

Each vial of the stock Wash Solution (SEBIA, PN 2052, 2 vials, 75 mL) should be diluted up to 750 mL with distilled or deionized water.
After dilution, the wash solution contains an alkaline solution pH ≈ 12.

Use

For washing the capillaries of CAPILLARYS 2 FLEX-PIERCING. This additional reagent is needed when the number of tests in series is below 40.

IMPORTANT: Before filling the wash solution container, it is recommended to wash the opening of the container, the connector and the tube with plenty of distilled or deionized water to avoid salts deposit.

Storage, stability and signs of deterioration

Store the stock and working wash solutions in closed containers at room temperature (15 to 30 °C) or refrigerated (2 - 8 °C).
The stock wash solution is stable until the expiration date indicated on the kit or wash solution vial label.
Working wash solution is stable for 3 months. Discard working wash solution if it changes its appearance, e.g., becomes cloudy due to microbial contamination.

6. SALINE

Preparation

Make 0.15 M (0.9 g/dL) NaCl solution in distilled or deionized water.

Use

To wash red blood cells before storage at - 70 / - 80 °C, if necessary.

Storage, stability and signs of deterioration

Store saline at room temperature (15 to 30 °C) or refrigerated (2 - 8 °C). Discard after 3 months or if it changes its appearance, e.g., becomes cloudy due to microbial contamination. For longer storage periods, add sodium azide, 0.1 g/dL.

OPTIONAL REAGENT BUT NOT SUPPLIED

WARNING: See the safety data sheet.

PATHOLOGICAL Hb A2 CONTROL

The Pathological Hb A2 Control, SEBIA, PN 4779, can be used for the migration control, in addition or as a replacement of the Normal Hb A2 Control. For its utilization for the migration control or quality control, the Pathological Hb A2 Control should be used like the Normal Hb A2 Control, see the previous paragraph "NORMAL Hb A2 CONTROL".

See the instructions for use of the Pathological Hb A2 Control for additional information.

NOTES :

The assays that were performed for the validation of reagents demonstrated that, for the different solutions and using an adapted equipment for the reconstitution volume, a variation of ± 5 % on the final volume has no adverse effect on the analysis.
The distilled or deionized water used to reconstitute solutions, must be free of bacterial proliferation and mold (use a filter ≤ 0.45 µm) and have a conductivity lower than 3 µS/cm, which corresponds to a resistivity higher than 0.33 MΩ.cm.

EQUIPMENT AND ACCESSORIES REQUIRED

1. CAPILLARYS 2 FLEX-PIERCING System SEBIA, PN 1227.
2. Sample racks supplied with CAPILLARYS 2 FLEX-PIERCING.
3. CAPILLARYS 2 FLEX-PIERCING racks for tubes 11 mm, SEBIA, PN 1360, 5 units.
4. Container Kit supplied with CAPILLARYS 2 FLEX-PIERCING: Rinse (to fill with distilled or deionized water), wash solution and waste container.
5. Collection tubes with 13 mm diameter and their corresponding caps (maximal length of tube with cap : 90 mm, maximal diameter of cap : 17 mm) : for example, BD Vacutainer, Terumo Venosafe 5 mL, Greiner Bio-one Vacuette 1, 2, 3 or 4 mL or Sarstedt S-Monovette 4 mL tubes (13 x 75 mm), or
   collection tubes with 11 mm diameter and their corresponding caps (maximal length of tube with cap : 90 mm, maximal diameter of cap : 17 mm) : for example, Sarstedt S-Monovette 2,7 mL or Kabe Labortechnik Primavette S 2,6 mL tubes (11 x 66 mm),
   or collection tubes with equivalent dimensions approved for clinical assays.
6. Tubes and caps for Controls, SEBIA, PN 9202 (20 units) or PN 9205 (500 units): conical tubes and their caps to analyze blood controls with the CAPILLARYS 2 FLEX-PIERCING instrument.
7. Wedge adapters for tubes for controls SEBIA, PN 9203, 10 units (or supplied with CAPILLARYS 2 FLEX-PIERCING).
8. Boxes for controls storage, SEBIA, PN 2082: 2 boxes for storage of dilution segments containing hemolyzed Controls.

SAMPLES FOR ANALYSIS

Sample collection and storage

Fresh anticoagulated whole blood samples collected in tubes containing EDTA as anticoagulant are recommended for analysis. Avoid anticoagulants containing iodoacetate. Blood must be collected according to established procedures used in clinical laboratory testing.
Samples may be stored for up to 7 days between 2 and 8 °C.
NOTE: Samples should not be stored at room temperature (15 to 30 °C)!

Progressive hemoglobins (Hb) degradation may occur for samples stored between 2 to 8 °C.
When the blood sample is stored for more than 7 days at 2 – 8 °C:

- a weak fraction, corresponding to methemoglobin, appears in the Hb S migration zone,
- when Hb C is present, a fraction corresponding to degraded Hb C appears more anodic than Hb A2 which does not interfere with it (Z(E) zone, see the table in paragraph "Interpretation"),
- when Hb O-Arab is present, a fraction corresponding to degraded Hb O-Arab appears in the Hb S migration zone (Z(S) zone, see the table in paragraph "Interpretation"),
- when Hb E is present, a fraction corresponding to degraded Hb E appears in the Z(D) zone (see the table in paragraph "Interpretation"),
- when Hb S is present, a fraction corresponding to degraded Hb S appears in the Hb F migration zone (Z(F) zone, see the table in paragraph "Interpretation"),
- when Hb A is present, a fraction corresponding to degraded Hb A ("aging fraction" of Hb A) appears more anodic (Z11 zone, see the table in paragraph "Interpretation").

  When Hb F is present (in blood samples from newborn babies), a fraction appears in the Hb A migration zone (Z(A) zone, see the table in paragraph "Interpretation") due to the sample degradation.

  When stored for more than 10 days, viscous aggregates in red blood cells are observed ; it is necessary to discard them before the analysis.

For longer storage, whole blood samples without prior preparation or washed red blood cells should be frozen quickly at - 70 / - 80 °C (within 8 hours maximum after collection).
Frozen whole blood samples and red blood cells are stable for 3 months maximum at - 70 / - 80 °C.

IMPORTANT : For optimal storage of blood samples, do not store them at - 20 °C but at - 80 °C (see BIBLIOGRAPHY, J. Bardakdjian-Michau *et al*, 2003).

Preparation of red blood cells for storage at - 70 / - 80 °C :
Wash red blood cells according to the following procedure :

- centrifuge anticoagulated whole blood to obtain a red blood cells pellet ; discard the plasma,
- wash the red blood cells 2 times with 10 volumes of saline (centrifuge after each washing step),
- discard the excess of saline over the red blood cells pellet,
- vortex before freezing the pellet.

Sample preparation

- Use directly whole blood samples.
- Check that all the tubes contain 1 mL minimum of blood and are perfectly closed.
- **Vortex for 5 seconds blood samples stored at 2 - 8 °C for one week or stored at - 70 / - 80 °C.**

WARNING: The tubes must be closed with their corresponding caps designed for the CAPILLARYS HEMOGLOBIN(E) procedure with the CAPILLARYS 2 FLEX-PIERCING system (see EQUIPMENT AND ACCESSORIES REQUIRED).

Particular cases: Analysis of samples without any Hb A and with Hb F < 3 % or without any Hb A2 (these samples are perfectly quantified but not identified by zones).
To identify hemoglobin fractions in a sample without any Hb A and with Hb F < 3 % or without any Hb A2, it is recommended to prepare this sample according to the following procedure:

- Vortex for 5 seconds the whole blood sample.
- In a conical tube for control, mix one volume (50 µL) of whole blood to analyze with one volume (50 µL) of Normal Hb A2 Control and cap the tube.
- Vortex for 5 seconds.
- Place the tube with a wedge adapter on a sample rack of the CAPILLARYS 2 FLEX-PIERCING system.
- Slide the sample rack into the CAPILLARYS 2 FLEX-PIERCING system.
- Perform the analysis of this sample according to the standard procedure like a usual blood sample.

The results are then automatically considered by the software for the data analysis.

IMPORTANT: For a sample without any Hb A, Hb F or Hb A2 prepared according to this procedure, the result obtained with the mixed sample will enable presumptive variant identification due to the positioning of the hemoglobins fractions in the appropriate identification zones. Do not report the relative quantification from the mixed sample result.

The relative quantification of hemoglobins should be reported utilizing the initial, unmixed sample result (without any dilution in the blood control).

Analysis of a sample with an additional fraction in Z(C) migration zone (Hb C migration zone) or Z(A2) migration zone (Hb A2 migration zone):
The presence of a Hb Constant Spring variant may be suspected when a hemoglobin fraction is observed in Z(C) or Z(A2) migration zones. This fraction may also be due to plasmatic proteins from the sample (from a patient with anaemia for example, with a decreased [red blood cells] / [plasma] ratio).
The analysis of red blood cells from the same sample, without plasmatic proteins, will confirm the presence of this variant.
Prepare the sample according to the following procedure :

- Centrifuge the whole blood sample to obtain a red blood cells pellet, discard plasma.
- In a microtube, mix one volume (50 µL) of red blood cells from the sample to analyze with 8 volumes (400 µL) of CAPILLARYS HEMOGLOBIN(E) hemolysing solution.
- Vortex for 5 seconds.
- Apply 100 µL of prepared hemolysate in the wells of a new green dilution segment.
- Place this dilution segment on the sample rack No. F0 of CAPILLARYS 2 FLEX-PIERCING.
- Slide the sample rack into the CAPILLARYS 2 FLEX-PIERCING system, select "Sample" with "manual dilution" in the window which appears on the screen and validate.

The results are then automatically considered by the software for the data analysis.

Analysis of samples stored at - 70 / - 80 °C:
Whole blood :
Vortex for 5 seconds the tube with thawed whole blood and perform the analysis according to the standard procedure.

Red blood cells :
To analyze a red blood cells sample stored at - 70 / - 80 °C, prepare it according to the following procedure:
- Vortex for 5 seconds the tube with thawed red blood cells.
- In a microtube, mix one volume (50 µL) of red blood cells with 8 volumes (400 µL) of CAPILLARYS HEMOGLOBIN(E) hemolysing solution.
- Vortex for 5 seconds.
- Apply 100 µL of prepared hemolysate in the wells of a new green dilution segment.
- Place this dilution segment on the sample rack No. F0 of CAPILLARYS 2 FLEX-PIERCING.
- Slide the sample rack into the CAPILLARYS 2 FLEX-PIERCING system, select "Sample" with "manual dilution" in the window which appears on the screen and validate.

The results are then automatically considered by the software for the data analysis.

Analysis of samples with volume below 1 mL:
- Vortex for 5 seconds the whole blood sample.
- Apply in a conical tube for control 100 µL of whole blood to analyze and cap the tube.
- Place the tube with a wedge adapter on a sample rack of the CAPILLARYS 2 FLEX-PIERCING system.
- Slide the sample rack into the CAPILLARYS 2 FLEX-PIERCING system at the beginning of an analysis series.
- Perform the analysis of this sample according to the standard procedure like a usual blood sample.

NOTE : Without any bar code label on the conical tube, the sample cannot be identified.

Samples to avoid
- Avoid coagulated blood samples.
- Avoid aged, improperly stored blood samples ; the automated hemolysis of samples may be disturbed by viscous aggregates in red blood cells. Then, degradation products (as artefacts) may affect the electrophoretic pattern.

In these 2 previous cases, aggregates in red blood cells may affect the collection of the sample by the probe.
- Do not analyze directly tubes containing less than 1 mL of blood sample, the analysis should be affected (see particular cases).
- Do not use samples from neonate / newborn population. The CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument has not been evaluated in the neonate / newborn population (age range – birth to 28 days).

NOTE : Collection tubes and centrifugation parameters for biological samples are described in the available documentation on pre-analytical phase for bio-medical analysis (data provided by the tube manufacturers, guides and recommendations on biological sample collection…). Without any indication in the instructions for use on the type of tube to use or on the centrifugation, please refer to this documentation and for the dimensions of tube to use, refer to the SEBIA document "Characteristics of tubes to use according to the instrument". The pre-analytical phase must be performed according to the state of art, the different recommendations, including those provided by the tube manufacturers, and applicable regulations.

PROCEDURE

The CAPILLARYS 2 FLEX-PIERCING system is a multiparameter instrument for hemoglobins analysis on parallel capillaries. The hemoglobins assay uses 8 capillaries to run the samples.
The sequence of automated steps is as follows:
- Bar code reading of sample tubes (for up to 8 tubes) and samples-racks ;
- Mixing of blood samples before analysis.
- Sample hemolysis and dilution from primary tubes into dilution segments ;
- Capillary washing ;
- Injection of hemolyzed samples ;
- Hemoglobin separation and direct detection of the separated hemoglobins on capillaries.

The manual steps include:
- Placement of sample tubes (with caps) in sample-racks in positions 1 to 8 ;
- Placement of new dilution segments in sample-racks ;
- Placement of racks on the CAPILLARYS 2 FLEX-PIERCING instrument ;
- Removal of sample-racks after analysis.

PLEASE CAREFULLY READ THE CAPILLARYS 2 FLEX-PIERCING INSTRUCTION MANUAL.

I. PREPARATION OF CAPILLARYS ANALYSIS
1. Switch on CAPILLARYS 2 FLEX-PIERCING instrument and computer.
2. Set up the software, enter and the instrument automatically starts.
3. The CAPILLARYS HEMOGLOBIN(E) kit is intended to run with "HEMOGLOBIN(E)" analysis program from the CAPILLARYS 2 FLEX-PIERCING instrument. To select "HEMOGLOBIN(E)" analysis program and place the CAPILLARYS HEMOGLOBIN(E) buffer and hemolyzing solution vials in the instrument, please read carefully the CAPILLARYS 2 FLEX-PIERCING instruction manual.
4. The sample rack contains 8 positions for sample tubes. Place up to 8 capped sample tubes with whole blood on each sample rack (positions 1 to 8) ; the bar code of each tube must be visible in the openings of the sample rack.
5. Position a new dilution segment on each sample rack. The sample rack will be ejected if the segment is missing.
6. Slide the complete sample carrier(s) into the CAPILLARYS 2 FLEX-PIERCING system through the opening in the middle of the instrument. Up to 13 sample racks can be introduced successively and continuously into the system. **When analyzing a control blood sample, it is advised to use the sample rack No. F0 intended for control blood sample with specific tubes, caps and the wedge adapter for tubes for controls.**
7. Remove analyzed sample racks from the plate on the left side of the instrument.
8. Take off carefully used dilution segments from the sample rack and discard them.

   WARNING: Dilution segments with biological samples have to be handled with care.

DILUTION - MIGRATION - DESCRIPTION OF THE AUTOMATED STEPS

1. Bar codes are read on both sample tubes and sample racks.
2. Mixing of tubes.
3. Samples are diluted in hemolysing solution and the sample probe is rinsed after each sample.
4. Capillaries are washed.
5. Diluted samples are injected into capillaries.
6. Migration is carried out under constant voltage for about 8 minutes and the temperature is controlled by Peltier effect.
7. Hemoglobins are detected directly by scanning at 415 nm and an electrophoretic profile appears on the screen of the system.

NOTE: These automated steps described above are applied to the first introduced sample rack. The electrophoretic patterns appear after about 20 minutes from the start of the analysis. For the following sample rack, the first three steps (bar code reading, mixing and sample dilution) are performed during analysis of the previous sample rack.

II. RESULT ANALYSIS

At the end of the analysis, relative quantification of individual hemoglobin fractions is automatically performed and profiles can be analyzed. The hemoglobin fractions Hb A, Hb F, Hb A2 and Hb C are automatically identified. The Hb A fraction is centered in the middle of the review window and Hb A2 is adjusted at a fixed position against that of Hb A. In the absence of Hb A and when Hb F is present (≥ 3 %), the recentering of the pattern is made with Hb F and Hb A2 peaks that are placed at fixed positions.
The resulting electrophoregrams are evaluated visually for pattern abnormalities.
The electrophoretic patterns are colored :

- in Cyan when the number of fractions / peaks is that which is configured by default for the procedure (2 fractions for HEMOGLOBIN(E) procedure, for example),
- in Magenta when the number of fractions / peaks is not that which is configured by default for the procedure.

With HEMOGLOBIN(E) procedure, the Hb F peak is orange (identified by "Hb F or variant") when the age of the patient is unknown and blue (identified by "Hb F") when the age of the patient is known and the fraction / peak is lower than 2 %.
The potential positions of the different hemoglobin variants (identified in zones called Z1 to Z15) are shown on the screen of the system and indicated on the result ticket. The table in paragraph "Interpretation" shows known variants which may be present in each corresponding zone.
When the software identifies a hemoglobin fraction in a defined zone, the name of this zone is framed.

Patterns are automatically adjusted with regard to Hb A and Hb A2 fractions, or with regard to Hb F and Hb A2 fractions as the case may be, to facilitate their interpretation:

- when Hb A and / or Hb A2 fractions are not detected on an electrophoretic pattern and / or when Hb F (with no Hb A) is not detected or is at a level < 3 %,
  - a yellow warning signal appears,
  - the adjustment of the pattern is performed using the position of the Hb A fraction on the two previous patterns obtained with the same capillary,
  - no fraction is identified (except when Hb C is detected: in this case, Hb A2 and Hb C fractions are identified),
  - the different migration zones (Z1 to Z15) do not appear neither on the screen of the system, nor on the ticket result.
- when Hb F is detected at a level ≥ 3.0 %, without any detection of Hb A (no Hb A or Hb A at a low level) on an electrophoretic pattern,
  - the adjustment of the pattern is performed using the position of the Hb F and Hb A2 fractions,
  - Hb F and Hb A2 fractions are placed at fixed positions,
  - Hb F and Hb A2 fractions are identified,
  - the different migration zones (Z1 to Z15) are indicated on the screen of the system and on the ticket result by the same way of patterns with Hb A,
  - abnormal fractions are grey-dashed and identified using their migration zone (a fraction detected in Z(D) zone is called “Z(D) zone” for example),
  - when a rare variant migrates in the Hb A2 migration zone, the different migration zones (Z1 to Z15) do not appear neither on the screen of the system, nor on the ticket result.
- when the adjustment is not possible,
  - a red warning signal appears,
  - no fraction is identified,
  - the different migration zones (Z1 to Z15) do not appear neither on the screen of the system, nor on the ticket result.

  Call SEBIA.
- when optical density (OD) is insufficient on a migration control electrophoretic pattern (obtained with the Normal Hb A2 Control or the Pathological Hb A2 Control, identified with its bar code label on the sample rack No. F0),
  - a warning message is displayed in order to consider or remove this analysis for the determination of Hb A fraction position,
  - a purple warning signal appears on the review window,
  - Hb A and Hb A2 fractions are not identified (except when the analysis is considered by the operator),
  - the different migration zones (Z1 to Z15) do not appear neither on the screen of the system, nor on the ticket result (except when the analysis is considered by the operator).

In all cases, the different migration zones (Z1 to Z15) do not appear neither on the screen of the system, nor on the ticket result.
On the electrophoretic pattern, the curves of Hb A2 and Hb C fractions, are calculated and redrawn by fitting with adjustment (or fitted) and are overlaid with the native curve. This display allows the Hb A2 fraction quantification if Hb C is present in the sample.

WARNING: In some cases of hemoglobin C (homozygous) or after a technical problem, the hemoglobins A2 and C are not fitted ; these fractions are then under-quantified. It is then recommended to quantify the Hb A2 fraction by using another technique.

PLEASE CAREFULLY READ THE CAPILLARYS 2 FLEX-PIERCING INSTRUCTION MANUAL.

III. END OF ANALYSIS SEQUENCE

At the end of each analysis sequence, the operator must initiate the "shut down" procedure of the CAPILLARYS 2 FLEX-PIERCING system in order to store capillaries in optimal conditions.

IV. FILLING OF REAGENT CONTAINERS

The CAPILLARYS 2 FLEX-PIERCING system has a reagent automatic control.

IMPORTANT: Please refer to the instructions for replacement of reagent containers respecting color code for vials and connectors.

A message will be displayed when it is necessary to perform one of the following tasks:

- Place a new buffer container and / or ;
- Place a new hemolysing solution container and / or ;
- Fill the container with working wash solution and / or ;
- Fill the container with filtered distilled or deionized water for rinsing capillaries and / or ;
- Empty the waste container.

WARNING: Do not use marketed deionized water, such as water for ironing for example (risk of important capillaries damage). Use only water with ultrapure quality, such as injection grade water.

IMPORTANT: Before filling the rinse container, it is recommended to wash it with plenty of distilled or deionized water.

PLEASE CAREFULLY READ THE CAPILLARYS 2 FLEX-PIERCING INSTRUCTION MANUAL.

QUALITY CONTROL

It is advised to include into each run of samples, an assayed control blood (for example, a blood sample containing hemoglobins A, F, S and C, such as Hb AFSC Control, SEBIA, PN 4792, or a normal blood sample, the Normal Hb A2 Control, SEBIA, PN 4778 or the Pathological Hb A2 Control, SEBIA, PN 4779).

IMPORTANT: For optimal use of the blood controls analyzed with the CAPILLARYS 2 FLEX-PIERCING system, it is necessary to use the specific conical tubes for controls and their corresponding caps, the wedge adapters for tubes for controls (see EQUIPMENT AND ACCESSORIES REQUIRED) and the bar code labels intended to identify the tubes for controls that contain the blood control to analyze (see the paragraph "Normal Hb A2 Control" for the utilization of a wedge adapter for tubes for controls).

RESULTS

Values

Direct detection at 415 nm in capillaries yields relative concentrations (percentages) of individual hemoglobin zones.
Reference values for individual major electrophoretic hemoglobin zones in the CAPILLARYS 2 FLEX-PIERCING system have been established from a healthy population of 113 adults (men and women), whose hemoglobin values (as established by HPLC) were normal :

Hemoglobin A : comprised between 96.7 and 97.8 %
Hemoglobin F : ≤ 0.5 % (*)
Hemoglobin A2 : comprised between 2.2 and 3.2 %

(*) See Interference and limitations

It is recommended that each laboratory establish its own threshold values.

