Anti-HBc IgM

**Reagents – working solution**

The reagent rackpack (M, R1, R2) is labeled as A-HBC/IGM.

- Streptavidin-coated microparticles (transparent cap): 1 bottle, 6.5 mL.
- Sample pretreatment reagent: Anti-human-Fdy-antibody (sheep) > 0.05 mg/mL; phosphate buffer 100 mmol/L, pH 7.4; preservative.
- Pretreatment anti-HBc IgM (gray cap): 1 bottle, 10 mL.
- Positive calibrator 2 (black cap): 2 bottles of 1.0 mL each.
- Negative calibrator 1 (white cap): 2 bottles of 1.0 mL each.
- Anti-HBc IgM (human): > 100 PEI-U/mL in human serum;

**Precautions and warnings**

For in vitro diagnostic use. Exercise the normal precautions required for handling all laboratory reagents. Disposal of all waste material should be in accordance with local guidelines.

**System information**

<table>
<thead>
<tr>
<th>System</th>
<th>MODULAR ANALYTICS E170</th>
</tr>
</thead>
<tbody>
<tr>
<td>cobas e 411</td>
<td></td>
</tr>
<tr>
<td>cobas e 601</td>
<td></td>
</tr>
<tr>
<td>cobas e 602</td>
<td></td>
</tr>
</tbody>
</table>

**Intended use**

The electrochemiluminescence immunoassay "ECLIA" is intended for use on Elecsys and cobas immunoassay analyzers.

**Summary**

References: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

Hepatitis B core antigen (HBcAg) is a non-glycosylated protein (p22) which forms the nucleocapsid (virus core) of the hepatitis B virus. The virus core encloses the HBV-DNA (virus genome) and the DNA-polymerase. In the cytosol of virus-producing hepatocytes the nucleocapsid is enveloped by the hepatitis B surface antigen (HBsAg) to form virions. Free HBcAg or non-enveloped virus cores are not detectable in serum.

IgM antibodies to HBcAg occur in serum during proliferation of active hepatitis B virus and can still be detected weeks to months after viral proliferation has ceased. High anti-HBc IgM concentrations can be found in acute hepatitis B and in attacks of chronic hepatitis B.

Tests for detecting anti-HBc IgM antibodies are used, in conjunction with HBsAg determinations, to identify acute hepatitis B virus infections. An acute attack of hitherto non-diagnosed chronic hepatitis B clinically resembles an acute hepatitis B infection and cannot be distinguished from this with certainty by determining the anti-HBc IgM. Follow-up studies, imaging procedures and liver biopsies are useful in differentiating between these two clinical pictures.

**Test principle**

\( \mu^- \) - Capture test principle. Total duration of assay: 18 minutes.

1. First incubation: Pretreatment of 10 \( \mu \)L of sample (automatically prediluted 1:400 with Diluent Universal) with anti-HBc IgM antibody (mouse) > 600 ng/mL; phosphate buffer 100 mmol/L, pH 7.4; preservative.
2. Second incubation: Biotinylated monoclonal anti-HBc IgM antibody (mouse) > 600 ng/mL; phosphate buffer 100 mmol/L, pH 7.4; preservative.
3. Third incubation: Pretreatment of 10 \( \mu \)L of sample (automatically prediluted 1:400 with Diluent Universal) with anti-HBc IgM antibody (mouse) > 600 ng/mL; phosphate buffer 100 mmol/L, pH 7.4; preservative.

**Usage**

Forcobase 411 analyzer: test number 460 for MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers: Application Code Number 086

Due to possible evaporation effects, not more than 5 calibration procedures per calibration at 20 °C. Exercise the normal precautions required for handling all laboratory reagents. Disposal of all waste material should be in accordance with local guidelines.
Anti-HBc IgM

transfer aliquots of the ready-for-use calibrators into empty snap-cap bottles (CalSet Vials). Attach the supplied labels to these additional bottles. Store the aliquots at 2-8 °C for later use.

Perform only one calibration procedure per aliquot.

All information required for correct operation is read in from the respective reagent barcodes.

Please note: Both the vial labels, and the additional labels (if available) contain 2 different barcodes. The barcode between the yellow markers is for cobas 8000 systems only. If using a cobas 8000 system, please turn the vial cap 180° into the correct position so the barcode can be read by the system. Place the vial on the instrument as usual.

Storage and stability
Store at 2-8 °C.

Do not freeze.

Store the Elecsys reagent kit upright in order to ensure complete availability of the microparticles during automatic mixing prior to use.

<table>
<thead>
<tr>
<th>Stability of the reagent rackpack</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>unopened at 2-8 °C</td>
<td>up to the stated expiration date</td>
</tr>
<tr>
<td>after opening at 2-8 °C</td>
<td>8 weeks</td>
</tr>
<tr>
<td>on cobas e 411</td>
<td>4 weeks</td>
</tr>
<tr>
<td>on MODULAR ANALYTICS E170,</td>
<td></td>
</tr>
<tr>
<td>cobas e 601 and cobas e 602</td>
<td>8 weeks</td>
</tr>
</tbody>
</table>

Stability of the calibrators

unopened at 2-8 °C up to the stated expiration date
after opening at 2-8 °C 8 weeks
on cobas e 411 at 20-25 °C up to 5 hours
on MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 at 20-25 °C use only once

Store calibrators upright in order to prevent the calibrator solution from adhering to the snap-cap.