NOTE: Reference values have been established using the standard parameters of the CAPILLARYS 2 software (smoothing 0 and hemoglobin fractions automatic quantification with HEMOGLOBIN(E) analysis program).

WARNING: Reference values must be considered only when hemoglobin variants are absent.

Interpretation

See ELECTROPHORETIC PATTERNS, figures 1 – 18.

The different migration zones of hemoglobin variants (called Z1 to Z15) are shown on the screen of the system and on the result ticket. Passing the mouse cursor over a zone name displays icon information containing possible hemoglobin variants that could be seen in this zone.
For each fraction, the maximum position defines the migration zone.
See the table showing the potential variants located in each zone.
With PHORESIS VS ≥ 9.15, this table lists 525 different hemoglobin variants. Due to the history of their discovery, some variants may have many names. A second name is added between brackets close to the main name (for example, in zone Z(D), Hb Korle-Bu (G-Accra)). Other names are not listed in this table.
In zone Z(A), variants are listed in alphabetical order.
For other zones, variants are sorted in main fractions and minor fractions and presented by migration order from most cathodic variants to most anodic variants.
For variants with a main fraction that migrates in zone Z(A), their minor fractions which migrate in zone Z(A2) are not indicated.

- The symbol "*" indicates a hidden or partially hidden peak due to similar migration to normal Hb A or Hb A2 fraction. A partially hidden fraction corresponds to a more or less important shoulder of the normal fraction.
- The symbol "#" indicates the display in icon information of several visible fractions from the same variant, generally present in different zones (for example, alpha-chain variant with a second visible peak as Hb Q-India, or unstable variant as Hb Sabine and Hb Köln). Not concerned: beta chain variants except unstable variants, gamma and delta chain variants and delta-beta hybrids, alpha chain variants without second peak visible on the electrophoretic pattern.

- The symbol "!!" alerts the potential risk of a migration zone shift for a rare variant located in a zone boundary. Additionally, the migration variation of a variant (± 1 point) depends on its percentage. For example, Hb Willamette, located on the far right of zone Z(F), may migrate in zone Z(D) when its percentage has decreased in case of an associated thalassemia.

These symbols are explained in the "Captions" icon information located in the upper left side of the review window.

1. Qualitative abnormalities: Hemoglobinopathies

Most hemoglobinopathies are due to substitution by mutation of a single amino acid in one of the four types of polypeptide chains [1, 2, 4, 9, 12]. The clinical significance of such a change depends on the type of amino acid and the site involved [13]. In clinically significant disease, either the α-chain or the ß-chain is affected.

More than 1400 variants of adult hemoglobin have been described [6, 14]. The first abnormal hemoglobins studied and the most frequently occuring have an altered net electric charge, leading to an easy detection by electrophoresis.

There are five main abnormal hemoglobins which present a particular clinical interest: S, C, E, O-Arab and D.

The CAPILLARYS HEMOGLOBIN(E) kit is intended for the identification of hemoglobinopathies and thalassemias.

Hemoglobin S

Hemoglobin S is the most frequent. It is due to the replacement of one glutamic acid (an acidic amino acid No. 6) of the ß-chain by valine (a neutral amino acid): when compared to Hb A, its isoelectric point is elevated and its total negative charge decreased with the analysis pH. Its electrophoretic mobility is therefore increased in the capillary and this hemoglobin is faster than A fraction. With alkaline buffered CAPILLARYS HEMOGLOBIN(E) procedure, hemoglobin S migrates between A and A2 fractions, next to Hb A2.

Hemoglobin C

One glutamic acid of the ß-chain is replaced by lysine (a basic amino acid No. 6): its mobility is strongly reduced. When compared to Hb A, its isoelectric point is highly elevated and its total negative charge decreased with the analysis pH. Its electrophoretic mobility is therefore increased in the capillary and this hemoglobin is faster than A fraction which allows its differenciation. Hemoglobins C, E and O-Arab are not superimposed on the electrophoretic pattern and are easily identified.

Hemoglobin E

One glutamic acid of the ß-chain (No. 26) is replaced by lysine. With CAPILLARYS HEMOGLOBIN(E) procedure, hemoglobin E migrates just anodically behind hemoglobin A2 and is totally separated from it. Then, when hemoglobin E is present, A2 fraction can be measured to detect ß thalassemia.

Hemoglobin O-Arab

One glutamic acid of the ß-chain (No. 121) is replaced by lysine. With CAPILLARYS HEMOGLOBIN(E) procedure, hemoglobin O-Arab migrates exactly like hemoglobin A2. In such a case, hemoglobin A2 can not be quantified. When this fraction is > 10.5 %, hemoglobin O-Arab must be suspected. Note that Hb O-Arab migrates separately from hemoglobins C and E.

Hemoglobin D (-Los Angeles)

One glutamic acid of the ß-chain (No. 121) is replaced by glutamine. With CAPILLARYS HEMOGLOBIN(E) procedure, hemoglobin D (called D-Punjab, D-Los Angeles, D-Chicago or D-Portugal) migrates behind hemoglobin S, this property allows to differenciate S and D hemoglobins.

2. Quantitative abnormalities: Thalassemias

Thalassemias constitute a quite heterogeneous group of genetic disorders characterized by decreased synthesis of one type of the polypeptide chains. The molecular mechanism of this decrease has not been fully described.

There are two types of thalassemia syndromes:

Alpha-thalassemias

They are characterized by the decrease of synthesis of the α-chains, consequently affecting the synthesis of all normal hemoglobins. The excess of synthesis of the ß- and γ-chains in relation to α-chains induces the formation of tetrameres without any α-chain:

- hemoglobin Bart = γ4,
- hemoglobin H = ß4.

Hemoglobin H presents a low isoelectric point ; with CAPILLARYS HEMOGLOBIN(E) procedure, it migrates more anodic than hemoglobin A (and may appear as one or several fractions).

Beta-thalassemias

They are characterized by the decrease of synthesis of the ß-chains. Only hemoglobin A synthesis is affected.

Therefore hemoglobin F and hemoglobin A2 percentages are increased with respect to hemoglobin A.

With CAPILLARYS HEMOGLOBIN(E) procedure, values obtained for different normal hemoglobin fractions allow the detection of beta thalassemias.

3. Particular cases

- When there is no hemoglobin A in the sample, a small fraction may be observed in anodic position compared with Hb F (in the Z8 zone when migration zones are diplayed on the electrophoretic pattern) ; this fraction may be acetylated hemoglobin F which represents about 15 to 25 % of hemoglobin F. The CAPILLARYS 2 FLEX-PIERCING system can identify this acetylated hemoglobin separately from the hemoglobin A without any confusion.
- When a small fraction (about 0.5 to 3 %) migrates between hemoglobins F and δA'2 (A2 variant), a hemoglobin A2 variant may be suspected.
- When a hemoglobin A2 variant is detected (δA'2 or any other A2 variant), it is recommended to add its percentage to hemoglobin A2 for a better beta-thalassemia diagnostic.
- Some hemoglobin variants (such as Hb Camperdown and Hb Okayama) migrate close to Hb A and may not be separated from this hemoglobin.
- Some hemoglobin variants (such as Hb Pôrto-Alegre or degraded Hb S, for example) including homozygous variants such as Hb Q-Thailand, migrate close to Hb F. In the absence of Hb A, the adjustment of the pattern using Hb F and Hb A2 peaks and the display of migration zones prevents any confusion of these variants with Hb F.
- PHORESIS VS < 9.15: Weak hemoglobin fractions which migrate in zone Z12 are sometimes quantified with imprecision (too asymmetric Hb Bart's, for example). It is thus necessary to delete automatic quantification and then to quantify them manually.
  PHORESIS VS ≥ 9.15: In zone Z12, the curve of Hb Bart is calculated and redrawn by fitting with adjustment (or fitted). Fitted fractions are then called "Hb Bart suspected". Narrow fractions with low percentage are not Hb Bart's, they are identified "Z12 zone". Wide fractions with elevated percentage, suspected to be hemoglobin variants, are identified "Hb Bart zone".

- In the CAPILLARYS HEMOGLOBIN(E) technique, for diabetic patients with elevated HbA_{1c} (over 10 %), a small fraction is observed and eventually identified as a peak in Z10 zone.
- Weak fractions may be observed in Z14 and Z15 migration zones. It is then necessary to analyze the hematologic state of the patient and to perform complementary analyses in order to characterize these fractions (artefact or hemoglobin abnormality). The software version (≥ 9.15) allows a specific identification of Hb H in Z15 zone. Fractions with a width over 10 points and a percentage between 0.3 and 32 % are called "Hb H suspected". Fractions with a width below 10 points are not Hb H and are identified "Z15 zone". Wide fractions with a percentage between 10 and 58 %, suspected to be hemoglobin variants, are identified "Abnormal Hb".
- When analysing blood samples from newborn babies, Hb A from samples containing Hb F at high concentrations may be disturbed, especially due to the presence of degraded Hb F in its migration zone. The Hb A percentage indicated by the software may be overvalued. In addition, when hemoglobin variants (> 4 %, such as Hb S, Hb C, Hb E or Hb D-Punjab) are present in blood samples containing high Hb F levels (> 60 %), it is necessary to perform complementary analyses in order to confirm the presence of Hb A.
- For newborn babies until 6 – 9 months old, it is recommended to analyze many blood samples (collected monthly, for example) in order to check the Hb F concentration. It will allow to verify the decrease of Hb F concentration and the potential presence of a variant. In case of uncertainty, it is advised to confirm by using complementary studies and to analyze parents' blood samples.
- Examples with increased hemoglobin F (Hb F) (except for newborn babies):
  - pregnancy ;
  - patients with sickle cell disease, more than 2 years old, with a Hydrea® (hydroxyurea) treatment and/or transfused and/or producing naturally Hb F increased by compensation ;
  - patients, aged more than 2 years old, with HPFH trouble (hereditary persistence of foetal hemoglobin exhibiting 15 to 35 % Hb F for heterozygous patients) ;
  - patients, more than 2 years old, with leukaemia (with any type), hereditary haemolytic anemia, diabetes, thyroid disease, hyperactivity of bone marrow, multiple myeloma, cancer with metastases.
- Hb S fraction may appear in a very anodic position in Z(S) zone (in far left of this zone) for the following cases:
  - blood sample with low Hb A level (< 10 %) and high Hb S level (for example, blood sample from transfused patient with sickle cell disease, or from patient with S beta-thalassemia) for which the pattern is adjusted with Hb A and Hb A2 peaks, and,
  - blood sample without any Hb A and with high Hb S level for which the pattern is adjusted with Hb F and Hb A2 peaks.

  This migration zone, which corresponds to an intermediary zone comprised within Z(S) zone, allows to automatically detect Hb S fractions with modified migration. It is called "Shifted Hb S area" and is indicated by a dash located on the left side of the name Z(S) in the upper section of the Z(S) migration zone. A variant which migrates in this position is identified as "Borderline variant" but not "Z(S) zone" like any other peak which migrates in the rest of the Z(S) zone.

  Mix the sample with the Normal Hb A2 Control according to the procedure described in paragraph "SAMPLES FOR ANALYSIS", section "Particular cases", in order to confirm the position of the variant in the Z(S) migration zone. It is necessary to analyze the hematologic state and to perform complementary studies to check the presence of Hb S.
- When analyzing blood samples from patients with sickle cell disease before transfusion, a variation of Hb S fraction may be observed for the analyses of the same patient due to the inhomogeneity of this type of sample. It is therefore recommended to homogenize this type of blood sample before the analysis.

Interference and Limitations

- See SAMPLES FOR ANALYSIS.
- Analyze only blood samples contained in collection tubes indicated in the paragraph "EQUIPMENT AND ACCESSORIES REQUIRED" or tubes with equivalent dimensions approved for clinical assays. Call SEBIA technical service for further information on these devices.
- Do not analyze directly tubes containing less than 1 mL of blood sample.
- Avoid aged, improperly stored blood samples ; degradation products (or artefacts) may affect the electrophoretic pattern after 7 days storage.
- After 10 days storage, viscous aggregates composed in red blood cells may appear, they must be discarded before analysis.
- When analysing blood samples with a decreased [red blood cells] / [plasma] ratio (from patients with anaemia), a hemoglobin Constant Spring variant may be suspected when a fraction is observed in Z(C) or Z(A2) migration zones. This fraction may be due to plasmatic proteins present in the sample (see § Sample preparation, Particular cases).
- When an abnormal hemoglobin is detected, use other means of identification (e.g., globin chain electrophoresis), or consult or send sample to a specialized laboratory.

  IMPORTANT: It is also necessary to analyze the hematologic state, as complementary results.
- The migration of a hemoglobin variant close to Hb A involves an underestimation of Hb A fraction and that of the variant and consequently, an overestimation of Hb A2 fraction. In order to quantify Hb A2 with precision, it is necessary to delete the separate integration of both variants and Hb A, and to quantify these fractions together.
- Some homozygous "S" subjects receive a "Hydrea"® (hydroxyurea) treatment that can induce synthesis of foetal hemoglobin. With CAPILLARYS HEMOGLOBIN(E) procedure, the mobility of the induced hemoglobin F is not different from the physiological hemoglobin F.
- Due to the resolution and sensitivity limits of zone electrophoresis, it is possible that some hemoglobin variants may not be detected with this method.
- The CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument has not been evaluated in the neonate / newborn population (age range – birth to 28 days).
- In the case of patients with hyperleukocytosis, the migration speed of the sample may be accelerated causing a shift of the profile that may result in a non-recognition of the zones.

Hemoglobin variants observed with Hb A1c and / or HEMOGLOBIN(E) procedures :
Due to the different composition of Hb A1c and HEMOGLOBIN(E) buffers, the electrophoretic mobility of some hemoglobin variants may be different.

The common interfering factors with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument (triglycerides and bilirubin) were evaluated in studies based on the Clinical Laboratory Standards Institute (CLSI - USA) EP7-A2 guideline "Interference Testing in Clinical Chemistry".
The results are summarized below:

- No qualitative or quantitative interference with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument was detected if bilirubin concentration is equal to or less than 17.9 mg/dL, or 306 µmol/L.
- No qualitative or quantitative interference with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument was detected if triglycerides concentration is equal to or less than 22.34 g/L.

Troubleshooting

Call SEBIA Technical Service of the supplier when the test fails to perform while the instruction for the preparation and storage of materials, and for the procedure were carefully followed.
Kit reagent Safety Data Sheets and information on cleaning and waste disposal, labeling and safety rules applied by SEBIA, packaging for the transportation of biological samples, and instruments cleaning are available on the SEBIA's extranet website : www.sebia.com.

PERFORMANCE DATA

Precision

The precision of the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument was evaluated in a study based on the Clinical Laboratory Standards Institute (CLSI - USA) EP5-A2 guideline "Evaluation of Precision Performance of Quantitative Measurements Methods".
The means, standard deviations and coefficients of variation (CV's %) (n = 80) were calculated for percentages (%) of hemoglobin fractions for each sample, using statistical tools recommended by CLSI.
The results obtained with the CAPILLARYS HEMOGLOBIN(E) procedure indicate a very good reproducibility for quantitative analysis for each hemoglobin component. All electrophoregrams were also interpreted visually.
The results presented below have been obtained using the standard parameters of the CAPILLARYS software (smoothing 0 and hemoglobin fractions automatic quantification with HEMOGLOBIN(E) analysis program).

Reproducibility between capillaries from the same instrument

Seven (7) different blood samples were run using the CAPILLARYS HEMOGLOBIN(E) procedure in all capillaries of the same CAPILLARYS 2 FLEX-PIERCING instrument and with 1 lot of CAPILLARYS HEMOGLOBIN(E) kit. The analyzed blood samples included 2 samples with normal Hb A2 level (No. 1 and 5), 2 samples with increased Hb A2 level (No. 2 and 6), 1 sample with low Hb A2 level (No. 3), 1 pathological sample with Hb F and Hb S (No. 4) and 1 sample with increased Hb F level (No. 7). In this study, each blood sample was analyzed on all capillaries from the same instrument, including 40 runs over 20 working days (at 2 different times of the day). Within each run, samples were analyzed in duplicate.
The results for Hb A, Hb A2, Hb F and Hb S percentages are summarized in the following tables.

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4	Sample No. 5	Sample No. 6	Sample No. 7
Mean Hb A %	97.2	95.4	98.1	54.9	97.4	93.8	34.3
Within-run reproducibility (CV %)	0.0	0.0	0.0	0.2	0.1	0.1	0.5
Between-run reproducibility (CV %)	0.0	0.0	0.0	0.2	0.0	0.0	0.6
Between-day reproducibility (CV %)	0.0	0.0	0.0	0.1	0.0	0.0	0.9
Total (CV %)	0.0	0.1	0.0	0.4	0.1	0.1	1.2

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4	Sample No. 5	Sample No. 6	Sample No. 7
Mean Hb A2 %	2.8	4.7	1.9	2.8	2.6	6.2	/
Within-run reproducibility (CV %)	1.6	1.0	1.5	1.6	2.6	1.3	/
Between-run reproducibility (CV %)	0.4	0.0	1.2	0.4	0.0	0.6	/
Between-day reproducibility (CV %)	0.1	0.7	0.0	0.6	0.7	0.6	/
Total (CV %)	1.6	1.2	1.9	1.7	2.6	1.6	/

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4	Sample No. 5	Sample No. 6	Sample No. 7
Mean Hb F %	/	/	/	8.3	/	/	65.2
Within-run reproducibility (CV %)	/	/	/	0.7	/	/	0.3
Between-run reproducibility (CV %)	/	/	/	0.8	/	/	0.4
Between-day reproducibility (CV %)	/	/	/	0.3	/	/	0.5
Total (CV %)	/	/	/	1.1	/	/	0.7

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4	Sample No. 5	Sample No. 6	Sample No. 7
Mean Hb S %	/	/	/	33.9	/	/	/
Within-run reproducibility (CV %)	/	/	/	0.4	/	/	/
Between-run reproducibility (CV %)	/	/	/	0.4	/	/	/
Between-day reproducibility (CV %)	/	/	/	0.1	/	/	/
Total (CV %)	/	/	/	0.6	/	/	/

In addition, none of the repeats showed false positive or false negative values.

Reproducibility between lots and instruments
The reproducibility study was conducted using 7 different blood samples that were tested on 3 CAPILLARYS 2 FLEX-PIERCING instruments with 3 lots of CAPILLARYS HEMOGLOBIN(E) kits. The analyzed blood samples included 2 samples with normal Hb A2 level (No. 1 and 5), 2 samples with increased Hb A2 level (No. 2 and 6), 1 sample with low Hb A2 level (No. 3), 1 pathological sample with Hb F and Hb S (No. 4) and 1 sample with increased Hb F level (No. 7). In this study, each blood sample was analyzed on all capillaries from the 3 CAPILLARYS 2 FLEX-PIERCING instruments, including 60 runs over 27 working days (at 2 different times of the day). Within each run, samples were analyzed in duplicate.
The following table summarizes the total instrument-reagent C.V. % range for the individual hemoglobin Hb A, Hb A2, Hb F and Hb S fractions tested.

Hemoglobin	Total CV % range
Hb A	0.0 – 2.0
Hb A2	0.0 – 5.5
Hb F	0.2 – 1.3
Hb S	0.4 – 0.7

Linearity
The linearity of the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument was evaluated in a study based on the Clinical Laboratory Standards Institute (CLSI - USA) EP6-A guideline "Evaluation of the Linearity of Quantitative Measurement Procedures: A statistical Approach".
The results for percentages (%) of hemoglobin fractions were analyzed using statistical tools recommended by CLSI.

Hb A2 linearity
One Hb A2 enriched blood sample (containing 13.2 g/dL total hemoglobin with 9.9 % Hb A2) was mixed with a Hb A2 depleted blood sample (containing 13.4 g/dL total hemoglobin with 0.0 % Hb A2) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb A and Hb A2 within the entire range studied, with a maximum of about 1.3 g/dL for Hb A2 (**between 0.0 and 9.9 % of Hb A2**).

Hb F linearity
One umbilical cord blood sample (containing 12.7 g/dL total hemoglobin with 75.5 % Hb F) was mixed with a normal blood sample (containing 8.8 g/dL total hemoglobin with 0.0 % Hb F) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb A and Hb F within the entire range studied, with a maximum of about 9.6 g/dL for Hb F (**between 0.0 and 75.5 % of Hb F**).

Hb S linearity
One blood sample with Hb S (containing 6.0 g/dL total hemoglobin with 90.7 % Hb S and 0.0 % Hb A) was mixed with a normal blood sample (containing 9.1 g/dL total hemoglobin with 0.0 % Hb S and 97.5 % Hb A) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb S within the entire range studied, with a maximum of about 5.4 g/dL for Hb S (**between 0.0 and 90.7 % of Hb S**) and a good linearity for Hb A within the entire range studied, with a maximum of about 8.9 g/dL for Hb A (**between 0.0 and 97.5 % of Hb A**).

Hb C linearity
One blood sample with Hb C (containing 11.5 g/dL total hemoglobin with 33.2 % Hb C) was mixed with a normal blood sample (containing 13.8 g/dL total hemoglobin with 0.0 % Hb C) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb C within the entire range studied, with a maximum of about 3.8 g/dL for Hb C in the analyzed sample (**between 0.0 and 33.2 % of Hb C**).

Hb D linearity
One blood sample with Hb D (containing 14.3 g/dL total hemoglobin with 40.9 % Hb D) was mixed with a normal blood sample (containing 14.0 g/dL total hemoglobin with 0.0 % Hb D) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb D within the entire range studied, with a maximum of about 5.8 g/dL for Hb D in the analyzed sample (**between 0.0 and 40.9 % of Hb D**).

Hb E linearity
One blood sample with Hb E (containing 10.8 g/dL total hemoglobin with 96.1 % Hb E) was mixed with a normal blood sample (containing 12.3 g/dL total hemoglobin with 0.0 % Hb E) within different proportions and the dilutions were electrophoresed with CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument.
The CAPILLARYS HEMOGLOBIN(E) procedure performed with CAPILLARYS 2 FLEX-PIERCING instrument gave a good linearity for Hb E within the entire range studied, with a maximum of about 10.4 g/dL for Hb E in the analyzed sample (**between 0.0 and 96.1 % of Hb E**).