Specimen collection and preparation

Only the specimens listed below were tested and found acceptable.

Serum collected using standard sampling tubes or tubes containing separating gel.

Li-heparin, Na-heparin, K+ -EDTA and Na-citrate plasma. Do not use plasma treated with sodium fluoride and potassium oxalate.

Criterion: Correct assignement of negative and positive samples.

Stable for 6 days at 2-8 °C, 3 months at -20 °C. The samples may be frozen 5 times.

The sample types listed were tested with a selection of sample collection tubes or systems that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Centrifuge samples containing precipitates and thawed samples before performing the assay. Heat-inactivated samples may be used.

Do not use samples and controls stabilized with azide.

Ensure the samples, calibrators and controls are at 20-25 °C prior to measurement.

Due to possible evaporation effects, samples and calibrators on the analyzers should be analyzed/measured within 2 hours.

The performance of the Elecsys Anti-HBc IgM assay has not been established with cadaveric samples or body fluids other than serum and plasma.

Materials provided

See “Reagents – working solutions” section for reagents.

- 2 x 6 bottle labels

Materials required (but not provided)

- 11876333222, PreciControl Anti-HBc IgM, 16 x 1.0 mL
- 11732277122, Diluent Universal, 2 x 16 mL sample diluent or
- 03183971122, Diluent Universal, 2 x 36 mL sample diluent
- 11776576322, CalSet Vials, 2 x 56 empty snap-cap bottles
- General laboratory equipment
- MODULAR ANALYTICS E170 or cobas e analyzer

Accessories for cobas e 411 analyzer:

- 11662986122, ProCell, 6 x 380 mL system buffer
- 11662970122, CleanCell, 6 x 380 mL measuring cell cleaning solution
- 11930346122, Elecsys SysWash, 1 x 500 mL washwater additive
- 11933159001, Adapter for SysClean
- 11706802001, AssyCup, 60 x 60 reaction cups
- 11706799001, AssyTIP, 30 x 120 pipette tips
- 11800507001, Clean-Liner

Accessories for MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers:

- 04880340190, ProCell M, 2 x 2 L system buffer
- 04880293190, CleanCell M, 2 x 2 L measuring cell cleaning solution
- 03023141001, PC/CC-Cups, 12 cups to prewarm ProCell M and CleanCell M before use
- 03005712001, ProbeWash M, 12 x 70 mL cleaning solution for run finalization and rinsing during reagent change
- 03004999190, PreClean M, 5 x 600 mL detection cleaning solution
- 12102137001, AssyTIP/AssyCup, 48 magazines x 84 reaction cups or pipette tips, waste bags
- 03023150001, WasteLiner, waste bags
- 03027651001, SysClean Adapter M

Accessories for all analyzers:

- 11298500316, ISE Cleaning Solution/Elecsys SysClean, 5 x 100 mL system cleaning solution

Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

Resuspension of the microparticles takes place automatically prior to use. Read in the test-specific parameters via the reagent barcode. If in exceptional cases the barcode cannot be read, enter the 15-digit sequence of numbers (except for the cobas e 602 analyzer).

MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers: ProClean M solution is necessary.

BRING the cooled reagents to approximately 20 °C and place on the reagent deck (20 °C) of the analyzer. Avoid foam formation. The system automatically regulates the temperature of the reagents and the opening/closing of the bottles.

Place the calibrators in the sample zone.

All the information necessary for calibrating the assay is automatically read into the analyzer.

After calibration has been performed, store the calibrators at 2-8 °C or discard (MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers).

Calibration

Traceability: This method has been standardized against the "HBc Reference Serum 84 (anti-HBc IgM)" of the Paul-Ehrlich-Institute, Langen (Germany). For the Elecsys Anti-HBc IgM assay, the cutoff (cutoff index 1.0) was set to approximately 100 PEI-U/mL.1

Calibration frequency: Calibration must be performed once per reagent lot using A-HBcIGM Cal1, A-HBcIGM Cal2 and fresh reagent (i.e. not more than 24 hours since the reagent kit was registered on the analyzer).
Anti-HBc IgM

Calibration interval may be extended based on acceptable verification of calibration by the laboratory.

Renewed calibration is recommended as follows:
- after 1 month (28 days) when using the same reagent lot
- after 7 days (when using the same reagent kit on the analyzer)
- as required: e.g.: quality control findings with PreciControl Anti–HBc IgM outside the defined limits
- more frequently when this is required by pertinent regulations.

Range for the electrochemiluminescence signals (counts) for the calibrators:
- Negative calibrator (A–HBcIGM Cal1): 600–3500 (cobas e 411 analyzer), 400–3500 (MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers).

Quality control

For quality control, use PreciControl Anti–HBc IgM.
Controls for the various concentration ranges should be run individually at least once every 24 hours when the test is in use, once per reagent kit, and following each calibration.