Accuracy – Internal correlation
The internal concordance study of the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument was evaluated in a study based on the Clinical Laboratory Standards Institute (CLSI - USA) EP09-A2 guideline "Method Comparison and Bias Estimation Using Patient Samples; Approved Guideline – Second Edition (Interim Revision)".
The results for percentages (%) of hemoglobin fractions were analyzed using statistical tools recommended by CLSI.

NOTE: The results presented below have been obtained from 1 internal accuracy study that has been performed in SEBIA facility. The analyzed blood samples and their diagnostic assessment were provided by 11 hospital laboratories in France and USA. The diagnosis was based on a routine HPLC procedure.

The levels of hemoglobin fractions were measured in 56 blood samples, including 20 samples with hemoglobin variants such as hemoglobins S, C, D and E, both by electrophoretic separations obtained with the CAPILLARYS HEMOGLOBIN(E) procedure with the CAPILLARYS 2 FLEX-PIERCING instrument and a commercially available HPLC system for hemoglobins analysis.
The measured values of hemoglobin fractions from both procedures were analyzed by a linear regression statistical procedure. The results of linear regression analysis for Hb A, Hb A2, Hb F and Hb S are tabulated below (y = CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument) :

Hb fraction	Number of samples	Correlation coefficient	y-Intercept	Slope	Range of Hb % values CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument
Hb A	56	0.996	- 11.42	1.33	21.0 – 98.2
Hb A2	44	0.978	- 0.08	1.13	0.1 – 6.3
Hb F	56	1.000	- 0.38	0.93	0.0 – 79.0
Hb S	8	0.998	0.06	1.07	6.8 – 41.2

All abnormal hemoglobins or abnormal levels of normal hemoglobins detected with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument were in agreement with the comparative HPLC system. There was no case observed of false positive, i.e., detection of an abnormal band or abnormal level of a normal band where no such abnormality existed.

Accuracy – External correlations

NOTE: The results presented below have been obtained from 2 external accuracy studies that have been performed in 2 hospital laboratories located in the USA. The diagnosis was based on a routine HPLC procedure.

In study No. 1, the levels of hemoglobin fractions were measured in 123 blood samples, including 33 samples with hemoglobin variants such as hemoglobins S, C and E, both by electrophoretic separations obtained with the CAPILLARYS HEMOGLOBIN(E) procedure with the CAPILLARYS 2 FLEX-PIERCING instrument and a commercially available HPLC system for hemoglobins analysis.
The measured values of hemoglobin fractions from both procedures were analyzed by a linear regression statistical procedure. The results of linear regression analysis for Hb A, Hb A2, Hb F, Hb S and Hb C are tabulated below (y = CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument) :

Hb fraction	Number of samples	Correlation coefficient	y-Intercept	Slope	Range of Hb % values CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument
Hb A	121	0.999	- 1.71	1.14	0.0 – 98.8
Hb A2	93	0.986	- 0.31	1.16	0.9 – 6.5
Hb F	103	0.997	- 0.65	0.97	0.0 – 90.3
Hb S	26	0.998	- 0.10	1.05	14.2 – 54.8
Hb C	5	0.999	- 1.08	1.02	9.7 – 44.7

All abnormal hemoglobins or abnormal levels of normal hemoglobins detected with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument were in agreement with the comparative HPLC system. There was no case observed of false positive, i.e., detection of an abnormal band or abnormal level of a normal band where no such abnormality existed.

In study No. 2, the levels of hemoglobin fractions were measured in 183 blood samples, including 83 samples with hemoglobin variants such as hemoglobins S, C and D, both by electrophoretic separations obtained with the CAPILLARYS HEMOGLOBIN(E) procedure with the CAPILLARYS 2 FLEX-PIERCING instrument and a commercially available HPLC system for hemoglobins analysis.
The measured values of hemoglobin fractions from both procedures were analyzed by a linear regression statistical procedure. The results of linear regression analysis for Hb A, Hb A2, Hb F, Hb S, Hb C and Hb D are tabulated below (y = CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument) :

Hb fraction	Number of samples	Correlation coefficient	y-Intercept	Slope	Range of Hb % values CAPILLARYS HEMOGLOBIN(E) with CAPILLARYS 2 FLEX-PIERCING instrument
Hb A	180	0.991	- 1.75	1.13	0.0 – 98.2
Hb A2	113	0.926	- 0.18	1.04	0.4 – 6.0
Hb F	181	0.991	0.11	1.06	0.0 – 98.2
Hb S	67	0.996	0.66	1.00	5.0 – 93.9
Hb C	13	0.996	0.81	0.94	12.5 – 45.7
Hb D	3	0.980	3.04	1.01	34.7 – 40.9

All abnormal hemoglobins or abnormal levels of normal hemoglobins detected with the CAPILLARYS HEMOGLOBIN(E) procedure performed with the CAPILLARYS 2 FLEX-PIERCING instrument were in agreement with the comparative HPLC system. There was no case observed of false positive, i.e., detection of an abnormal band or abnormal level of a normal band where no such abnormality existed.

BIBLIOGRAPHIE / BIBLIOGRAPHY

BIBLIOGRAFIE - BIBLIOGRAFIA - BIBLIOGRAFÍA - BIBLIOGRAFI - ΒΙΒΛΙΟΓΡΑΦΙΑ - BIBLIOGRAFIJU - BIBLIOGRAFIJA - KAYNAKÇA - БИБЛИОГРАФИЯ - 参考书目 - БИБЛИОГРАФИЮ - 参考文献 - IZMANTOTĀ LITERATŪRA - BIBLIOGRAFIU - KIRJANDUS - DANH MỤC TÀI LIỆU THAM KHẢO

1. J. Bardakdjian-Michau, J.-L. Dhondt, R. Ducrocq, F. Galactéros, A. Guyard, F.-X. Huchet, A. Lahary, D. Lena-Russo, P. Maboudou, M.-L. North, C. Prehu, A.-M. Soummer, M. Verschelde, H. Wajcman (2003) Bonnes pratiques de l'étude de l'hémoglobine. *Ann. Biol. Clin.*, 61, 401-409.
2. V.F. Fairbanks, ed. (1980) Hemoglobinopathies and thalassemia: Laboratory methods and case studies. Brian C. Decker, New York.
3. F. Galacteros (1986) Thalassémie, drépanocytose et autres hémoglobinopathies. *Techniques et Biologie*, 3, 174-178.
4. JM Hempe, JN Granger and RD Craver (1997) Capillary isoelectric focusing of hemoglobin variants. *Electrophoresis*, 18, 1785-1795.
5. T.H.J. Huisman and J.H.P. Jonxis (1977) The hemoglobinopathies: techniques of identification. Marcel Dekker, New York.
6. Jellum E *et al.* Diagnostic applications of chromatography and capillary electrophoresis. *J. Chromatogr.* B, 689, 155-164 (1997).
7. Joutovsky A, Hadzi-Nesic J and Nardi MA (2004) HPLC retention time as a diagnostic tool for hemoglobin variants and hemoglobinopathies : a study of 60 000 samples in a clinical diagnostic laboratories. *Clin. Chem.*, 50, 10, 1736-1747.
8. J.S. Krauss, P.A. Drew, M.H. Jonah, M. Trinh, S. Shell, L. Black and C.R. Baisden (1986) Densitometry and microchromatography compared for determination of the hemoglobin C and A2 proportions in hemoglobin C and hemoglobin SC disease and in hemoglobin C trait. *Clin. Chem.* 32, 5, 860-863.
9. Landers JP. Clinical Capillary Electrophoresis. *Clin. Chem.*, 41, 495-509 (1995).
10. C. Livingstone (1986) The hemoglobinopathies. Edit. London.-
11. M. Maier-Redelsberger, R. Girot (1989) Diagnostic biologique des maladies de l'hémoglobine. *Feuillets de biologie*, 170.
12. Oda RP *et al.* Capillary electrophoresis as a clinical tool for the analysis of protein in serum and other body fluids. *Electrophoresis*, 18, 1715-1723 (1997).
13. R.G. Schneider (1978) Methods for detection of hemoglobin variants and hemoglobinopathies in the routine clinical laboratory. CRC *Crit. Rev. Clin. Lab. Sci.* 9, 243-271.
14. L. Vovan, D. Lara-Russo, A. Orsini (1985) Diagnostic biologique des hémoglobinoses. *Ann. Pédiat.* 32, 9, 780-789.
15. http://globin.cse.psu.edu/hbvar/menu.html : Hbvar : A Database of Human Hemoglobin Variants and Thalassemias.
16. http://www.isns-neoscreening.org/agenda.htm.
17. F Boemer, O Ketelslegers, JM Minon, V Bours, R Schoops (2008) Newborn screening for sickle cell disease using tandem mass spectrometry. *Clin. Chem.*, 54, 12, 2036-2041.
18. Lubin BH, Witkowska HE, Kleman K (1991) Laboratory diagnosis of hemoglobinopathies. *Clin. Biochem.*, 24, 363-374.
19. B Gulbis, B Fontaine, F Vertongen, F Cotton (2003) The place of capillary electrophoresis techniques in screening for haemoglobinopathies. *Ann. Clin. Biochem.*, 40, 659-662.
20. Aguilar-Martinez P *et al* (2010) Arbres décisionnels pour le diagnostic et la caractérisation moléculaire des hémoglobinopathies. *Ann. Biol. Clin.*, 68 (4) : 455-464.
21. Wendling A. Procédures de diagnostic ou de dépistage : Justification et validité d'un test de diagnostic ou de dépistage-sensibilité-spécificité. *Impact-Internat*, 1986 ; Sept : 93-97.
22. L. Guis, A. Chaumier, V. Le Gall, S. Havrez (Février 2013) Intégration du Capillarys 2 Flex Piercing (Sebia) dans un laboratoire de biologie médicale spécialisée. *Revue Francophone des Laboratoires*, 449, 47 – 56.
23. I. Agouti, F. Merono, N. Bonello-Palot, C. Badens (2013) Analytical evaluation of the Capillarys 2 Flex piercing for routine haemoglobinopathies diagnosis. *Int. Jnl. Lab. Hem.* 35, 217 – 221.
24. S. Altinier, M. Varagnolo, M. Zaninotto, M. Plebani. (2012) Identification and quantification of hemoglobins in whole blood: the analytical and organizational aspects of Capillarys 2 Flex Piercing compared with agarose electrophoresis and HPLC methods. *Clin. Chem. Lab. Med.* DOI 10.1515/cclm-2012-0061.
25. M. Angastiniotis, J.L. Vives Corrons, E.S. Soteriades, A. Eleftheriou (2013) The Impact of Migrations on the Health Services for Rare Diseases in Europe: The Example of Haemoglobin Disorders. *The Scientific World Journal* Volume 2013, Article ID 727905, 10 pages.
26. Nicole Borbely, Lorraine Phelan, Richard Szydlo, *et al.* (2012) Capillary zone electrophoresis for haemoglobinopathy diagnosis. *J. Clin. Pathol.*, doi: 10.1136/jclinpath-2012-200946.
27. F. Cotton *et al.* (2009) Evaluation of an automated capillary electrophoresis system in the screening for hemoglobinopathies. *Clin. Lab.*, 55 : 217 – 221.
28. D. Greene, A.L. Pyle, J.S. Chang, C. Hoke, T. Lorey (2012) Comparison of Sebia Capillarys Flex capillary electrophoresis with the BioRad Variant II high pressure liquid chromatography in the evaluation of hemoglobinopathies. *Clin. Chim.* Acta 413, 1232 – 1238.
29. T. Higgins, M. Mack, A. Khajuria (2009) Comparison of two methods for the quantification and identification of hemoglobin variants. *Clin. Biochem.*, 42, 701 – 705.
30. D.F. Keren *et al* (2008) Comparison of Sebia Capillarys capillary electrophoresis with the Primus High-Pressure Liquid Chromatography in the evaluation of hemoglobinopathies. *Am. J. Clin. Pathol.*, 130 : 824 – 831.
31. D.F. Keren *et al* (2012) Expression of hemoglobin variant migration by capillary electrophoresis relative to Hemoglobin A2 improves precision. *Am. J. Clin. Pathol.*,137 : 660 – 664.
32. Can Liao, Jian-Ying Zhou, Xing-Mei Xie, Jian Li, Ru Li, and Dong-Zhi Li (2010). Detection of Hb constant spring by a capillary electrophoresis method. *Hemoglobin*, 34 (2) : 175 – 178.
33. D.M. Mais *et al* (2009) The range of hemoglobin A2 in hemoglobin E heterozygotes as determined by capillary electrophoresis. *Am. J. Clin. Pathol.*,132 : 34 – 38.
34. T. Munkongdee *et al* (2010) Quantitative analysis of Hb Bart's in cord blood by capillary electrophoresis system. *Ann. Hematol.* DOI 10.1007/s00277-010-1137-4.
35. R. Paleari, B. Gulbis, F. Cotton, A. Mosca (2012) Interlaboratory comparison of current high-performance methods for HbA2. *Int. Jnl. Lab. Hem.* 34, 362 – 368.
36. S. Sangkitporn *et al* (2011) Multicenter validation of fully automated capillary electrophoresis method for diagnosis of thalassemias and hemoglobinopathies in Thailand. Southeast Asian J. Trop. Med. *Public Health* 42 (5), 1224 – 1232.
37. F. Wolff, F. Cotton, B. Gulbis (2012) Screening for haemoglobinopathies on cord blood : laboratory and clinical experience. *J. Med. Screen.*, 19, 3, 116 - 122.

BIBLIOGRAPHIE / BIBLIOGRAPHY

BIBLIOGRAFIE - BIBLIOGRAFIA - BIBLIOGRAFÍA - BIBLIOGRAFI - ΒΙΒΛΙΟΓΡΑΦΙΑ - BIBLIOGRAFIJU - BIBLIOGRAFIJA - KAYNAKÇA - БИБЛИОГРАФИЯ - 参考书目 - БИБЛИОГРАФИЮ - 参考文献 - IZMANTOTĀ LITERATŪRA - BIBLIOGRAFIU - KIRJANDUS - DANH MỤC TÀI LIỆU THAM KHẢO

38. A.D. Stephens *et al* on behalf of the International Council for the Standardisation of Haematology (ICSH) (2012). ICSH recommendations for the measurement of Haemoglobin F. *Int. Jnl. Lab. Hem.*, 34, 14 – 20.
39. A. Mosca, R. Paleari, D. Leone, G. Ivaldi (2009) The relevance of hemoglobin F measurement in the diagnosis of thalassemias and related hemoglobinopathies. *Clinical Biochemistry,* 42, 1797–1801.
40. J. D. Hoyer, C. S. Penz, V. F. Fairbanks, C. A. Hanson and J.A. Katzmann (2002) Diagnostic Usefulness in the Distinction of Hereditary Persistence of Fetal Hemoglobin (HPFH) and Hemoglobin S–HPFH From Other Conditions With Elevated Levels of Hemoglobin F. *Am. J. Clin. Pathol.*, 117 : 857 – 863.
41. P. Van Delft *et al* (2009) Evaluating five dedicated automatic devices for haemoglobinopathy diagnostics in multi-ethnic populations. *Int. J. Lab. Hematol.*, 31 (5) : 484 – 95.
42. Prevention and diagnosis of haemoglobinopathies. A short guide for health professionals and laboratory scientists. Thalassemia International Federation (TIF) publication No. 21.
43. A.J. Marengo-Rowe (2007) The thalassemias and related disorders. *Baylor University Medical Center Proceedings*, 20, 27 - 31.
44. Sae-ung *et al* (2012). Phenotypic expression of hemoglobins A2, E and F in various hemoglobin E related disorders. *Blood Cells, Molecules, and Diseases*, 48, 11–16.
45. A. Cao and R. Galanello (2010) Beta-thalassemia. *Genetics in Medicine*, 12 (2) : 61 – 76.
46. R.Z. Azma *et al* (2012) Co-inheritance of compound heterozygous Hb Constant Spring and a single – α3.7 gene deletion with heterozygous δβ thalassaemia: A diagnostic challenge. Malaysian J. Pathol. ; 34(1) : 57 – 62.
47. C.L. Harteveld and D.R. Higgs (2010) α-thalassaemia. *Orphanet Journal of Rare Diseases*, 5, 13.

TABLEAU / TABLE

CAPILLARYS HEMOGLOBIN(E) : VARIANTS POTENTIELS PRÉSENTS DANS CHAQUE ZONE
POTENTIAL VARIANTS LOCATED IN EACH ZONE

Zone	Hémoglobines / Hemoglobins (Hb)
Z1	Hb Santa Ana (pic mineur) #, Hb Mizuho (pic mineur) #, Hb delta A'2, Hb A2-Canebière, Hb A2-Lampang, Hb S-Oman, Hb A2-Turkish, Hb T-Cambodia, Hb Poissy (pic mineur) #, variant de Hb A2 "Chad" #, variant de Hb A2 "Savaria" #, variant de Hb A2 "Arya" #, variant de Hb A2 "Hasharon" #, variant de Hb A2 "Fort de France" #, variant de Hb A2 "Ottawa" #, variant de Hb A2 "Shimonoseki" #, variant de Hb A2 "Russ" (alpha 2) #, variant de Hb A2 "Russ" (alpha 1) #, variant de Hb A2 "Matsue-Oki" #, variant de Hb A2 "Reims" #, variant de Hb A2 "Mizushi" #, variant de Hb A2 "Stanleyville-II" #, variant de Hb A2 "O-Indonesia" #, variant de Hb A2 "San Antonio" #, variant de Hb A2 "G-Audhali" #, variant de Hb A2 "Handsworth" #, variant de Hb A2 "G-Philadelphia" #, variant de Hb A2 "Q-India" #, variant de Hb A2 "Memphis" #, variant de Hb A2 "Q-Iran" #, variant de Hb A2 "G-Waimanalo" #, variant de Hb A2 "Watts" #, variant de Hb A2 "Spanish Town" #, variant de Hb A2 "Montgomery" #, variant de Hb A2 "G-Norfolk" #, variant de Hb A2 "Inkster" #, variant de Hb A2 "Ube-4" #, variant de Hb A2 "G-Pest" #, variant de Hb A2 "Winnipeg" #, variant de Hb A2 "Queens" #, variant de Hb A2 "Etobicoke" #, variant de Hb A2 "Chapel Hill" #, variant de Hb A2 "Park Ridge" #, variant de Hb A2 "Q-Thailand" #, variant de Hb A2 "Delfzicht" # !!
	Hb Santa Ana (minor peak) #, Hb Mizuho (minor peak) #, Hb delta A'2, Hb A2-Canebière, Hb A2-Lampang, Hb S-Oman, Hb A2-Turkish, Hb T-Cambodia, Hb Poissy (minor peak) #, "Chad" Hb A2 variant #, "Savaria" Hb A2 variant #, "Arya" Hb A2 variant #, "Hasharon" Hb A2 variant #, "Fort de France" Hb A2 variant #, "Ottawa" Hb A2 variant #, "Shimonoseki" Hb A2 variant #, "Russ" Hb A2 variant (alpha 2) #, "Russ" Hb A2 variant (alpha 1) #, "Matsue-Oki" Hb A2 variant #, "Reims" Hb A2 variant #, "Mizushi" Hb A2 variant #, "Stanleyville-II" Hb A2 variant #, "O-Indonesia" Hb A2 variant #, "San Antonio" Hb A2 variant #, "G-Audhali" Hb A2 variant #, "Handsworth" Hb A2 variant #, "G-Philadelphia" Hb A2 variant #, "Q-India" Hb A2 variant #, "Memphis" Hb A2 variant #, "Q-Iran" Hb A2 variant #, "G-Waimanalo" Hb A2 variant #, "Watts" Hb A2 variant #, "Spanish Town" Hb A2 variant #, "Montgomery" Hb A2 variant #, "G-Norfolk" Hb A2 variant #, "Inkster" Hb A2 variant #, "Ube-4" Hb A2 variant #, "G-Pest" Hb A2 variant #, "Winnipeg" Hb A2 variant #, "Queens" Hb A2 variant #, "Etobicoke" Hb A2 variant #, "Chapel Hill" Hb A2 variant #, "Park Ridge" Hb A2 variant #, "Q-Thailand" Hb A2 variant #, "Delfzicht" Hb A2 variant # !!
Z(C)	Hb C-Ziguinchor !!, Hb F-Hull, Hb F-Texas-I, Hb Constant Spring, Hb Paksé, Hb C, Hb C-Harlem (C-Georgetown), variant de Hb A2 "Les Lilas" #, variant de Hb A2 "Boumerdes" #, variant de Hb A2 "Tarrant" #, variant de Hb A2 "Dunn" #, variant de Hb A2 "Bassett" #, variant de Hb A2 "Sassari" #, variant de Hb A2 "St. Luke's" #, variant de Hb A2 "Verdun" #, variant de Hb A2 "Manitoba-I" #, variant de Hb A2 "Setif" #, variant de Hb A2 "Sunshine Seth" #, variant de Hb A2 "Titusville" #, variant de Hb A2 "Swan River" #, variant de Hb A2 "Manitoba-II" #, variant de Hb A2 "Val de Marne" #
	Hb C-Ziguinchor !!, Hb F-Hull, Hb F-Texas-I, Hb Constant Spring, Hb Paksé, Hb C, Hb C-Harlem (C-Georgetown), "Les Lilas" Hb A2 variant #, "Boumerdes" Hb A2 variant #, "Tarrant" Hb A2 variant #, "Dunn" Hb A2 variant #, "Bassett" Hb A2 variant #, "Sassari" Hb A2 variant #, "St. Luke's" Hb A2 variant #, "Verdun" Hb A2 variant #, "Manitoba-I" Hb A2 variant #, "Setif" Hb A2 variant #, "Sunshine Seth" Hb A2 variant #, "Titusville" Hb A2 variant #, "Swan River" Hb A2 variant #, "Manitoba-II" Hb A2 variant #, "Val de Marne" Hb A2 variant #
Z(A2)	Hb A2, Hb Chad (E-Keelung) #, Hb A2-Madrid *, Hb A2-Saint Denis *, Hb A2-Saint-Etienne *, Hb Hong Kong (cas anti-Lepore), Hb O-Tibesti, Hb Gun Hill, Hb O-Arab, Hb E-Saskatoon, Hb Shuangfeng, variant de Hb A2 "Charolles" #, variant de Hb A2 "Roubaix" #, variant de Hb A2 "El Escorial" * #, variant de Hb A2 "Dallas" * #, variant de Hb A2 "Barika" * #, variant de Hb A2 "Melusine" * #, variant de Hb A2 "Jura" #, variant de Hb A2 "Nouakchott" #, variant de Hb A2 "Pohnpei" #
	*Hb A2, Hb Chad (E-Keelung) #, Hb A2-Madrid *, Hb A2-Saint Denis *, Hb A2-Saint-Etienne *, Hb Hong Kong (anti-Lepore case), Hb O-Tibesti, Hb Gun Hill, Hb O-Arab, Hb E-Saskatoon, Hb Shuangfeng, "Charolles" Hb A2 variant #, "Roubaix" Hb A2 variant #, "El Escorial" Hb A2 variant * #, "Dallas" Hb A2 variant * #, "Barika" Hb A2 variant * #, "Melusine" Hb A2 variant * #, "Jura" Hb A2 variant #, "Nouakchott" Hb A2 variant #, "Pohnpei" Hb A2 variant #*
Z(E)	Hb Hornchurch, Hb Seal Rock, Hb Köln (Ube-1) #, Hb Buenos Aires (pic mineur) #, Hb E, Hb Cleveland, Hb M-Saskatoon (pic mineur) #, Hb G-Siriraj, Hb A2-Babinga, Hb F-Moyen Orient, Hb O-Padova, Hb Agenogi, Hb Sabine #, Hb Santa Ana #, Hb Savaria # !!, Hb Djelfa (pic 3) # !!, variant de Hb A2 "M-Iwate" #, variant de Hb A2 "Saint Claude" #, variant de Hb A2 "Jackson" (alpha 2) #, Hb C dégradée
	Hb Hornchurch, Hb Seal Rock, Hb Köln (Ube-1) #, Hb Buenos Aires (minor peak) #, Hb E, Hb Cleveland, Hb M-Saskatoon (minor peak) #, Hb G-Siriraj, Hb A2-Babinga, Hb F-Moyen Orient, Hb O-Padova, Hb Agenogi, Hb Sabine #, Hb Santa Ana #, Hb Savaria # !!, Hb Djelfa (peak 3) # !!, "M-Iwate" Hb A2 variant #, "Saint Claude" Hb A2 variant #, "Jackson" Hb A2 variant (alpha 2) #, denatured Hb C
Z(S)	Hb Arya # !!, Hb Kenya (HPFH-7), Hb Hasharon (Sinai) #, Hb Dhofar (Yukuhashi), Hb Shimonoseki (Hikoshima) #, Hb O-Indonesia (Buginese-X) #, Hb Machida, Hb Vexin, Hb Corbeil, Hb Ottawa (Siam) #, Hb Fort de France #, Hb S, Hb G-Makassar, Hb Montgomery #, Hb G-Copenhagen, Hb S-Antilles, Hb Handsworth #, Hb Lavagna, Hb Poissy #, Hb Hamadan, Hb Belfast, Hb Russ (alpha 1) #, Hb Russ (alpha 2) #, Hb Evanston, Hb Stanleyville-II # !!, Hb Cocody !!, Hb Reims # !!, variant de Hb A2 "Tokoname" #, variant de Hb A2 "Wayne" (pic 1) #, variant de Hb A2 "Pisa" #, variant de Hb A2 "J-Oxford" #, variant de Hb A2 "Lombard" #, variant de Hb A2 "Tatras" #, variant de Hb A2 "J-Cape Town" (alpha 2) #, variant de Hb A2 "Thionville" #, variant de Hb A2 "J-Cape Town" (alpha 1) #, variant de Hb A2 "Cemenelum" #, variant de Hb A2 "Nikaia" #, variant de Hb A2 "Hopkins-II" (alpha 1) #, variant de Hb A2 "Jackson" (alpha 1) #, variant de Hb A2 "Hopkins-II" (alpha 2) #, variant de Hb A2 "Singapore" # !!, Hb O-Arab dégradée
	Hb Arya # !!, Hb Kenya (HPFH-7), Hb Hasharon (Sinai) #, Hb Dhofar (Yukuhashi), Hb Shimonoseki (Hikoshima) #, Hb O-Indonesia (Buginese-X) #, Hb Machida, Hb Vexin, Hb Corbeil, Hb Ottawa (Siam) #, Hb Fort de France #, Hb S, Hb G-Makassar, Hb Montgomery #, Hb G-Copenhagen, Hb S-Antilles, Hb Handsworth #, Hb Lavagna, Hb Poissy #, Hb Hamadan, Hb Belfast, Hb Russ (alpha 1) #, Hb Russ (alpha 2) #, Hb Evanston, Hb Stanleyville-II # !!, Hb Cocody !!, Hb Reims # !!, "Tokoname" Hb A2 variant #, "Wayne" Hb A2 variant (peak 1) #, "Pisa" Hb A2 variant #, "J-Oxford" Hb A2 variant #, "Lombard" Hb A2 variant #, "Tatras" Hb A2 variant #, "J-Cape Town" Hb A2 variant (alpha 2) #, "Thionville" Hb A2 variant #, "J-Cape Town" Hb A2 variant (alpha 1) #, "Cemenelum" Hb A2 variant #, "Nikaia" Hb A2 variant #, "Hopkins-II" Hb A2 variant (alpha 1) #, "Jackson" Hb A2 variant (alpha 1) #, "Hopkins-II" Hb A2 variant (alpha 2) #, "Singapore" Hb A2 variant # !!, denatured Hb O-Arab

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CAPILLARYS HEMOGLOBIN(E) : VARIANTS POTENTIELS PRÉSENTS DANS CHAQUE ZONE
POTENTIAL VARIANTS LOCATED IN EACH ZONE

Zone	Hémoglobines / Hemoglobins (Hb)
Z(D)	Hb Memphis # !!, Hb G-Audhali # !!, Hb G-Szuhu (Gifu) !!, Hb Leiden !!, Hb Beograd (D-Camperdown), Hb Muravera, Hb D-Bushman, Hb Gavello, Hb Sogn, Hb Matsue-Oki #, Hb Osu Christiansborg, Hb D-Punjab (D-Los Angeles), Hb Watts #, Hb A2-Coburg, Hb G-Waimanalo (Aida) #, Hb Q-India #, Hb Muskegon, Hb D-Ibadan, Hb Buenos Aires (pic mineur) #, Hb Lepore-BW, Hb Q-Iran #, Hb Akron, Hb Summer Hill, Hb G-Philadelphia #, Hb Karlskoga, Hb D-Ouled Rabah, Hb Aichi, Hb Oleander, Hb Yaizu, Hb Kenitra, Hb San Antonio #, Hb Aalborg, Hb Al-Hammadi Riyadh, Hb Ocho Rios, Hb Rocky Mountain (Paddington), Hb Lepore-Hollandia, Hb Quin-Hai, Hb Fort Worth, Hb Mizushi #, Hb G-Honolulu (G-Chinese), Hb Redondo (Isehara), Hb Lepore-Baltimore, Hb G-Ferrara, Hb Djelfa (pic 2) #, Hb G-Hsi-Tsou, Hb Hackney (Xu Chang), Hb Rothschild, Hb Spanish Town #, Hb Korle-Bu (G-Accra), Hb Khartoum, Hb Moabit, Hb Mobile, Hb Köln (Ube-1) #, Hb G-Norfolk #, Hb Ube-4 #, Hb Maputo, Hb Etobicoke #, Hb D-Iran, Hb Caribbean, Hb Okaloosa, Hb St. Luke's #, Hb G-Taipei, Hb G-Coushatta (G-Saskatoon), Hb Winnipeg #, Hb Canuts [A2], Hb Inkster #, Hb Zürich, Hb G-Pest #, Hb P-Galveston, Hb Queens (Ogi) #, Hb Canuts, Hb Aubenas, Hb Setif #, Hb P-Nilotic, Hb G-Galveston (G-Port Arthur), Hb Sunshine Seth # !!, Hb King's Mill !!, Hb Henri Mondor !!, Hb Titusville # !!, variant de Hb A2 "J-Sardegna" # !!, variant de Hb A2 "Suresnes" # !!, variant de Hb A2 "J-Meerut" (alpha 2) #, variant de Hb A2 "J-Broussais" (alpha 2) #, variant de Hb A2 "J-Rajappen" #, variant de Hb A2 "J-Anatolia" #, variant de Hb A2 "J-Meerut" (alpha 1) #, variant de Hb A2 "Ube-2" #, variant de Hb A2 "J-Broussais" (alpha 1) #, variant de Hb A2 "J-Abidjan" #, variant de Hb A2 "J-Toronto" (alpha 1) #, variant de Hb A2 "Mexico" (alpha 2) #, variant de Hb A2 "Thailand" #, variant de Hb A2 "Mexico" (alpha 1) #, variant de Hb A2 "J-Tongariki" #, variant de Hb A2 "Belliard" #, variant de Hb A2 "Neuilly-sur-Marne" #, variant de Hb A2 "J-Wenchang-Wuming" #, variant de Hb A2 "J-Paris-I" (alpha 2) #, variant de Hb A2 "J-Habana" #, variant de Hb A2 "J-Paris-I" (alpha 1) #, Hb E dégradée
	Hb Memphis # !!, Hb G-Audhali # !!, Hb G-Szuhu (Gifu) !!, Hb Leiden !!, Hb Beograd (D-Camperdown), Hb Muravera, Hb D-Bushman, Hb Gavello, Hb Sogn, Hb Matsue-Oki #, Hb Osu Christiansborg, Hb D-Punjab (D-Los Angeles), Hb Watts #, Hb A2-Coburg, Hb G-Waimanalo (Aida) #, Hb Q-India #, Hb Muskegon, Hb D-Ibadan, Hb Buenos Aires (minor peak) #, Hb Lepore-BW, Hb Q-Iran #, Hb Akron, Hb Summer Hill, Hb G-Philadelphia #, Hb Karlskoga, Hb D-Ouled Rabah, Hb Aichi, Hb Oleander, Hb Yaizu, Hb Kenitra, Hb San Antonio #, Hb Aalborg, Hb Al-Hammadi Riyadh, Hb Ocho Rios, Hb Rocky Mountain (Paddington), Hb Lepore-Hollandia, Hb Quin-Hai, Hb Fort Worth, Hb Mizushi #, Hb G-Honolulu (G-Chinese), Hb Redondo (Isehara), Hb Lepore-Baltimore, Hb G-Ferrara, Hb Djelfa (peak 2) #, Hb G-Hsi-Tsou, Hb Hackney (Xu Chang), Hb Rothschild, Hb Spanish Town #, Hb Korle-Bu (G-Accra), Hb Khartoum, Hb Moabit, Hb Mobile, Hb Köln (Ube-1) #, Hb G-Norfolk #, Hb Ube-4 #, Hb Maputo, Hb Etobicoke #, Hb D-Iran, Hb Caribbean, Hb Okaloosa, Hb St. Luke's #, Hb G-Taipei, Hb G-Coushatta (G-Saskatoon), Hb Winnipeg #, Hb Canuts [A2], Hb Inkster #, Hb Zürich, Hb G-Pest #, Hb P-Galveston, Hb Queens (Ogi) #, Hb Canuts, Hb Aubenas, Hb Setif #, Hb P-Nilotic, Hb G-Galveston (G-Port Arthur), Hb Sunshine Seth # !!, Hb King's Mill !!, Hb Henri Mondor !!, Hb Titusville # !!, "J-Sardegna" Hb A2 variant # !!, "Suresnes" Hb A2 variant # !!, "J-Meerut" Hb A2 variant (alpha 2) #, "J-Broussais" Hb A2 variant (alpha 2) #, "J-Rajappen" Hb A2 variant #, "J-Anatolia" Hb A2 variant #, "J-Meerut" Hb A2 variant (alpha 1) #, "Ube-2" Hb A2 variant #, "J-Broussais" Hb A2 variant (alpha 1) #, "J-Abidjan" Hb A2 variant #, "J-Toronto" Hb A2 variant (alpha 1) #, "Mexico" Hb A2 variant (alpha 2) #, "Thailand" Hb A2 variant #, "Mexico" Hb A2 variant (alpha 1) #, "J-Tongariki" Hb A2 variant #, "Belliard" Hb A2 variant #, "Neuilly-sur-Marne" Hb A2 variant #, "J-Wenchang-Wuming" Hb A2 variant #, "J-Paris-I" Hb A2 variant (alpha 2) #, "J-Habana" Hb A2 variant #, "J-Paris-I" Hb A2 variant (alpha 1) #, denatured Hb E
Z(F)	Hb F, Hb Willamette !!, Hb Hoshida (Chaya) !!, Hb Languidic, Hb Chiapas, Hb P-India, Hb Tamano, Hb Sunnybrook, Hb Park Ridge #, Hb Delfzicht #, Hb Atago, Hb Deer Lodge, Hb Alabama, Hb Chapel Hill #, Hb Bunbury, Hb Tak, Hb Q-Thailand (G-Taichung) #, Hb Sabine #, Hb Bassett #, Hb Boyle Heights, Hb Les Lilas #, Hb Rampa, Hb Haaglanden, Hb G-Georgia, Hb Barcelona, Hb G-San José, Hb Denmark Hill, Hb Pôrto Alegre, Hb F-Sardinia, Hb Geldrop Santa Anna, Hb Ta-Li, Hb Chongqing, Hb Richmond, Hb Hirose, Hb Abruzzo, Hb Boumerdes #, Hb British Columbia, Hb Kansas, Hb Tarrant #, Hb Verdun #, Hb Swan River #, Hb Attleboro, Hb Sawara, Hb Burke, Hb Dunn #, Hb Manitoba-I #, Hb Manitoba-II #, Hb Sassari #, Hb Hazebrouck !!, Hb Port Phillip !!, Hb Vanderbilt !!, variant de Hb A2 "J-Rovigo" # !!, variant de Hb A2 "Wayne" (pic 2) # !!, Hb S dégradée, Hb D-Punjab dégradée
	Hb F, Hb Willamette !!, Hb Hoshida (Chaya) !!, Hb Languidic, Hb Chiapas, Hb P-India, Hb Tamano, Hb Sunnybrook, Hb Park Ridge #, Hb Delfzicht #, Hb Atago, Hb Deer Lodge, Hb Alabama, Hb Chapel Hill #, Hb Bunbury, Hb Tak, Hb Q-Thailand (G-Taichung) #, Hb Sabine #, Hb Bassett #, Hb Boyle Heights, Hb Les Lilas #, Hb Rampa, Hb Haaglanden, Hb G-Georgia, Hb Barcelona, Hb G-San José, Hb Denmark Hill, Hb Pôrto Alegre, Hb F-Sardinia, Hb Geldrop Santa Anna, Hb Ta-Li, Hb Chongqing, Hb Richmond, Hb Hirose, Hb Abruzzo, Hb Boumerdes #, Hb British Columbia, Hb Kansas, Hb Tarrant #, Hb Verdun #, Hb Swan River #, Hb Attleboro, Hb Sawara, Hb Burke, Hb Dunn #, Hb Manitoba-I #, Hb Manitoba-II #, Hb Sassari #, Hb Hazebrouck !!, Hb Port Phillip !!, Hb Vanderbilt !!, "J-Rovigo" Hb A2 variant # !!, "Wayne" Hb A2 variant (peak 2) # !!, denatured Hb S, denatured Hb D-Punjab
Z8	Hb F acétylée, Hb Grifton !!, Hb Lansing !!, Hb Hinsdale !!, Hb Ypsilanti (Ypsi - pic 1) # !!, Hb Auckland !!, Hb Roanne, Hb Southampton (Casper), Hb Yakima, Hb Saint Mandé, Hb Alberta, Hb Bruxelles, Hb Beth Israel, Hb Val de Marne (Footscray) #, Hb Kempsey, Hb Shelby (Leslie), Hb Atlanta, Hb Chemilly, Hb S-Clichy, Hb Sarrebourg, Hb Ypsilanti (Ypsi - pic 2) #, Hb Charolles #, Hb Athens-GA (Waco), Hb Debrousse, Hb Köln (Ube-1) #, Hb Aubagne, Hb Rainier
	Acetylated Hb F, Hb Grifton !!, Hb Lansing !!, Hb Hinsdale !!, Hb Ypsilanti (Ypsi - peak 1) # !!, Hb Auckland !!, Hb Roanne, Hb Southampton (Casper), Hb Yakima, Hb Saint Mandé, Hb Alberta, Hb Bruxelles, Hb Beth Israel, Hb Val de Marne (Footscray) #, Hb Kempsey, Hb Shelby (Leslie), Hb Atlanta, Hb Chemilly, Hb S-Clichy, Hb Sarrebourg, Hb Ypsilanti (Ypsi - peak 2) #, Hb Charolles #, Hb Athens-GA (Waco), Hb Debrousse, Hb Köln (Ube-1) #, Hb Aubagne, Hb Rainier

TABLEAU / TABLE

CAPILLARYS HEMOGLOBIN(E) : VARIANTS POTENTIELS PRÉSENTS DANS CHAQUE ZONE
POTENTIAL VARIANTS LOCATED IN EACH ZONE

Zone	Hémoglobines / Hemoglobins (Hb)
Z(A)	Hb A, Hb Presbyterian *, Hb Roubaix (Poland) * #, Hb Silver Springs *, Hb El Escorial * #, Hb Dallas * #, Hb Phnom Penh *, Hb La Coruna *, Hb Bougardirey-Mali *, Hb Saint Nazaire *, Hb Barika * #, Hb Allentown *, Hb Allison Park *, Hb Alperton *, Hb Altdorf *, Hb Alzette *, Hb Anamosa *, Hb Antibes-Juan-Les-Pins *, Hb Arta (pic majeur) * #, Hb Aurillac *, Hb Austin *, Hb Aylesbury *, Hb Aztec *, Hb Bass Hill *, Hb Beirut *, Hb Belleville *, Hb Belluno *, Hb Bethesda *, Hb Bibba *, Hb Bladensburg *, Hb Boghé *, Hb Bonn *, Hb Brem-sur-Mer *, Hb Brest *, Hb Brigham *, Hb Brisbane (Great Lakes) *, Hb Broomhill *, Hb Brugg *, Hb Buenos Aires (Bryn Mawr - pic majeur) * #, Hb Buffalo (Reeuwijk) *, Hb Bushwick *, Hb Caen *, Hb Calvino *, Hb Cardarelli *, Hb Cheverly *, Hb Chicago *, Hb City of Hope *, Hb Coimbra (Ingelheim) *, Hb Columbia Missouri *, Hb Conakry *, Hb Cowtown *, Hb Crete *, Hb Dapu *, Hb Den Haag *, Hb Denver *, Hb Dhaka *, Hb Dhonburi (Neapolis) *, Hb Djelfa (pic 1) * #, Hb Ecuador *, Hb Evans *, Hb Flurlingen *, Hb Fontainebleau *, Hb Frankfurt *, Hb Fukuoka *, Hb Fukuyama *, Hb Geisinger *, Hb Genova (Hyogo) *, Hb Godavari *, Hb Gorwihl (Hinchingbrooke) *, Hb Gouda *, Hb Grange Blanche *, Hb Groene Hart (Bernalda) *, Hb Grove City *, Hb Guanajuato *, Hb Haelen *, Hb Hamilton *, Hb Hammersmith (Chiba) *, Hb Heathrow *, Hb Hekinan *, Hb Hershey *, Hb Hyden *, Hb Inglewood *, Hb Iowa *, Hb Iraq-Halabja *, Hb Jabalpur *, Hb Jeddah *, Hb Johnstown *, Hb Kaiser West End *, Hb Kansas City *, Hb King Ecgbert *, Hb Knossos *, Hb Kokomo *, Hb Kosovo *, Hb La Desirade *, Hb Le Lamentin *, Hb Les Andelys *, Hb Linköping (Meilahti) *, Hb Lisbon *, Hb Little Rock *, Hb Louisville (Bucuresti) *, Hb Lulu Island *, Hb Lyon-Bron *, Hb M-Boston (M-Osaka) *, Hb M-Saskatoon (pic majeur) * #, Hb McKees Rocks *, Hb Malay *, Hb Malmö *, Hb Marijampolé *, Hb Marseille (Long Island) *, Hb Matsudo *, Hb Milledgeville *, Hb Minneapolis Laos *, Hb Mizuho * #, Hb Moriguchi *, Hb Mosella *, Hb Nakhon Ratchasima (Aberystwyth) *, Hb Nantes *, Hb Niguarda *, Hb Noko *, Hb Novara *, Hb Okayama *, Hb Olupona *, Hb Olympia *, Hb Owari *, Hb Ozieri *, Hb Parma *, Hb Part-Dieu *, Hb Perth (Abraham Lincoln) *, Hb Petit Bourg *, Hb Pierre-Bénite *, Hb Pittsburgh *, Hb Pohnpei * #, Hb Port Huron *, Hb Potomac *, Hb Pressath *, Hb Princes Risborough *, Hb Puttelange *, Hb Raleigh *, Hb Ramona *, Hb Ravenscourt Park *, Hb Regina *, Hb Rhode Island (Southwark) *, Hb Riccarton *, Hb Rio Claro *, Hb Rotterdam *, Hb Rouen (Ethiopia) *, Hb Saclay *, Hb Saint-Clair *, Hb Saint-Jacques *, Hb St Joseph's *, Hb Saint-Marcellin *, Hb Saki *, Hb San Bruno *, Hb San Diego *, Hb San Martin *, Hb Santa Barnabas (Croxley Green) *, Hb Santa Juana (Serres) *, Hb Savannah *, Hb Saveh *, Hb Sendagi (Warsaw) *, Hb Sheffield *, Hb Sitia *, Hb Sodertalje *, Hb South Florida *, Hb South Milwaukee *, Hb South Yorkshire *, Hb Sydney *, Hb Taradale (Middlesbrough) *, Hb Taybe *, Hb Templeuve *, Hb Torino *, Hb Toulon *, Hb Twin Peaks *, Hb Ty Gard *, Hb Tyne *, Hb Utrecht *, Hb Uzes *, Hb Valletta *, Hb Valme *, Hb Venetia *, Hb Verona *, Hb Vientiane (Grey Lynn) *, Hb Vila Real *, Hb Villejuif *, Hb Villeparisis *, Hb Villeurbanne *, Hb Volga (Drenthe) *, Hb Voorhees *, Hb Washtenaw *, Hb Waterland *, Hb Weesp *, Hb Wembley *, Hb Westmead *, Hb Wiangpapao *, Hb William-Harvey *, Hb Wood *, Hb Worthing *, Hb Yaounde (Mataro) *, Hb Zoetermeer *, Hb Sinai-Baltimore *, Hb M-Milwaukee-I *, Hb Melusine * #, Hb Pitie-Salpetriere *, Hb Syracuse *, Hb Hounslow, Hb Fort Dodge, Hb Old Dominion (OD/BuT), Hb Camperdown, Hb Duarte !!, Hb Jura (Bamako) # !!
	*Hb A, Hb Presbyterian *, Hb Roubaix (Poland) * #, Hb Silver Springs *, Hb El Escorial * #, Hb Dallas * #, Hb Phnom Penh *, Hb La Coruna *, Hb Bougardirey-Mali *, Hb Saint Nazaire *, Hb Barika * #, Hb Allentown *, Hb Allison Park *, Hb Alperton *, Hb Altdorf *, Hb Alzette *, Hb Anamosa *, Hb Antibes-Juan-Les-Pins *, Hb Arta (main peak) * #, Hb Aurillac *, Hb Austin *, Hb Aylesbury *, Hb Aztec *, Hb Bass Hill *, Hb Beirut *, Hb Belleville *, Hb Belluno *, Hb Bethesda *, Hb Bibba *, Hb Bladensburg *, Hb Boghé *, Hb Bonn *, Hb Brem-sur-Mer *, Hb Brest *, Hb Brigham *, Hb Brisbane (Great Lakes) *, Hb Broomhill *, Hb Brugg *, Hb Buenos Aires (Bryn Mawr, major peak) * #, Hb Buffalo (Reeuwijk) *, Hb Bushwick *, Hb Caen *, Hb Calvino *, Hb Cardarelli *, Hb Cheverly *, Hb Chicago *, Hb City of Hope *, Hb Coimbra (Ingelheim) *, Hb Columbia Missouri *, Hb Conakry *, Hb Cowtown *, Hb Crete *, Hb Dapu *, Hb Den Haag *, Hb Denver *, Hb Dhaka *, Hb Dhonburi (Neapolis) *, Hb Djelfa (peak 1) * #, Hb Ecuador *, Hb Evans *, Hb Flurlingen *, Hb Fontainebleau *, Hb Frankfurt *, Hb Fukuoka *, Hb Fukuyama *, Hb Geisinger *, Hb Genova (Hyogo) *, Hb Godavari *, Hb Gorwihl (Hinchingbrooke) *, Hb Gouda *, Hb Grange Blanche *, Hb Groene Hart (Bernalda) *, Hb Grove City *, Hb Guanajuato *, Hb Haelen *, Hb Hamilton *, Hb Hammersmith (Chiba) *, Hb Heathrow *, Hb Hekinan *, Hb Hershey *, Hb Hyden *, Hb Inglewood *, Hb Iowa *, Hb Iraq-Halabja *, Hb Jabalpur *, Hb Jeddah *, Hb Johnstown *, Hb Kaiser West End *, Hb Kansas City *, Hb King Ecgbert *, Hb Knossos *, Hb Kokomo *, Hb Kosovo *, Hb La Desirade *, Hb Le Lamentin *, Hb Les Andelys *, Hb Linköping (Meilahti) *, Hb Lisbon *, Hb Little Rock *, Hb Louisville (Bucuresti) *, Hb Lulu Island *, Hb Lyon-Bron *, Hb M-Boston (M-Osaka) *, Hb M-Saskatoon (main peak) * #, Hb McKees Rocks *, Hb Malay *, Hb Malmö *, Hb Marijampolé *, Hb Marseille (Long Island) *, Hb Matsudo *, Hb Milledgeville *, Hb Minneapolis Laos *, Hb Mizuho * #, Hb Moriguchi *, Hb Mosella *, Hb Nakhon Ratchasima (Aberystwyth) *, Hb Nantes *, Hb Niguarda *, Hb Noko *, Hb Novara *, Hb Okayama *, Hb Olupona *, Hb Olympia *, Hb Owari *, Hb Ozieri *, Hb Parma *, Hb Part-Dieu *, Hb Perth (Abraham Lincoln) *, Hb Petit Bourg *, Hb Pierre-Bénite *, Hb Pittsburgh *, Hb Pohnpei * #, Hb Port Huron *, Hb Potomac *, Hb Pressath *, Hb Princes Risborough *, Hb Puttelange *, Hb Raleigh *, Hb Ramona *, Hb Ravenscourt Park *, Hb Regina *, Hb Rhode Island (Southwark) *, Hb Riccarton *, Hb Rio Claro *, Hb Rotterdam *, Hb Rouen (Ethiopia) *, Hb Saclay *, Hb Saint-Clair *, Hb Saint-Jacques *, Hb St Joseph's *, Hb Saint-Marcellin *, Hb Saki *, Hb San Bruno *, Hb San Diego *, Hb San Martin *, Hb Santa Barnabas (Croxley Green) *, Hb Santa Juana (Serres) *, Hb Savannah *, Hb Saveh *, Hb Sendagi (Warsaw) *, Hb Sheffield *, Hb Sitia *, Hb Sodertalje *, Hb South Florida *, Hb South Milwaukee *, Hb South Yorkshire *, Hb Sydney *, Hb Taradale (Middlesbrough) *, Hb Taybe *, Hb Templeuve *, Hb Torino *, Hb Toulon *, Hb Twin Peaks *, Hb Ty Gard *, Hb Tyne *, Hb Utrecht *, Hb Uzes *, Hb Valletta *, Hb Valme *, Hb Venetia *, Hb Verona *, Hb Vientiane (Grey Lynn) *, Hb Vila Real *, Hb Villejuif *, Hb Villeparisis *, Hb Villeurbanne *, Hb Volga (Drenthe) *, Hb Voorhees *, Hb Washtenaw *, Hb Waterland *, Hb Weesp *, Hb Wembley *, Hb Westmead *, Hb Wiangpapao *, Hb William-Harvey *, Hb Wood *, Hb Worthing *, Hb Yaounde (Mataro) *, Hb Zoetermeer *, Hb Sinai-Baltimore *, Hb M-Milwaukee-I *, Hb Melusine * #, Hb Pitie-Salpetriere *, Hb Syracuse *, Hb Hounslow, Hb Fort Dodge, Hb Old Dominion (OD/BuT), Hb Camperdown, Hb Duarte !!, Hb Jura (Bamako) # !!*

TABLEAU / TABLE

CAPILLARYS HEMOGLOBIN(E) : VARIANTS POTENTIELS PRÉSENTS DANS CHAQUE ZONE
POTENTIAL VARIANTS LOCATED IN EACH ZONE

Zone	Hémoglobines / Hemoglobins (Hb)
Z10	Hb Stockholm !!, Hb Créteil, Hb Nouakchott #, Hb M-Iwate (M-Kankakee) #, Hb Wayne (pic 1) #, Hb Complutense, Hb Camden (Tokuchi), Hb Hope
	Hb Stockholm !!, Hb Créteil, Hb Nouakchott #, Hb M-Iwate (M-Kankakee) #, Hb Wayne (peak 1) #, Hb Complutense, Hb Camden (Tokuchi), Hb Hope
Z11	Hb A dégradée, Hb Vaasa, Hb Tacoma, Hb Providence (pic X-Asn) #, Hb Yamagata, Hb Shepherds Bush, Hb Cook, Hb Corsica, Hb Pisa #, Hb K-Woolwich, Hb Lombard #, Hb J-Guantanamo, Hb Andrew Minneapolis, Hb J-Cape Town (alpha 1) #, Hb Kaohsiung (New York), Hb Fannin-Lubbock I, Hb Saint Claude #, Hb Thionville #, Hb Jackson (alpha 2) #, Hb J-Cape Town (alpha 2) #, Hb Strasbourg, Hb Osler (Fort Gordon), Hb Helsinki, Hb Doha, Hb Linwood, Hb J-Auckland, Hb Nancy, Hb Chesapeake, Hb Himeji, Hb Singapore #, Hb Jackson (alpha 1) #, Hb Cemenelum # !!, Hb Tatras # !!, variant de Hb A2 "I (I-Texas)" #
	Denatured Hb A, Hb Vaasa, Hb Tacoma, Hb Providence (X-Asn peak) #, Hb Yamagata, Hb Shepherds Bush, Hb Cook, Hb Corsica, Hb Pisa #, Hb K-Woolwich, Hb Lombard #, Hb J-Guantanamo, Hb Andrew Minneapolis, Hb J-Cape Town (alpha 1) #, Hb Kaohsiung (New York), Hb Fannin-Lubbock I, Hb Saint Claude #, Hb Thionville #, Hb Jackson (alpha 2) #, Hb J-Cape Town (alpha 2) #, Hb Strasbourg, Hb Osler (Fort Gordon), Hb Helsinki, Hb Doha, Hb Linwood, Hb J-Auckland, Hb Nancy, Hb Chesapeake, Hb Himeji, Hb Singapore #, Hb Jackson (alpha 1) #, Hb Cemenelum # !!, Hb Tatras # !!, "I (I-Texas)" Hb A2 variant #
Z12	Hb Bart, Hb Nikaia # !!, Hb Tokoname # !!, Hb J-Cubujuqui, Hb Hopkins-II (alpha 1) #, Hb J-Calabria (J-Bari), Hb J-Camagüey, Hb J-Tongariki #, Hb Wayne (pic 2) #, Hb J-Meerut (J-Birmingham - alpha 1) #, Hb Hopkins-II (alpha 2) #, Hb Zaïre, Hb J-Meerut (J-Birmingham - alpha 2) #, Hb Trollhättan, Hb Pyrgos (Mizunami), Hb Providence (pic X-Asp) #, Hb Suresnes #, Hb J-Broussais (Tagawa-I - alpha 2) #, Hb Grady (Dakar - alpha 2), Hb Grady (Dakar - alpha 1), Hb Legnano, Hb Hikari, Hb J-Rajappen #, Hb J-Anatolia #, Hb J-Broussais (Tagawa-I - alpha 1) #, Hb J-Chicago, Hb J-Sardegna #, Hb J-Toronto (alpha 1) #, Hb J-Cordoba, Hb J-Meinung (J-Bangkok), Hb Ube-2 #, Hb Dagestan, Hb J-Cambridge (Rambam), Hb Hofu, Hb J-Abidjan #, Hb Ulm, Hb Belliard #, Hb J-Iran, Hb Riyadh (Karatsu), Hb Mexico (J-Paris-II - alpha 1) #, Hb Mexico (J-Paris-II - alpha 2) #, Hb Neuilly-sur-Marne #, Hb Pontoise (J-Pontoise), Hb Ankara, Hb J-Buda, Hb J-Medellin, Hb J-Paris-I (J-Aljezur - alpha 1) #, Hb Thailand #, Hb J-Habana #, Hb J-Baltimore (N-New Haven), Hb J-Wenchang-Wuming (Anantharaj) #, Hb J-Paris-I (J-Aljezur - alpha 2) #, Hb Beijing, Hb J-Oxford (I-Interlaken) #, Hb K-Ibadan !!
	Hb Bart, Hb Nikaia # !!, Hb Tokoname # !!, Hb J-Cubujuqui, Hb Hopkins-II (alpha 1) #, Hb J-Calabria (J-Bari), Hb J-Camagüey, Hb J-Tongariki #, Hb Wayne (peak 2) #, Hb J-Meerut (J-Birmingham - alpha 1) #, Hb Hopkins-II (alpha 2) #, Hb Zaïre, Hb J-Meerut (J-Birmingham - alpha 2) #, Hb Trollhättan, Hb Pyrgos (Mizunami), Hb Providence (X-Asp peak) #, Hb Suresnes #, Hb J-Broussais (Tagawa-I - alpha 2) #, Hb Grady (Dakar - alpha 2), Hb Grady (Dakar - alpha 1), Hb Legnano, Hb Hikari, Hb J-Rajappen #, Hb J-Anatolia #, Hb J-Broussais (Tagawa-I - alpha 1) #, Hb J-Chicago, Hb J-Sardegna #, Hb J-Toronto (alpha 1) #, Hb J-Cordoba, Hb J-Meinung (J-Bangkok), Hb Ube-2 #, Hb Dagestan, Hb J-Cambridge (Rambam), Hb Hofu, Hb J-Abidjan #, Hb Ulm, Hb Belliard #, Hb J-Iran, Hb Riyadh (Karatsu), Hb Mexico (J-Paris-II - alpha 1) #, Hb Mexico (J-Paris-II - alpha 2) #, Hb Neuilly-sur-Marne #, Hb Pontoise (J-Pontoise), Hb Ankara, Hb J-Buda, Hb J-Medellin, Hb J-Paris-I (J-Aljezur - alpha 1) #, Hb Thailand #, Hb J-Habana #, Hb J-Baltimore (N-New Haven), Hb J-Wenchang-Wuming (Anantharaj) #, Hb J-Paris-I (J-Aljezur - alpha 2) #, Hb Beijing, Hb J-Oxford (I-Interlaken) #, Hb K-Ibadan !!
Z13	Hb Al-Ain Abu Dhabi, Hb J-Europa, Hb N-Baltimore (Hopkins-I), Hb J-Rovigo #, Hb J-Lome, Hb Arta (pic mineur) #, Hb J-Norfolk (Kagoshima), Hb Nigeria, Hb J-Kaohsiung (J-Honolulu)
	Hb Al-Ain Abu Dhabi, Hb J-Europa, Hb N-Baltimore (Hopkins-I), Hb J-Rovigo #, Hb J-Lome, Hb Arta (minor peak) #, Hb J-Norfolk (Kagoshima), Hb Nigeria, Hb J-Kaohsiung (J-Honolulu)
Z14	Hb N-Seattle, Hb J-Tashikuergan
	Hb N-Seattle, Hb J-Tashikuergan
Z15	Hb H, Hb I-Toulouse !!, Hb Sudbury, Hb Kurosaki (alpha 1), Poly A (A->G); AATAAA->AATAAG of the alpha2 gene alpha-Thal-2, Hb Kurosaki (alpha 2), Hb F-Emirates, Hb N-Timone, Hb I (I-Texas, I-Philadelphia) #, Hb Shaare Zedek
	Hb H, Hb I-Toulouse !!, Hb Sudbury, Hb Kurosaki (alpha 1), Poly A (A->G); AATAAA->AATAAG of the alpha2 gene alpha-Thal-2, Hb Kurosaki (alpha 2), Hb F-Emirates, Hb N-Timone, Hb I (I-Texas, I-Philadelphia) #, Hb Shaare Zedek

* Pic non ou peu visible car co-migrant de la fraction normale
Hidden or partially hidden peak due to similar migration time to normal fraction

\# Variant avec plusieurs fractions affichées (variant de la chaîne alpha ou variant instable ...)
Variant with several fractions displayed (alpha-chain or unstable variant ...)

!! Pic en bordure de zone (risque de saut de zone)
Peak in zone boundary (risk of zone shift)

Rappel : dans chaque zone les variants Hb sont listés selon leur temps de migration de droite vers la *gauche*
Reminder: *in each zone Hb variants are sorted according to their migration time from right to left*

TABLEAU / TABLE

FR : VARIANTS POTENTIELS PRÉSENTS DANS CHAQUE ZONE	*Zone*	*Hémoglobines (Hb)*	** Pic peu ou pas visible car migrant conjointement avec la fraction normale*
GB : POTENTIAL VARIANTS LOCATED IN EACH ZONE	*Zone*	*Hemoglobins (Hb)*	** Hidden or partially hidden peak due to similar migration time to normal fraction*
DE : POTENZIELLE VARIANTEN IN DEN EINZELNEN ZONEN	*Zone*	*Hämoglobine (Hb)*	** Versteckter oder teilweise versteckter Spitzenwert infolge ähnlicher Migrationszeit wie bei der normalen Fraktion*
NL : POTENTIËLE VARIANTEN IN ELKE ZONE	*Zone*	*Hemoglobinen (Hb)*	** Verborgen of gedeeltelijk verborgen piek vanwege migratietijd die vergelijkbaar is met normale fractie*
IT : VARIANTI POTENZIALI PRESENTI IN CIASCUNA ZONA	*Zona*	*Emoglobine (Hb)*	** Picco invisibile o scarsamente visibile poiché migrante unitamente alla frazione normale*
ES : VARIANTES POTENCIALES PRESENTES EN CADA ZONA	*Zona*	*Hemoglobinas (Hb)*	** Pico oculto o parcialmente oculto debido a migración conjunta con la fracción normal*
PT : VARIANTES POTENCIAIS LOCALIZADAS EM CADA ZONA	*Zona*	*Hemoglobinas (Hb)*	** Pico oculto ou parcialmente oculto devido a tempo de migração similar para fração normal*
SV : POTENTIELLA VARIANTER BELÄGNA I VARJE ZON	*Zon*	*Hemoglobiner (Hb)*	** Dold eller delvis dold topp på grund av liknande migrationstid till normal fraktion*
GR : ΔΥΝΗΤΙΚΕΣ ΠΑΡΑΛΛΑΓΕΣ ΠΟΥ ΕΝΤΟΠΙΖΟΝΤΑΙ ΣΕ ΚΑΘΕ ΖΩΝΗ	*Ζώνη*	*Αιμοσφαιρίνες (Hb)*	** Απόκρυψη ή μερική απόκρυψη κορυφής λόγω παρόμοιου χρόνου ηλεκτροφόρησης σε φυσιολογικό κλάσμα*
HR : POTENCIJALNE VARIJANTE LOCIRANE U SVAKOJ ZONI	*Zona*	*Hemoglobini (Hb)*	** Vrh je potpuno ili djelomično skriven zbog vremena migracije sličnog onome za normalnu frakciju*
LT : GALIMI VARIANTAI, ESANTYS KIEKVIENOJE ZONOJE	*Zona*	*Hemoglobinas (Hb)*	** Paslėpta arba iš dalies paslėpta viršūnė, nes migracijos laikas panašus į normalios frakcijos migracijos laiką*
PL : POTENCJALNE ODMIANY ZLOKALIZOWANE W KAŻDEJ STREFIE	*Strefa*	*Hemoglobiny (Hb)*	** Ukryty lub częściowo ukryty pik ze względu na podobny czas migracji względem frakcji prawidłowej*
RO : VARIANTE POTENŢIALE SITUATE ÎN FIECARE ZONĂ	*Zonă*	*Hemoglobine (Hb)*	** Vârf ascuns sau parţial ascuns datorită timpului de migrare asemănător cu fracţia normală*
CS : POTENCIÁLNE VARIJANTE KOJE SE NALAZE U SVAKOJ ZONI	*Zona*	*Hemoglobini (Hb)*	** Skrivení ili delimično skrivení vrh zbog sličnog vremena migracije u normalnu frakciju*
HU : LEHETSÉGES VARIÁNSOK AZ EGYES ZÓNÁKBAN	*Zóna*	*Hemoglobinok (Hb)*	** A normál fragmentuméhoz hasonló migrációs idő miatt rejtett vagy részben rejtett csúcs*
TR : HER BİR BÖLGEDE YER ALAN VARYANTLAR	*Bölge*	*Hemoglobinler (Hb)*	** Normal fraksiyona benzer migrasyon süresi nedeniyle gizli veya kısmen gizli pik*
CZ : POTENCIÁLNÍ VARIANTY HEMOGLOBINU UMÍSTĚNÉ V KAŽDÉ ZÓNĚ	*Zóna*	*Hemoglobiny (Hb)*	** Skrytý nebo částečně skrytý pík v důsledku podobné doby migrace normální frakce*
BG : ВЪЗМОЖНИ ВАРИАНТИ, РАЗПОЛОЖЕНИ ВЪВ ВСЯКА ЗОНА	*Зона*	*Хемоглобини (Hb)*	** Скрит или частично скрит пик поради време на миграция, подобно на това на нормалната фракция*
NO : POTENSIELLE VARIANTER PLASSERT I HVER SONE	*Sone*	*Hemoglobiner (Hb)*	** Skjult eller delvis skjult topp på grunn av lignende migreringstid til normal fraksjon*
DK : POTENTIELLE VARIANTER I HVER ZONE	*Zone*	*Hæmoglobiner (Hb)*	** Skjult eller delvist skjult top på grund af lignende migrationstid til normal fraktion*
CN : 每个区中潜在的变种	*区*	*血红蛋白 (Hb)*	**由于电泳时间与普通馏分相似，因此峰被隐藏或部分隐藏*
RU : ВОЗМОЖНЫЕ ВАРИАЦИИ, РАСПОЛОЖЕННЫЕ В КАЖДОЙ ЗОНЕ	*Зона*	*Гемоглобин (Hb)*	** Скрытый или частично скрытый пик по причине схожего времени миграции в нормальную фракцию*
JP : 各ゾーンに位置する潜在的な変異体	*ゾーン*	*ヘモグロビン (Hb)*	** 正常フラクションへの移行時間が同一であるため、非表示または部分的に非表示のピーク*
LV : POTENCIĀLIE VARIANTI KATRĀ ZONĀ	*Zona*	*Hemoglobīns (Hb)*	** Slēpta vai daļēji slēpta maksimālā vērtība, ko izraisa migrācijas laiks, kas ir līdzīgs ar normālu frakciju*
SK : POTENCIÁLNE VARIANTY, KTORÉ SA NACHÁDZAJÚ V KAŽDEJ ZÓNE	*Zóna*	*Hemoglobíny (Hb)*	** Skrytá alebo čiastočne skrytá špička v dôsledku podobného času migrácie ako pri normálnej frakcii*
EE : POTENTSIAALSED VARIANDID IGAS TSOONIS	*Tsoon*	*Hemoglobiinid (Hb)*	** Varjatud või osaliselt varjatud piik normaalse fraktsiooniga sarnase migratsiooniaja tõttu*
VN : BIẾN TIỀM ẨN TẠI MỖI VÙNG	*Vùng*	*Hemoglobin (Hb)*	** Đỉnh ẩn hoặc ẩn một phần vì thời gian di chuyển sang mánh thông thường tương tự*

FR : # Variant avec plusieurs fractions affichées (variant de la chaîne alpha ou variant instable ...)
GB : # Variant with several fractions displayed (alpha-chain or unstable variant ...)
DE : # Variante mit mehreren angezeigten Fraktionen (Alpha-Kette oder instabile Variante ...)
NL : # Variant met verschillende zichtbare fracties (alfaketen of onstabiele variant ...)
IT : # Variante con più frazioni visualizzate (variante della catena alfa o variante instabile, ecc.)
ES : # Variante que presenta varias fracciones (variante de cadena alfa o variante inestable ...)
PT : # Variante com várias frações apresentadas (cadeia alfa ou variante instável, etc.)
SV : # Variant med flera fraktioner som visas (alfa-kedja eller instabil variant ...)
GR : # Παραλλαγή με εμφάνιση πολλών κλασμάτων (άλφα αλυσίδα ή ασταθής παραλλαγή ...)
HR : # Varijanta s nekoliko prikazanih frakcija (alfa-lanac ili nestabilna varijanta...)
LT : # Varianto su keliomis rodomomis frakcijomis nr. (alfa grandis arba nestabilus variantas...)
PL : # odmiany z kilkoma wyświetlanymi frakcjami (łańcuch alfa lub odmiana niestabilna...)
RO : # variantă cu mai multe fracţii afişate (lanţ alfa sau variantă instabilă...)
CS : # Varijanta sa prikazanih nekoliko frakcija (alfa lanac ili nestabilna varijanta ...)
HU : # Több fragmentumot mutató variáns (alfa lánc vagy instabil variáns...)
TR : # Birden çok fraksiyonun görüntülendiği varyant (alfa zincir veya kararsız varyant ...)
CZ : # Varianta s několika zobrazenými frakcemi (alfa řetězce nebo nestálá varianta...)
BG : # Появява се вариант с няколко фракции (алфа-верига или нестабилен вариант ...)
NO : # Variant med flere fraksjoner vises (Alpha-kjeden eller ustabil variant ...)
DK : # Variant med flere fraktioner vist (alfakæde eller ustabil variant ...)
CN : # 显示了多个区带的变体（α 链或不稳定变体...）
RU : # Вариация с отображением нескольких фракций (альфа-цепь или неустойчивая вариация ...)
JP : # 数個のフラクションが表示される変異体（α鎖または不安定な変異体 ...）
LV : # Tiek parādīts variants ar vairākām frakcijām (alfa ķēde vai nestabils variants u. c.)
SK : # Variant s viacerými zobrazenými frakciami (alfa-reťazec alebo nestabilný variant ...)
EE : # Kuvatud on mitme fraktsiooniga variant (alfa-ahel või ebastabiilne variant ...)
VN : # Biến có vài mảnh hiển thị (biến chuỗi alpha hay biến không ổn định...)

!! Pic en bordure de zone (risque de changement de zone)
!! Peak in zone boundary (risk of zone shift)
!! Spitzenwert im Zonengrenzbereich (Risiko einer Zonenverschiebung)
!! Piek in zonegrens (gevaar voor zonevervorming)
!! Picco sul confine di zona (rischio di variazione di zona)
!! Pico en el límite de la zona (riesgo de cambio de zona)
!! Pico no limite da zona (risco de deslocação de zona)
!! Topp i zongränsen (risk för zonförskjutning)
!! Κορυφή σε όριο ζώνης (κίνδυνος μετατόπισης ζώνης)
!! Vrh u granici zone (opasnost od pomaka zone)
!! Viršūnė ant zonos ribos (zonos pasislinkimo pavojus)
!! Pik w granicy strefy (ryzyko przesunięcia strefy)
!! Vârf în limita zonei (risc de schimbare a zonei)
!! Vrh u graničnoj zoni (rizik od pomaka zone)
!! Csúcs a zóna határánál (zónaáttolódás kockázata)
!! Bölge sınırında pik değeri (bölge kayması riski)
!! Pík na hranici zóny (riziko posunu zóny)
!! Пик на границата на зоната (опасност от преместване на зоната)
!! Topp i sonegrense (fare for soneforskyvning)
!! Top i zonegrænse (risiko for zoneskift)
!! 区边界峰值（有区位移的风险）
!! Пик на границе зоны (риск смещения зоны)
!! ゾーン境界でのピーク (ゾーンシフトのリスクがある)
!! Maksimālā vērtība zonas robežās (zonas maiņas risks)
!! Špička v hraničnej zóne (riziko posunutia zóny)
!! Pīk tsooni piiril (tsooni nihke risk)
!! Đỉnh nằm trong ranh giới vùng (nguy cơ thay đổi vùng)

FR : Rappel : Dans chaque zone, les variants Hb sont listés selon leur temps de migration de la droite vers la gauche
GB : Reminder: In each zone, Hb variants are sorted according to their migration time from the right to the left
DE : Hinweis : Die Hb-Varianten werden in allen Zonen nach ihrer Migrationszeit von rechts nach links sortiert
NL : Herinnering : in elke zone worden Hb varianten op basis van hun migratietijd van rechts naar links gesorteerd
IT : NB : In ciascuna zona, le varianti Hb sono elencate in base al loro tempo di migrazione da destra verso sinistra
ES : NOTA : En cada zona, las variantes de la Hb son listadas según su tiempo de migración de derecha a izquierda
PT : Lembrete : Em cada zona, as variantes Hb são ordenadas de acordo com o seu tempo de migração da direita para a esquerda
SV : Påminnelse : I varje zon, sorteras Hb-varianter enligt deras migrationstid från höger till vänster
GR : Υπενθύμιση : Σε κάθε ζώνη, οι παραλλαγές Hb ταξινομούνται ανάλογα με τον χρόνο ηλεκτροφόρησής τους από τα δεξιά προς τα αριστερά
HR : Podsjetnik : Hb varijante razvrstane su u svakoj zoni prema svom vremenu migracije s desne na lijevu stranu
LT : Primename : kiekvienoje zonoje Hb variantai pagal migracijos laiką surūšiuoti iš dešinės į kairę.
PL : Przypomnienie : W każdej strefie odmiany Hb są sortowane według czasu migracji, od prawej do lewej
RO : Memento : În fiecare zonă, variantele Hb sunt sortate în funcţie de timpul de migrare de la dreapta la stânga
CS : Podsetník : U svakoj zoni, Hb varijante se sortiraju prema svom vremenu migracija sa desna na levo
HU : Emlékeztető : A Hb-variánsok mindegyik zónában a migrációs idejüknek megfelelően rendeződnek jobbról balra
TR : Hatırlatma : Her bir bölgede, Hb varyantları sağdan sola migrasyon sürelerine göre sınıflandırılır
CZ : Připomínka : V každé zóně jsou varianty Hb roztříděny podle své doby migrace zprava doleva
BG : Напомняне : Варианти във всяка зона се сортират от дясно наляво според времето им на миграция
NO : Påminnelse : I hver sone, er Hb-varianter sortert i henhold til deres migreringstid fra høyre til venstre
DK : Påmindelse : I hver zone sorteres Hb-varianter efter deres migrationstid fra højre til venstre
CN : 提示：在每个区中，根据 Hb 变体从右到左的电泳时间进行排序
RU : Напоминание : вариации Hb сортируются по времени миграции в каждой зоне справа налево
JP : 注意：各ゾーンにおいて、Hb変異体は泳動時間に従って右から左にソートされ (並べ替えられ) ます
LV : Atgādinājums! Katrā zonā Hb varianti tiek sakārtoti pēc to migrācijas laika no labās uz kreiso pusi
SK : Pripomienka : Varianty Hb sú v každej zóne usporiadané sprava doľava podľa času migrácie
EE : Meelespea : Igas tsoonis sorteeritakse Hb variandid vastavalt nende migratsiooniajale paremalt vasakule.
VN : Xin nhắc lại : Ở mỗi vùng, biến thể Hb được sắp xếp theo thời gian di chuyển từ phải sang trái

SCHÉMAS / FIGURES

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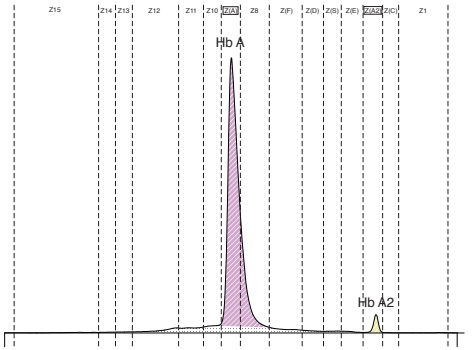
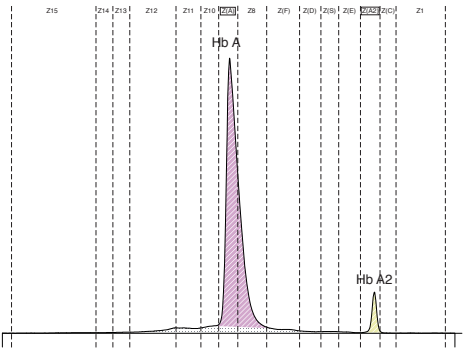
CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

1



Sang normal
Normal blood sample

2



Sang bêta-thalassémique
Blood sample with beta-thalassemia

FR : PROFILS ÉLECTROPHORÉTIQUES	*Sang normal*	*Sang bêta-thalassémique*
GB : ELECTROPHORETIC PATTERNS	*Normal blood sample*	*Blood sample with beta-thalassemia*
DE : ELEKTROPHORESEMUSTER	*Normalblutprobe*	*Blutprobe mit Beta-Thalassämie*
NL : ELEKTROFORETISCHE PATRONEN	*Normaal bloedmonster*	*Bloedmonster met bètathalassemie*
IT : PROFILI ELETTROFORETICI	*Sangue normale*	*Sangue beta-talassemico*
ES : PERFILES ELECTROFORÉTICOS	*Sangre normal*	*Sangre con beta talasemia*
PT : PADRÕES ELETROFORÉTICOS	*Amostra de sangue normal*	*Amostra de sangue com beta-talassemia*
SV : ELEKTROFORETISKA MÖNSTER	*Normalt blodprov*	*Blodprov med beta-thalassemi*
GR : ΗΛΕΚΤΡΟΦΟΡΗΤΙΚΑ ΠΡΟΤΥΠΑ	*Φυσιολογικό δείγμα αίματος*	*Δείγμα αίματος με βήτα-θαλασσαιμία*
HR : ELEKTROFORETSKI OBRASCI	*Normalan uzorak krvi*	*Uzorak krvi s beta-talasemijom*
LT : ELEKTROFOREZĖS ŠABLONAI	*Normalus kraujo mėginys*	*Paciento, sergančio beta talasemija, kraujo mėginys*
PL : OBRAZY ELEKTROFORETYCZNE	*Próbka krwi prawidłowej*	*Próbka krwi z beta-talasemią*
RO : TIPARE ELECTROFORETICE	*Probă normală de sânge*	*Probă de sânge cu beta-talasemie*
CS : ELEKTROFORETSKÍ ŠABLONI	*Normalan uzorak krvi*	*Uzorak krvi sa beta-talasemijom*
HU : ELEKTROFORETIKUS MINTÁZATOK	*Normál vérminta*	*Béta-talasszémiás vérminta*
TR : ELEKTROFORETİK PATERNLER	*Normal kan numunesi*	*Beta-talasemi içeren kan numunesi*
CZ : ELEKTROFORETICKÉ TYPY	*Normální vzorek krve*	*Vzorek krve s beta talasemií*
BG : ЕЛЕКТРОФОРЕТИЧНИ МОДЕЛИ	*Нормална кръвна проба*	*Кръвна проба с бета-таласемия*
NO : ELEKTROFORETISKE MØNSTRE	*Normal blodprøve*	*Blodprøve med beta-talassemi*
DK : ELEKTROFORETISKE MØNSTRE	*Normal blodprøve*	*Blodprøve med beta-thalassæmi*
CN : 电泳图谱	*正常血液样品*	*β -地中海贫血的血液样品*
RU : ЭЛЕКТРОФОРЕТИЧЕСКИЕ ПРОФИЛИ	*Образец нормальной крови*	*Образец крови с бета-талассемией*
JP : 電気泳動パターン	*正常血液サンプル*	*βサラセミアての血液サンプル*
LV : ELEKTROFORĒTISKIE SPEKTRI	*Normāls asins paraugs*	*Asins paraugs ar beta talasēmiju*
SK : ELEKTROFORÉZNE VZORY	*Vzorka normálnej krvi*	*Vzorka krvi s beta-talasémiou*
EE : ELEKTROFOREETILISED MUSTRID	*Normaalne vereproov*	*Beeta-talasseemiaga vereproov*
VN : MÔ HÌNH ĐIỆN DI	*Mẫu máu thông thường*	*Mẫu máu có beta-thalassemia*

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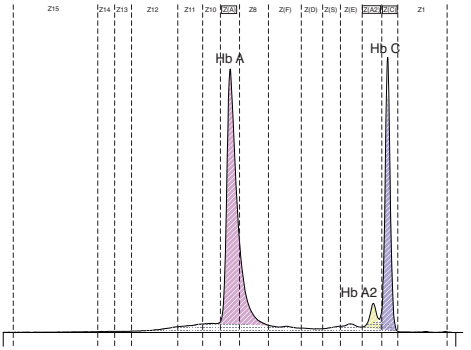
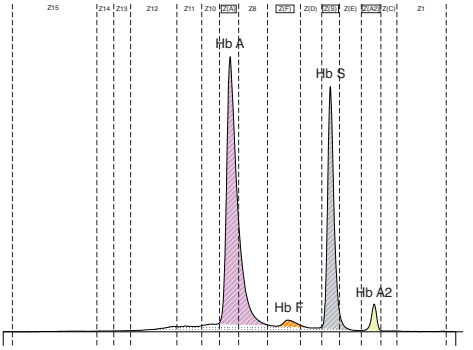
CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

3



Sang de patient hétérozygote avec variant Hb C
Blood sample from heterozygous patient with Hb C variant

4



Sang de patient hétérozygote avec variant Hb S
Blood sample from heterozygous patient with Hb S variant

FR : Sang de patient hétérozygote avec variant Hb C
GB : Blood sample from heterozygous patient with Hb C variant
DE : Blutprobe eines heterozygoten Patienten mit Hb C-Variante
NL : Bloedmonster van heterozygote patiënt met Hb C variant
IT : Sangue di paziente eterozigote con variante Hb C
ES : Sangre de paciente heterocigoto con la variante Hb C
PT : Amostra de sangue de doente heterozigótico com variante Hb C
SV : Blodprov från heterozygot patient med Hb C-variant
GR : Δείγμα αίματος από ετερόζυγο ασθενή με παραλλαγή Hb C
HR : Uzorak krvi heterozigotnog bolesnika s varijantom Hb C
LT : Heterozigotinio paciento kraujo, kuriame yra Hb C varianto, kraujo mėginys
PL : Próbka krwi od heterozygotycznego pacjenta z odmianą Hb C
RO : Probă de sânge de la pacient heterozigot cu varianta Hb C
CS : Uzorak krvi od heterozigotnog pacijenta sa Hb C varijantom
HU : Heterozigóta beteg vérmintája Hb C variánssal
TR : Hb C varyantı taşıyan heterozigot hastasına ait kan numunesi
CZ : Vzorek krve heterozygotního pacienta s variantou Hb C
BG : Кръвна проба от хетерозиготен пациент с Hb C вариант
NO : Blodprøve fra heterozygot pasient med Hb C-variant
DK : Blodprøve fra heterozygot patient med Hb C-variant
CN : 来自 Hb C 变体杂合患者的血液样品
RU : Образец крови от гетерозиготного пациента с вариацией Hb C
JP : Hb C変異体を含むヘテロ接合患者からの血液サンプル
LV : Heterozigota pacienta asins paraugs ar Hb C variantu
SK : Vzorka krvi od heterozygotného pacienta s variantom Hb C
EE : Vereproov Hb C variandiga heterosügootselt patsiendilt
VN : Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb C

Sang de patient hétérozygote avec variant Hb S
Blood sample from heterozygous patient with Hb S variant
Blutprobe eines heterozygoten Patienten mit Hb S-Variante
Bloedmonster van heterozygote patiënt met Hb S variant
Sangue di paziente eterozigote con variante Hb S
Sangre de paciente heterocigoto con la variante Hb S
Amostra de sangue de doente heterozigótico com variante Hb S
Blodprov från heterozygot patient med Hb S-variant
Δείγμα αίματος από ετερόζυγο ασθενή με παραλλαγή Hb S
Uzorak krvi heterozigotnog bolesnika s varijantom Hb S
Heterozigotinio paciento kraujo, kuriame yra Hb S varianto, mėginys
Próbka krwi od heterozygotycznego pacjenta z odmianą Hb S
Probă de sânge de la pacient heterozigot cu varianta Hb S
Uzorak krvi od heterozigotnog pacijenta sa Hb S varijantom
Heterozigóta beteg vérmintája Hb S variánssal
Hb S varyantı taşıyan heterozigot hastasına ait kan numunesi
Vzorek krve heterozygotního pacienta s variantou Hb S
Кръвна проба от хетерозиготен пациент с Hb S вариант
Blodprøve fra heterozygot pasient med Hb S-variant
Blodprøve fra heterozygot patient med Hb S-variant
来自 Hb S 变体杂合患者的血液样品
Образец крови от гетерозиготного пациента с вариацией Hb S
Hb S変異体を含むヘテロ接合患者からの血液サンプル
Heterozigota pacienta asins paraugs ar Hb S variantu
Vzorka krvi od heterozygotného pacienta s variantom Hb S
Vereproov Hb S variandiga heterosügootselt patsiendilt
Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb S

SCHÉMAS / FIGURES

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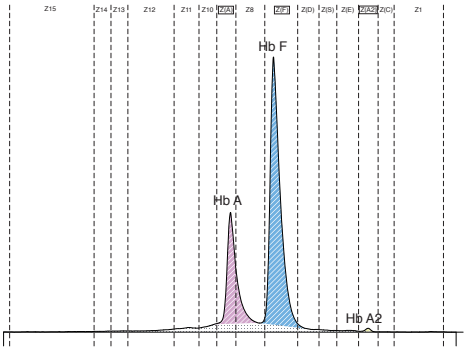
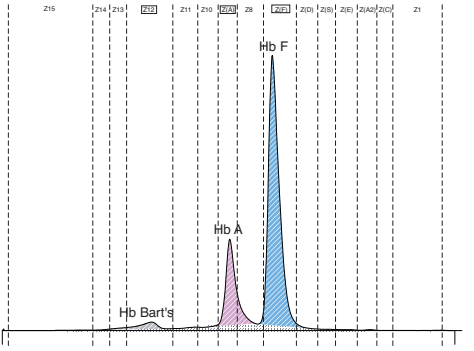
CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

5



Sang normal de bébé (âgé de 3 semaines)
Normal blood sample from baby (3 weeks old)

6



Sang de bébé avec Hb Bart
Baby blood sample with Hb Bart's

FR : Sang normal de bébé (âgé de 3 semaines)
GB : Normal blood sample from baby (3 weeks old)
DE : Normalblutprobe eines Säuglings (Alter: 3 Wochen)
NL : Normaal bloedmonster van baby (3 weken oud)
IT : Sangue normale di neonato (età 3 settimane)
ES : Sangre normal de bebé (3 semanas de edad)
PT : Amostra de sangue normal de bebé (3 semanas de idade)
SV : Normalt blodprov från baby (3 veckor gammal)
GR : Φυσιολογικό δείγμα αίματος από βρέφος (ηλικίας 3 εβδομάδων)
HR : Normalan uzorak krvi dojenčeta (u dobi od 3 tjedna)
LT : Normalus kūdikio (3 savaičių amžiaus) kraujo mėginys
PL : Próbka krwi prawidłowej od niemowlęcia (3-tygodniowego)
RO : Probă normală de sânge de la bebeluş (trei săptămâni)
CS : Normalan uzorak krvi od bebe (stare 3 nedelje)
HU : 3 hetes csecsemő normál vérmintája
TR : Bebekten alınan normal kan numunesi (3 haftalık)
CZ : Normální vzorek krve malého dítěte (věk 3 týdny)
BG : Нормална кръвна проба от бебе (на възраст 3 седмици)
NO : Normal blodprøve fra nyfødt barn (3 uker gammel)
DK : Normal blodprøve fra baby (3 uger gammel)
CN : 来自婴儿（3 个月）的正常血液样品
RU : Образец нормальной крови младенца (возраст — 3 недели)
JP : 新生児（生後3週）からの正常血液サンプル
LV : Mazuļa (3 nedēļas vecs) normāls asins paraugs
SK : Vzorka normálnej krvi od novorodenca (vo veku 3 týždňov)
EE : Normaalne vereproov imikult (3-nädalane)
VN : Mẫu máu thông thường của trẻ sơ sinh (3 tuần tuổi)

Sang de bébé avec Hb Bart
Baby blood sample with Hb Bart's
Blutprobe eines Säuglings mit Hb-Barts
Bloedmonster van baby met Hb Bart
Sangue di neonato con Hb Bart
Sangre de bebé con Hb Bart
Amostra de sangue de bebé com Hb de Bart
Blodprov från baby med Hb Bart's
Δείγμα αίματος βρέφους με Hb Bart's
Uzorak krvi dojenčeta s Bartovim Hb
Kūdikio kraujo, kuriame yra Hb Bart, mėginys
Próbka krwi niemowlęcia z Hb Barta
Probă de sânge de la bebeluş cu Hb Bart's
Uzorak krvi bebe sa Hb Barts
Csecsemő vérmintája Hb Barttal
Hb Barts taşıyan bebeğe ait kan numunesi
Vzorek krve malého dítěte s Bartovým Hb
Кръвна проба от бебе с Hb на Bart
Blodprøve fra nyfødt barn med Hb Barts
Babyblodprøve med Hb Bart's
含 Hb Bart's 的血液样品
Образец крови младенца с гемоглобином Барта
Hbバーツを含む新生児の血液サンプル
Mazuļa asins paraugs ar Hb Bart
Vzorka krvi od novorodenca s Hb Bartovým Hb
Imiku vereproov Hb Bart'iga
Mẫu máu của trẻ sơ sinh có Hb Bart's

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CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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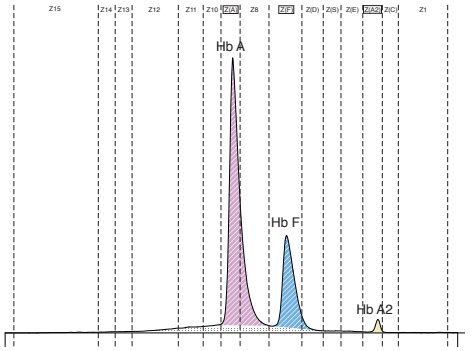

Sang avec Hb F élevée (jeune enfant)
Blood sample with elevated Hb F (young child)

FR : Sang avec Hb F élevée (jeune enfant)
GB : Blood sample with elevated Hb F (young child)
DE : Blutprobe mit erhöhtem Hb F (Kleinkind)
NL : Bloedmonster met verhoogd Hb F niveau (klein kind)
IT : Sangue con Hb F alta (bambino)
ES : Sangre con Hb F elevada (niño de corta edad)
PT : Amostra de sangue com Hb F elevada (criança pequena)
SV : Blodprov med förhöjd Hb F (litet barn)
GR : Δείγμα αίματος με αυξημένο επίπεδο Hb F (μικρό παιδί)
HR : Uzorak krvi s povišenom vrijednošću Hb F (malo dijete)
LT : Kraujo, kuriame padidėjęs Hb F kiekis, mėginys (mažo vaiko)
PL : Próbka krwi o podwyższonym stężeniu Hb F (małe dziecko)
RO : Probă de sânge cu Hb F crescută (copil mic)
CS : Uzorak krvi sa povišenim Hb F (malo dete)
HU : Vérminta emelkedett Hb F-fel (kisgyermek)
TR : Yüksek Hb F içeren kan numunesi (genç çocuk)
CZ : Vzorek krve se zvýšeným Hb F (dítě)
BG : Кръвна проба с повишен Hb F (малко дете)
NO : Blodprøve med forhøyet Hb F (små barn)
DK : Blodprøve med forhøjet Hb F (lille barn)
CN : Hb F 升高（幼儿）的血液样品
RU : Образец крови с повышенным уровнем Hb F (ребенок младшего возраста)
JP : Hb F が高値の血液サンプル（幼児）
LV : Asins paraugs ar paaugstinātu Hb F līmeni (mazs bērns)
SK : Vzorka krvi so zvýšenou hladinou Hb F (dojča)
EE : Vereproov kõrgenenud Hb F-iga (noor laps)
VN : Mẫu máu có Hb F gia tăng (trẻ nhỏ)

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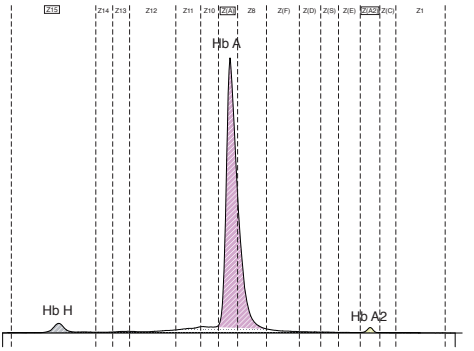

Sang avec Hb H
Blood sample with Hb H

Sang avec Hb H
Blood sample with Hb H
Blutprobe mit Hb H
Bloedmonster met Hb H
Sangue con Hb H
Sangre con Hb H
Amostra de sangue com Hb H
Blodprov med Hb H
Δείγμα αίματος με Hb H
Uzorak krvi s Hb H
Kraujo, kuriame yra Hb H, mėginys
Próbka krwi z Hb H
Probă de sânge cu Hb H
Uzorak krvi sa Hb H
Vérminta Hb H-val
Hb H içeren kan numunesi
Vzorek krve s Hb H
Кръвна проба с Hb H
Blodprøve med Hb H
Blodprøve med Hb H
含 Hb H 的血液样品
Образец крови с Hb H
Hb H を含む血液サンプル
Asins paraugs ar Hb H
Vzorka krvi s Hb H
Vereproov Hb H-ga
Mẫu máu có Hb H

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CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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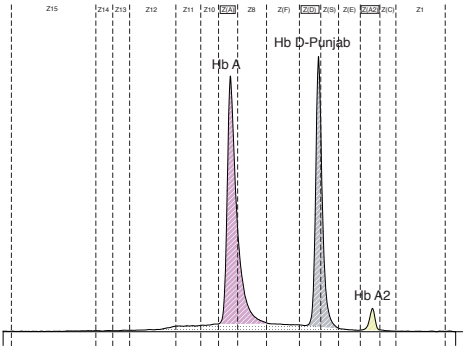

Sang de patient hétérozygote avec variant Hb D-Punjab
Blood sample from heterozygous patient with Hb D-Punjab variant

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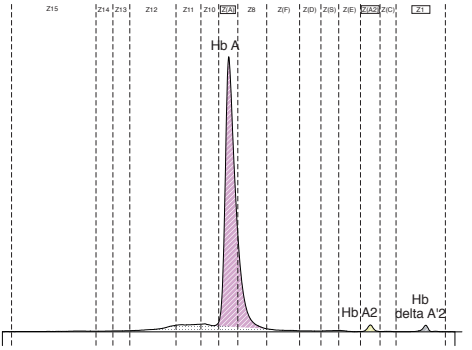

Sang de patient hétérozygote avec variant delta Hb A'2
Blood sample from heterozygous patient with delta Hb A'2 variant

FR : Sang de patient hétérozygote avec variant Hb D-Punjab
GB : Blood sample from heterozygous patient with Hb D-Punjab variant
DE : Blutprobe eines heterozygoten Patienten mit Hb D-Punjab-Variante
NL : Bloedmonster van heterozygote patiënt met Hb D-Punjab variant
IT : Sangue di paziente eterozigote con variante Hb D-Punjab
ES : Sangre de paciente heterocigoto con la variante Hb D-Punjab
PT : Amostra de sangue de doente heterozigótico com variante Hb D-Punjab
SV : Blodprov från heterozygot patient med Hb D-Punjab variant
GR : Δείγμα αίματος από ετερόζυγο ασθενή με παραλλαγή Hb D-Punjab
HR : Uzorak krvi heterozigotnog bolesnika s varijantom Hb D-Punjab
LT : Heterozigotinio paciento kraujo, kuriame yra Hb D-Punjab varianto, méginys
PL : Próbka krwi od heterozygotycznego pacjenta z odmianą Hb D-Punjab
RO : Probă de sânge de la pacient heterozigot cu varianta Hb D-Punjab
CS : Uzorak krvi od heterozigotnog pacijenta sa Hb D-Punjab varijantom
HU : Heterozigóta beteg vérmintája Hb D-Punjab variánssal
TR : Hb D-Punjab varyantı taşıyan heterozigot hastasına ait kan numunesi
CZ : Vzorek krve heterozygotního pacienta s variantou Hb D-Paňdžáb
BG : Кръвна проба от хетерозиготен пациент с Hb D-Punjab вариант
NO : Blodprøve fra heterozygot pasient med Hb D-Punjab variant
DK : Blodprøve fra heterozygot patient med Hb D-Punjab-variant
CN : 来自 Hb D-Punjab 变体杂合患者的血液样品
RU : Образец крови от гетерозиготного пациента с вариацией Hb D-Punjab
JP : Hb D-Punjab変異体を含むヘテロ接合患者からの血液サンプル
LV : Heterozigota pacienta asins paraugs ar Hb D-Punjab variantu
SK : Vzorka krvi od heterozygotného pacienta s variantom Hb D-Punjab
EE : Vereproov Hb D-Punjabi variandiga heterosügootselt patsiendilt
VN : Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb D-Punjab

Sang de patient hétérozygote avec variant delta Hb A'2
Blood sample from heterozygous patient with delta Hb A'2 variant
Blutprobe eines heterozygoten Patienten mit Delta-Hb A2-Variante
Bloedmonster van heterozygote patiënt met delta Hb A'2 variant
Sangue di paziente eterozigote con variante delta Hb A2
Sangre de paciente heterocigoto con variante delta Hb A'2
Amostra de sangue de doente heterozigótico com variante delta Hb A'2
Blodprov från heterozygot patient med delta Hb A'2-variant
Δείγμα αίματος από ετερόζυγο ασθενή με παραλλαγή δέλτα Hb A'2
Uzorak krvi heterozigotnog bolesnika s varijantom delta Hb A'2
Heterozigotinio paciento kraujo, kuriame yra delta Hb A'2 varianto, méginys
Próbka krwi od heterozygotycznego pacjenta z odmianą delta Hb A'2
Probă de sânge de la pacient heterozigot cu varianta delta Hb A'2
Uzorak krvi od heterozigotnog pacijenta sa delta Hb A'2 varijantom
Heterozigóta beteg vérmintája delta Hb A'2 variánssal
Delta Hb A'2 varyantı taşıyan heterozigot hastasına ait kan numunesi
Vzorek krve heterozygotního pacienta s variantou delta Hb A'2
Кръвна проба от хетерозиготен пациент с делта Hb A'2 вариант
Blodprøve fra heterozygot pasient med delta Hb A'2 variant
Blodprøve fra heterozygot patient med Hb A'2-variant
来自 Hb A'2 变体杂合患者的血液样品
Образец крови от гетерозиготного пациента с вариацией delta Hb A'2
デルタHb A'2変異体を含むヘテロ接合患者からの血液サンプル
Heterozigota pacienta asins paraugs ar delta Hb A'2 variantu
Vzorka krvi od heterozygotného pacienta s variantom Hb A'2
Vereproov delta Hb A'2 variandiga heterosügootselt patsiendilt
Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb A'2 delta

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CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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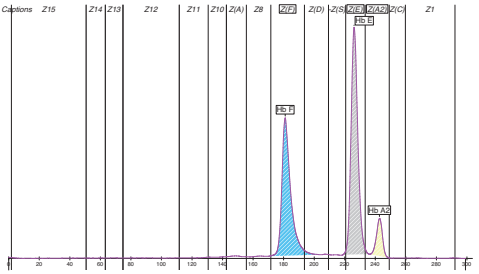

Sang de patient homozygote avec variant Hb E et fraction Hb F élevée
Blood sample from homozygous patient with Hb E variant and elevated Hb F

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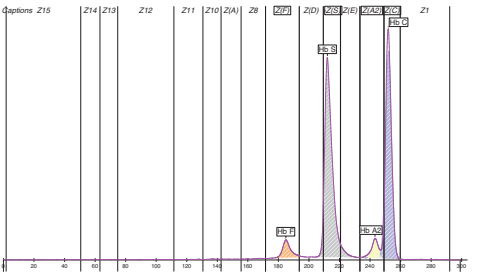

Sang de patient hétérozygote composite avec variants Hb S et Hb C
Blood sample from compound heterozygous patient with Hb S & Hb C variants

FR : Sang de patient homozygote avec variant Hb E et fraction Hb F élevée
GB : Blood sample from homozygous patient with Hb E variant and elevated Hb F
DE : Blutprobe eines homozygoten Patienten mit Hb E-Variante und erhöhtem Hb F
NL : Bloedmonster van homozygote patiënt met Hb E variant en verhoogd Hb F niveau
IT : Sangue di paziente omozigote con variante Hb E e frazione Hb F alta
ES : Sangre de paciente homocigoto con la variante Hb E y la fracción Hb F elevada
PT : Amostra de sangue de doente heterozigótico com variante Hb E e Hb F elevada
SV : Blodprov från heterozygot patient med Hb E variant och förhöjd Hb F
GR : Δείγμα αίματος από ομόζυγο ασθενή με παραλλαγή Hb E και αυξημένο επίπεδο Hb F
HR : Uzorak krvi homozigotnog bolesnika s varijantom Hb E i povišenom vrijednošću Hb F
LT : Homozigotinio paciento kraujo, kuriame yra Hb E varianto ir padidėjęs Hb F kiekis, mėginys
PL : Próbka krwi od homozygotycznego pacjenta z odmianą Hb E i podwyższonym stężeniem Hb F
RO : Probă de sânge de la pacient heterozigot cu varianta Hb E şi Hb F crescută
CS : Uzorak krvi od heterozigotnog pacijenta sa Hb E varijantom i povišenim Hb F
HU : Homozigóta beteg vérmintája Hb E variánssal és emelkedett Hb F-fel
TR : Hb E varyantı ve yüksek Hb F taşıyan homozigot hastasına ait kan numunesi
CZ : Vzorek krve homozygotního pacienta s variantou Hb E a zvýšeným Hb F
BG : Кръвна проба от хомозиготен пациент с Hb E вариант и повишен Hb F
NO : Blodprøve fra homozygot pasient med Hb E variant og forhøyet Hb F
DK : Blodprøve fra homozygot patient med Hb E-variant og forhøjet Hb F
CN : 来自 Hb E 变体和 Hb F 升高杂合患者的血液样品
RU : Образец крови от гомозиготного пациента с вариацией Hb E и повышенным уровнем Hb F
JP : Hb E変異体およびHb Fを含むホモ接合患者からの血液サンプル
LV : Homozigota pacienta asins paraugs ar Hb E variantu un paaugstinātu Hb F līmeni
SK : Vzorka krvi od homozygotného pacienta s variantom Hb E a zvýšenou hladinou Hb F
EE : Vereproov Hb E variandi ja kõrgenenud Hb F-iga heterosügootselt patsiendilt
VN : Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb E và Hb F gia tăng

Sang de patient hétérozygote composite avec variants Hb S et Hb C
Blood sample from compound heterozygous patient with Hb S & Hb C variants
Blutprobe eines compound-heterozygoten Patienten mit Hb S- und Hb C-Varianten
Bloedmonster van samengestelde heterozygote patiënt met Hb S en Hb C varianten
Sangue di paziente eterozigote composto con varianti Hb S e Hb C
Sangre de paciente heterocigoto compuesto con las variantes Hb S y Hb C
Amostra de sangue de doente heterozigótico composto com variantes Hb S e Hb C
Blodprov från förenad heterozygot patient med Hb S & Hb C-varianter
Δείγμα αίματος από σύνθετο ετερόζυγο ασθενή με παραλλαγές Hb S & Hb C
Uzorak krvi složenog heterozigotnog bolesnika s varijantama Hb S i Hb C
Paciento kraujo, kuriame yra heterozigotinių junginių ir Hb S bei Hb C variantų, mėginys
Próbka krwi od heterozygotycznego pacjenta z jednoczesną obecnością odmian Hb S oraz Hb C
Probă de sânge de la pacient heterozigot compus cu variantele Hb S şi Hb C
Uzorak krvi od složenog heterozigotnog pacijenta sa Hb S & Hb C varijantama
Összetett heterozigóta beteg vérmintája Hb S és Hb C variánsokkal
Hb S ve Hb C varyantlarını taşıyan bileşik heterozigot hastasına ait kan numunesi
Vzorek krve sdruženého heterozygotního pacienta s variantami Hb S a Hb C
Кръвна проба от пациент със съставна хетерозиготност с Hb S и Hb C варианти
Blodprøve fra sammensatt heterozygot pasient med Hb S og Hb C-varianter
Blodprøve fra heterozygot patient med Hb S- og Hb C-varianter
来自 Hb S & Hb C 变体杂合患者的血液样品
Образец крови от компаунд-гетерозигота с вариациями Hb S и Hb C
Hb SおよびHb C変異体を含む複合ヘテロ接合患者からの血液サンプル
Kompaunda heterozigota pacienta asins paraugs ar Hb S un Hb C variantu
Vzorka krvi od heterozygotného pacienta s variantmi Hb S a Hb C
Vereproov Hb S ja Hb C variantidega ühend-heterosügootselt patsiendilt
Mẫu máu của bệnh nhân bị bệnh dị hợp tử kép với biến thể Hb S & Hb C

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CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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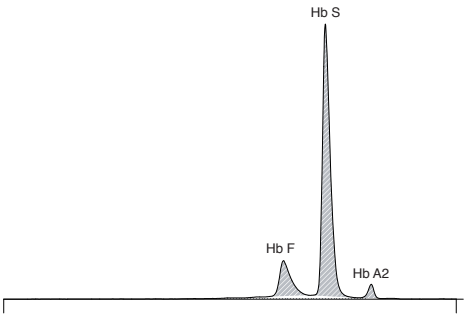

Sang de patient homozygote avec Hb F et variant Hb S
Blood sample from homozygous patient with Hb F and Hb S variant

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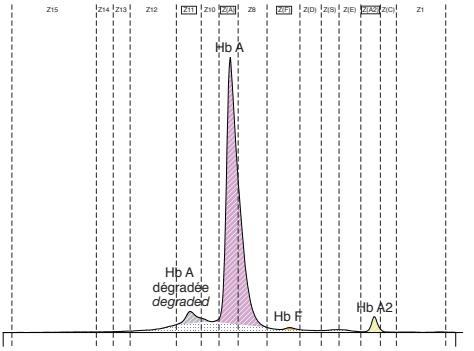

Sang avec Hb A dégradée (Hb A3) et Hb F faible
Blood sample with degraded Hb A (Hb A3) and faint Hb F

FR : Sang de patient homozygote avec Hb F et variant Hb S
GB : Blood sample from homozygous patient with Hb F and Hb S variant
DE : Blutprobe eines homozygoten Patienten mit Hb F- und Hb S-Variante
NL : Bloedmonster van homozygote patiënt met Hb F en Hb S variant
IT : Sangue di paziente omozigote con Hb F e variante Hb S
ES : Sangre de paciente homocigoto con Hb F y la variante Hb S
PT : Amostra de sangue de doente homozigótico com variantes Hb F e Hb S
SV : Blodprov från homozygot patient med Hb F- och Hb S-variant
GR : Δείγμα αίματος από ομόζυγο ασθενή με παραλλαγή Hb F και Hb S
HR : Uzorak krvi homozigotnog bolesnika s varijantama Hb F i Hb S
LT : Homozigotinio paciento kraujo, kuriame yra Hb F bei Hb S variantų, méginys
PL : Próbka krwi od homozygotycznego pacjenta z odmianą Hb F i Hb S.
RO : Probă de sânge de la pacient heterozigot cu variantele Hb F şi Hb S
CS : Uzorak krvi od heterozigotnog pacijenta sa Hb F i Hb S varijantom
HU : Homozigóta beteg vérmintája Hb F-fel és Hb S variánssal
TR : Hb F ve Hb S varyantlarını taşıyan homozigot hastasına ait kan numunesi
CZ : Vzorek krve homozygotního pacienta s variantami Hb F a Hb S
BG : Кръвна проба от хомозиготен пациент с Hb F и Hb S вариант
NO : Blodprøve fra homozygot pasient med Hb F og Hb S variant
DK : Blodprøve fra heterozygot patient med Hb F- og Hb S-variant
CN : 来自 Hb F 和 Hb S 变体杂合患者的血液样品
RU : Образец крови от гомозиготного пациента с вариациями Hb F и Hb S
JP : Hb FおよびHb S変異体を含むホモ接合患者からの血液サンプル
LV : Heterozigota pacienta asins paraugs ar Hb F un Hb S variantu
SK : Vzorka krvi od homozygotného pacienta s variantmi Hb F a Hb S
EE : Vereproov Hb F ja Hb S variandiga homosügootselt patsiendilt
VN : Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến Hb thể F và Hb S

Sang avec Hb A dégradée (Hb A3) et Hb F faible
Blood sample with degraded Hb A (Hb A3) and faint Hb F
Blutprobe mit degradiertem Hb A (Hb A3) und schwachem Hb F
Bloedmonster met afgebroken Hb A (Hb A3) and nauwelijks waarneembare Hb F
Sangue con Hb A degradata (Hb A3) e Hb F bassa
Sangre con Hb A degradada (Hb A3) y Hb F débil
Amostra de sangue com Hb A (Hb A3) degradada e Hb F baixa
Blodprov med nedbrutet Hb A (Hb A3) och svagt Hb F
Δείγμα αίματος με αποσυντεθειμένη Hb A (Hb A3) και αμυδρή Hb F
Uzorak krvi s degradiranim Hb A (Hb A3) i slabim Hb F
Kraujo, kuriame yra suskilusio Hb A (Hb A3) ir išblukusio Hb F, méginys
Próbka krwi z rozłożoną Hb A (Hb A3) i śladową obecnością Hb F
Probă de sânge cu Hb A degradată (Hb A3) şi Hb F slabă
Uzorak krvi sa degradiranim Hb A (Hb A3) i niskim Hb F
Vérminta degradálódott Hb A-val (Hb A3) és halvány Hb F-fel
İndirgenmiş Hb A (Hb A3) ve belirsiz/zayıf Hb F içeren kan numunesi
Vzorek krve s degradovaným Hb A (Hb A3) a slabým Hb F
Кръвна проба с разграден Hb A (Hb A3) и малко количество Hb F
Blodprøve med degradert Hb A (Hb A3) og svakt Hb F
Blodprøve med nedbrudt Hb A (Hb A3) og svag Hb F
Hb A (Hb A3) 降低和Hb F虚弱的血液样品
Образец крови с подвергнувшимся разложению Hb A (Hb A3) и низким Hb F
劣化したHb A (Hb A3) および僅少のHb Fを含む血液サンプル
Asins paraugs ar noārdītu Hb A (Hb A3) un nelielu Hb F daudzumu
Vzorka krvi s degradovaným Hb A (Hb A3) a nevýrazným Hb F
Vereproov lagunenud Hb A (Hb A3) ja ja nõrga Hb F-ga
Mẫu máu có Hb A (Hb A3) suy giảm và Hb F yếu

SCHÉMAS / FIGURES

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CAPILLARYS HEMOGLOBIN(E)
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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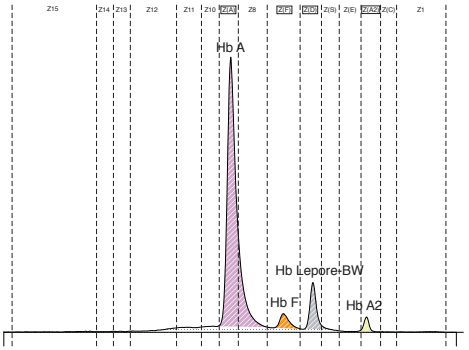

Sang de patient hétérozygote avec variant Hb Lepore-Boston-Washington
Bood sample from heterozygous patient with Hb Lepore-Boston-Washington variant

FR : Sang de patient hétérozygote avec variant Hb Lepore-Boston-Washington
GB : Bood sample from heterozygous patient with Hb Lepore-Boston-Washington variant
DE : Blutprobe eines heterozygoten Patienten mit Hb Lepore-Boston-Washington-Variante
NL : Bloedmonster van heterozygote patiënt met Hb Lepore-Boston-Washington variant
IT : Sangue di paziente eterozigote con variante Hb Lepore-Boston-Washington
ES : Sangre de paciente heterocigoto con la variante Hb Lepore-Boston-Washington
PT : Amostra de sangue de doente heterozigótico com variante Hb Lepore-Boston-Washington
SV : Blodprov från heterozygot patient med Hb Lepore-Boston-Washington-variant
GR : Δείγμα αίματος από ετερόζυγο ασθενή με παραλλαγή Hb Lepore-Boston-Washington
HR : Uzorak krvi heterozigotnog bolesnika s varijantom Hb Lepore-Boston-Washington
LT : Heterozigotinio paciento kraujo, kuriame yra Hb Lepore-Boston-Washington varianto, kraujo méginys
PL : Próbka krwi od heterozygotycznego pacjenta z odmianą Hb Lepore-Boston-Washington
RO : Probă de sânge de la pacient heterozigot cu varianta Hb Lepore-Boston-Washington
CS : Uzorak krvi od heterozigotnog pacijenta sa Hb Lepore-Boston-Washington varijantom
HU : Heterozigóta beteg vérmintája Hb Lepore-Boston-Washington variánssal
TR : Hb Lepore-Boston-Washington varyantı taşıyan heterozigot hastasına ait kan numunesi
CZ : Vzorek krve heterozygotního pacienta s variantou Hb Lepore-Boston-Washington
BG : Кръвна проба от хетерозиготен пациент с Hb Lepore-Boston-Washington вариант
NO : Blodprøve fra heterozygot pasient med Hb Lepore-Boston-Washington variant
DK : Blodprøve fra heterozygot patient med Hb Lepore-Boston-Washington-variant
CN : 来自 Hb Lepore-Boston-Washington 变体杂合患者的血液样品
RU : Образец крови от гетерозиготного пациента с вариацией Hb Lepore-Boston-Washington
JP : Hb Lepore-Boston-Washington変異体を含むヘテロ接合患者からの血液サンプル
LV : Heterozigota pacienta asins paraugs ar Hb Lepore-Boston-Washington variantu
SK : Vzorka krvi od heterozygotného pacienta s variantom Hb Lepore-Boston-Washington
EE : Vereproov Hb Lepore-Boston-Washingtoni variandiga heterosügootselt patsiendilt
VN : Mẫu máu của bệnh nhân bị bệnh dị hợp tử với biến thể Hb Lepore-Boston-Washington

SCHÉMAS / FIGURES

ABBILDUNGEN - FIGUREN - FIGURE - FIGURAS - BILDER - EIKONEΣ - SLIKE - PAVEIKSLAI - RYSUNKI - FIGURI - ÁBRÁK - ŞEKİLLER - OBRÁZKY - ФИГУРИ - FIGURER - 插图 - РИСУНКИ - 図 - CIPARI - JOONISED - SƠ ĐỒ

CAPILLARYS HEMOGLOBIN(E) - CAPILLARYS 2 FLEX-PIERCING
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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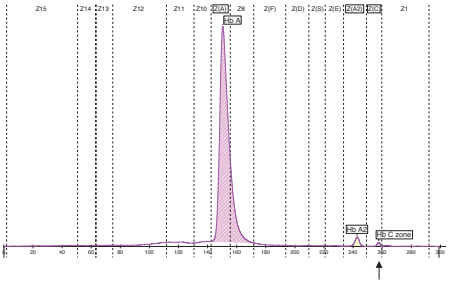
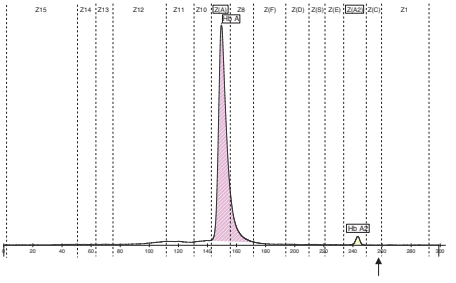
Fraction supplémentaire en zone de migration Z(C) (protéines plasmatiques)
Additional fraction in Z(C) migration zone (plasmatic proteins)



Analyse du sang total
Whole blood analysis



Analyse des globules rouges correspondants
Analysis of corresponding red blood cells

FR : Fraction supplémentaire en zone de migration Z(C) (protéines plasmatiques)	*Analyse du sang total*	*Analyse des globules rouges correspondants*
GB : Additional fraction in Z(C) migration zone (plasmatic proteins)	*Whole blood analysis*	*Analysis of corresponding red blood cells*
DE : Zusätzliche Fraktion in der Z(C)-Migrationszone (plasmatische Proteine)	*Vollblutanalyse*	*Analyse der entsprechenden roten Blutkörperchen*
NL : Bijkomende fractie in Z(C) migratiezone (plasma-eiwitten)	*Volbloedanalyse*	*Analyse van overeenkomstige rode bloedlichaampjes*
IT : Frazione addizionale in zona di migrazione Z(C) (proteine plasmatiche)	*Analisi su sangue intero*	*Analisi su globuli rossi corrispondenti*
ES : Fracción adicional en la zona de migración Z(C) (proteínas plasmáticas)	*Análisis de sangre total*	*Análisis de los glóbulos rojos correspondientes*
PT : Fração adicional na zona de migração Z2 (proteínas plasmáticas)	*Análise do sangue total*	*Análise dos eritrócitos correspondentes*
SV : Extra fraktion i Z(C) migreringszon (plasmatiska proteiner)	*Hel blodanalys*	*Analys av motsvarande röda blodkroppar*
GR : Πρόσθετο κλάσμα σε ζώνη μετακίνησης Z(C) (πρωτεΐνες πλάσματος)	*Ανάλυση ολικού αίματος*	*Ανάλυση των αντίστοιχων ερυθροκυττάρων*
HR : Dodatna frakcija u zoni migracije Z(C) (plazmatski proteini)	*Analiza pune krvi*	*Analiza odgovarajućih crvenih krvnih stanica*
LT : Papildoma frakcija Z(C) migravimo zonoje (plazmos baltymai)	*Visos sudėties kraujo analizė*	*Atitinkamų eritrocitų analizė*
PL : Dodatkowa frakcja w strefie migracji Z(C) (białka plazmatyczne)	*Analiza krwi pełnej*	*Analiza odpowiednich krwinek czerwonych*
RO : Fracție suplimentară în zona de migrare Z(C) (proteine plasmatice)	*Hemoleucograma completă*	*Analiza eritrocitelor aferente*
CS : Dodatna frakcija u zoni migracije Z(C) (plazmatski proteini)	*Analiza cele krvi*	*Analiza odgovarajúcich crvenih krvných čelija*
HU : További frakció a Z(C) migrációs zónában (plazmafehérjék)	*Teljesvér-vizsgálat*	*Megfelelő vörösvértestek vizsgálata*
TR : Z(C) migrasyon bölgesinde ek fraksiyon (plazma proteinleri)	*Tam kan analizi*	*İlgili kırmızı kan hücrelerinin analizi*
CZ : Další frakce v migrační zóně Z(C) (plazmatické proteiny)	*Analýza plné krve*	*Analýza odpovídajících červených krvinek*
BG : Допълнителна фракция в зона на миграция Z(C) (плазмени протеини)	*Анализ на цяла кръв*	*Анализ на съответните червени кръвни телца*
NO : Tilleggsfraksjon i Z(C) migrasjonszone (plasmatiske proteiner)	*Fullstendig blodanalyse*	*Analyse av tilsvarende røde blodlegemer*
DK : Ekstra fraktion i Z(C)-migrationszonen (plasmaproteiner)	*Fuldblodsanalyse*	*Analyse af tilsvarende røde blodceller*
CN : Z(C) 电泳区的其他区带（血浆蛋白质）	*全血分析*	*分析相应的红细胞*
RU : Дополнительная фракция в зоне миграции Z(C) (плазматические белки)	*Анализ цельной крови*	*Анализ соответствующих эритроцитов*
JP : Z(C)泳動領域における追加フラクション（血漿タンパク）	*全血分析*	*対応する赤血球の分析*
LV : Papildu sadaļa Z(C) migrācijas zonā (plazmas olbaltumvielas)	*Pilna asins aina*	*Atbilstošo sarkano asins ķermenīšu analīze*
SK : Dodatočná frakcia v zóne migrácie Z(C) (plazmatické proteíny)	*Analýza plnej krvi*	*Analýza zodpovedajúcich červených krviniek*
EE : Lisafraktsioon Z(C) migratsioonitsoonis (plasmavalgud)	*Täisvere analüüs*	*Vastavate punaste vereliblete analüüs*
VN : Phân đoạn bổ sung trong vùng di chuyển Z(C) (protein huyết tương)	*Phân tích máu toàn phần*	*Phân tích tế bào hồng cầu tương ứng*

SCHÉMAS / FIGURES

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CAPILLARYS HEMOGLOBIN(E) - CAPILLARYS 2 FLEX-PIERCING
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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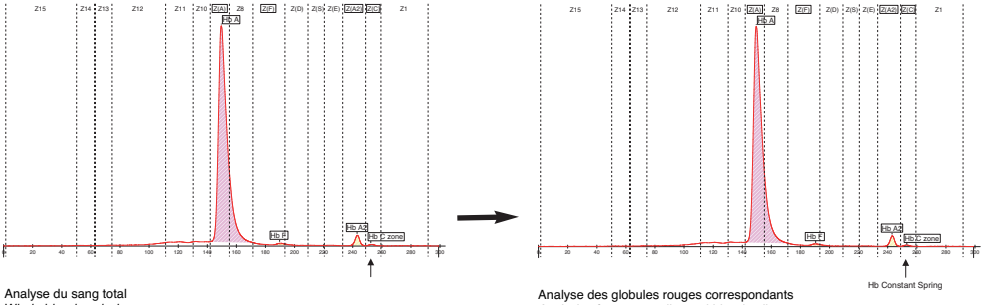
Fraction supplémentaire en zone de migration Z(C) (Hb Constant spring)
Additional fraction in Z(C) migration zone (Hb Constant spring)



Analyse du sang total
Whole blood analysis

Analyse des globules rouges correspondants
Analysis of corresponding red blood cells

FR : Fraction supplémentaire en zone de migration Z(C) (Hb Constant spring)
GB : Additional fraction in Z(C) migration zone (Hb Constant spring)
DE : Zusätzliche Fraktion in der Z(C)-Migrationszone (Hb Constant Spring)
NL : Bijkomende fractie in Z(C) migratiezone (Hb Constant spring)
IT : Frazione addizionale in zona di migrazione Z(C) (Hb Constant spring)
ES : Fracción adicional en la zona de migración Z(C) (Hb Constant spring)
PT : Fração adicional na zona de migração Z(C) (Hb Constant spring)
SV : Extra fraktion i Z(C) migreringszon (Hb Constant spring)
GR : Πρόσθετο κλάσμα σε ζώνη μετακίνησης Z(C) (Hb Constant spring)
HR : Dodatna frakcija u zoni migracije Z(C) (Hb Constant Spring)
LT : Papildoma frakcija Z(C) migravimo zonoje (Hb Konstant Springas)
PL : Dodatkowa frakcja w strefie migracji Z(C) (Hb Constant spring)
RO : Fracţie suplimentară în zona de migrare Z(C) (Hb Constant Spring)
CS : Dodatna frakcija u zoni migracije Z(C) (Hb Constant spring)
HU : További frakció a Z(C) migrációs zónában (Hb Constant Spring)
TR : Z(C) migrasyon bölgesinde ek fraksiyon (Hb Sabit Yay)
CZ : Další frakce v migrační zóně Z(C) (Hb Constant spring)
BG : Допълнителна фракция в зона на миграция Z(C) (Hb с удължена верига)
NO : Tilleggsfraksjon i Z(C) migrasjonszone (Hb konstant fjær)
DK : Ekstra fraktion i Z(C)-migrationszonen (Hb-konstant spring)
CN : Z(C) 电泳区的其他区带 (Hb Constant spring)
RU : Дополнительная фракция в зоне миграции Z(C) (Гемоглобин Констант-Спринг)
JP : Z(C)泳動領域における追加フラクション (Hb Constant spring)
LV : Papildu sadaļa Z(C) migrācijas zonā (Hb atsauces konstante)
SK : Dodatočná frakcia v zóne migrácie Z(C) (Hb Constant spring)
EE : Lisafraktsioon Z(C) migratsioonitsoonis (Hb Constant spring)
VN : Phân đoạn bổ sung trong vùng di chuyển Z(C) (Hb Constant spring)

SCHÉMAS / FIGURES

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CAPILLARYS HEMOGLOBIN(E) - CAPILLARYS 2 FLEX-PIERCING
PROFILS ÉLECTROPHORÉTIQUES - ELECTROPHORETIC PATTERNS

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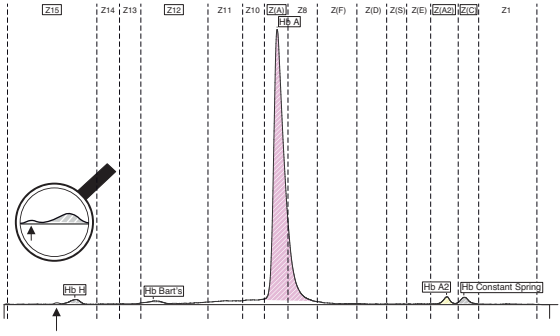
Fraction supplémentaire en zone de migration Z15
Additional fraction in Z15 migration zone



FR : Fraction supplémentaire en zone de migration Z15
GB : Additional fraction in Z15 migration zone
DE : Zusätzliche Fraktion in der Z15-Migrationszone
NL : Bijkomende fractie in Z15 migratiezone
IT : Frazione addizionale in zona di migrazione Z15
ES : Fracción adicional en la zona de migración Z15
PT : Fração adicional na zona de migração Z15
SV : Extra fraktion i Z15 migreringszon
GR : Πρόσθετο κλάσμα σε ζώνη μετακίνησης Z15
HR : Dodatna frakcija u zoni migracije Z15
LT : Papildoma frakcija Z15 migravimo zonoje
PL : Dodatkowa frakcja w strefie migracji Z15
RO : Fracţie suplimentară în zona de migrare Z15
CS : Dodatna frakcija u zoni migracije Z15
HU : További frakció a Z15 migrációs zónában
TR : Z15 migrasyon bölgesinde ek fraksiyon
CZ : Další frakce v migrační zóně Z15
BG : Допълнителна фракция в зона на миграция Z15
NO : Tilleggsfraksjon i Z15 migrasjonszone
DK : Ekstra fraktion i Z15-migrationszonen
CN : Z15 电泳区的其他区带
RU : Дополнительная фракция в зоне миграции Z15
JP : Z15泳動領域における追加フラクション
LV : Papildu sadaļa Z15 migrācijas zonā
SK : Dodatočná frakcia v zóne migrácie Z15
EE : Lisafraktsioon Z15 migratsioonitsoonis
VN : Phân đoạn bổ sung trong vùng di chuyển Z15

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CAPILLARYS HEMOGLOBIN(E)

Ref. 2007

Composition du kit
Kit composition

IVD

CE

2017/01

REAGENTS AND MATERIALS SUPPLIED IN THE CAPILLARYS HEMOGLOBIN(E) KIT

WARNING : See the safety data sheets.

ITEMS	PN. 2007
Buffer (ready to use)	2 vials, 700 mL each
Hemolysing solution (ready to use)	1 vial, 700 mL
Wash solution (stock solution)	1 vial, 75 mL
Dilution segments	1 pack of 90
Filters	4 filters

630 tests based on maximum usage.

During transportation, the kit can be kept without refrigeration (15 to 30 °C) for 15 days without any adverse effects on performance.

FOR OPTIMAL MANAGEMENT OF TRACEABILITY : All reagents from the same kit must be used together.
TO OBTAIN THE EXPECTED PERFORMANCES : The package insert instructions must be observed.

WARNING : Do not use marketed deionized water, such as water for ironing for example (risk of important capillaries damage). Use only water with ultrapure quality, such as injection grade water.

1. BUFFER

Preparation

The buffer is ready to use. It contains : buffer solution pH 9.4 ± 0.5 ; additives, nonhazardous at concentrations used, necessary for optimum performance.

Use

Buffer for analysis of hemoglobins in CAPILLARYS 2 & CAPILLARYS 2 FLEX-PIERCING.

Storage, stability and signs of deterioration

Store the buffer refrigerated (2 to 8 °C). It is stable until the expiration date indicated on the kit package or buffer vial labels. Avoid storage at room temperature (15 to 30 °C) for a long time or close to a window or to a heat source.
DO NOT FREEZE.

IMPORTANT: When stored at 2 - 8 °C and prior to use, it is necessary for the buffer to reach room temperature (15 to 30 °C); when it is full, let the buffer vial at room temperature for at least 3 hours prior to use. If this precaution is not respected, the performances of the procedure may be affected.

WARNING: Do not pre-heat the buffer in hot water.

Once the buffer vial has been opened and positioned on the CAPILLARYS 2 & CAPILLARYS 2 FLEX-PIERCING system, it is stable for a maximum of **1 month** (accumulated) at room temperature (15 to 30 °C). **After each use, the buffer must imperatively be stored refrigerated (between 2 and 8 °C) without any delay**, it is then stable until the expiration date indicated on the buffer vial label.

IMPORTANT: The accumulated time of the buffer stored at room temperature (15 to 30 °C) must not exceed **1 month**. This time of 1 month storage takes account of the time for the buffer to come to room temperature.

Discard buffer if it changes its appearance, e.g., becomes cloudy due to microbial contamination.

2. HEMOLYSING SOLUTION

Preparation

Hemolyzing solution is ready to use. It contains buffer solution pH 8.5 ± 0.5 ; additives, nonhazardous at concentrations used, necessary for optimum performance.

Use

To dilute and hemolyze red blood cells and whole blood.

Storage, stability and signs of deterioration

Store Hemolysing Solution at room temperature (15 to 30 °C) or refrigerated (2 to 8 °C). It is stable until the expiration date indicated on the kit package or Hemolysing Solution vial label. DO NOT FREEZE.
Once the Hemolyzing solution vial has been opened and positioned on the CAPILLARYS 2 FLEX-PIERCING instrument, it is stable for a maximum of 3 months (accumulated). If the Hemolyzing solution vial is planned to be used for more than 3 months, it must be removed from the instrument after each use and stored at room temperature (15 to 30 °C) or refrigerated (between 2 and 8 °C), Hemolyzing solution is then stable until the expiration date indicated on the Hemolyzing solution vial label.
Discard Hemolysing Solution if it changes its appearance, e.g., becomes cloudy due to microbial contamination.

3. WASH SOLUTION

Preparation

The vial of the stock wash solution should be diluted up to 750 mL with distilled or deionized water.
After dilution, the wash solution contains an alkaline solution pH ≈ 12.

Use

For washing the capillaries before and after hemoglobin electrophoresis.

IMPORTANT: Before filling the wash solution container, it is recommended to wash the opening of the container, the connector and the tube with plenty of distilled or deionized water to avoid salts deposit.

Storage, stability and signs of deterioration

Store the stock and working wash solutions in closed containers at room temperature (15 to 30 °C) or refrigerated (2 to 8 °C). The stock wash solution is stable until the expiration date indicated on the kit or wash solution vial label.
Working wash solution is stable for 3 months.
Discard working wash solution if it changes its appearance, e.g., becomes cloudy due to microbial contamination.

4. DILUTION SEGMENTS

Use

Single use dilution segments for the preparation of biological samples to analyze with the automated instrument. To be placed on the sample rack. One dilution segment is intended for the analysis of 8 samples (7 samples in the presence of a diluent).

WARNING : After use, dilution segments with biological samples have to be handled with care. When the analysis is completed, dilution segments must be discarded with biological waste products and they must NEVER be reused.

Storage

Before use, store the dilution segments in their sealed package in a clean and dry place and at a temperature comprised between 2 and 30 °C.

5. FILTERS

Use

Disposable filters for filtration of analysis buffer, hemolysing solution (**for CAPILLARYS 2 FLEX-PIERCING system**), working wash solution and distilled or deionized water (used for capillaries rinsing).

IMPORTANT : When kit replacement, change systematically all the filters. Wear clean gloves for handling and installation of filters.

Screw one filter at the connector situated at the extremity of each tube that plunges in the vials of buffer, hemolysing solution, wash solution and distilled or deionized water. When setting filters on CAPILLARYS 2 & CAPILLARYS 2 FLEX-PIERCING system, rinse the connectors and the tubes with distilled or deionized water.

Storage

Before use, store the filters in their sealed package in a dry place at room temperature (15 to 30 °C) or refrigerated (2 to 8 °C).