The control intervals and limits should be adapted to each laboratory’s individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

If necessary, repeat the measurement of the samples concerned.

Follow the applicable government regulations and local guidelines for quality control.

Note:
For technical reasons re-assigned target values valid only for a specific reagent and control lot combination must be entered manually on all analyzers (except for the cobas e 602 analyzer). Therefore always refer to the value sheet included in the reagent kit or PreciControl kit to make sure that the correct target values are used.

When a new reagent or control lot is used, the analyzer will use the original values encoded in the control barcodes.

Calculation

The analyzer automatically calculates the cutoff based on the measurement of A–HBcIGM Cal1 and A–HBcIGM Cal2.

The result of a sample is given either as reactive or non-reactive as well as in the form of a cutoff index (signal sample/cutoff).

Interpretation of the results

Samples with a cutoff index ≥ 1.0 are reactive in the Elecsys Anti–HBc IgM assay. These samples are considered positive for anti–HBc IgM.

Samples with a cutoff index < 1.0 are non-reactive in the Elecsys Anti–HBc IgM assay. These samples are considered negative.

Note: According to the recommendations of the Paul–Ehrlich Institute, Langen (Germany), an equivocal range should be allowed for the assessment of results from anti–HBc IgM tests.

For the Elecsys Anti–HBc IgM assay the equivocal cutoff index range is 0.9–1.1.

Limitations - interference

The assay is unaffected by icterus (bilirubin < 428 μmol/L or < 25 mg/dL), hemolysis (Hb < 1.2 mmol/L or < 2.0 g/dL), lipemia (Intralipid < 1500 mg/dL) and biotin (< 409 nmol/L or < 100 ng/mL).

Criterion: Correct assignment of positive and negative samples.

Samples should not be taken from patients receiving therapy with high biotin doses (i.e. > 5 mg/day) until at least 8 hours following the last biotin administration.

As with many μ-capture assays, an interference with unspecific human IgM is observed. Increasing amounts of unspecific human IgM may lead to a decrease in the recovery of positive samples with the Elecsys Anti–HBc IgM assay.

No interference was observed from rheumatoid factors up to a concentration of 4200 IU/mL.

In vitro tests were performed on 19 commonly used pharmaceuticals. No interference with the assay was found.

In rare cases, interference due to extremely high titers of antibodies to immunological components, streptavidin and ruthenium can occur.

For diagnostic purposes, the results should always be assessed in conjunction with the patient’s medical history, clinical examination and other findings.

Limits and ranges

Detection limit: ≤ 3.0 PEI-U/mL

The detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying two standard deviations above that of the negative calibrator (negative calibrator + 2 SD, repeatability study, n = 21).

Dilution

Use Diluent Universal for automatic sample predilution.

Expected values

For the Elecsys Anti–HBc IgM assay, the cutoff (cutoff index 1.0) was set to approximately 100 PEI–U/mL. In acute HBV infections the anti–HBc IgM level is generally far above this limit. After recovery from hepatitis B disease the anti–HBc IgM levels are below this. Chronic hepatitis can produce values in the vicinity of the cutoff.

Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using Elecsys reagents, human sera and controls.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Repeatability&lt;sup&gt;)&lt;/sup&gt;</th>
<th>Intermediate precision&lt;sup&gt;)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean COI</td>
<td>SD COI</td>
</tr>
<tr>
<td>HS, negative</td>
<td>0.123</td>
<td>0.003</td>
</tr>
<tr>
<td>HS, weakly positive</td>
<td>1.14</td>
<td>0.040</td>
</tr>
<tr>
<td>HS, positive</td>
<td>3.58</td>
<td>0.131</td>
</tr>
<tr>
<td>PC A–HBcIGM1</td>
<td>0.053</td>
<td>0.001</td>
</tr>
<tr>
<td>PC A–HBcIGM2</td>
<td>1.39</td>
<td>0.063</td>
</tr>
</tbody>
</table>

MODULAR ANALYTICS E170, cobas e 601 and cobas e 602 analyzers

<table>
<thead>
<tr>
<th>Sample</th>
<th>Repeatability&lt;sup&gt;)&lt;/sup&gt;</th>
<th>Intermediate precision&lt;sup&gt;)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean COI</td>
<td>SD COI</td>
</tr>
<tr>
<td>HS, negative</td>
<td>0.037</td>
<td>0.001</td>
</tr>
<tr>
<td>HS, weakly positive</td>
<td>1.32</td>
<td>0.032</td>
</tr>
<tr>
<td>HS, positive</td>
<td>4.91</td>
<td>0.080</td>
</tr>
<tr>
<td>PC A–HBcIGM1</td>
<td>0.032</td>
<td>0.001</td>
</tr>
<tr>
<td>PC A–HBcIGM2</td>
<td>1.67</td>
<td>0.043</td>
</tr>
</tbody>
</table>

h) Repeatability = within-run precision (n = 2021)
i) Intermediate precision = between-run precision (n = 10)

Analytical specificity

No cross-reactions with HAV, HCV, HIV 1+2, CMV, EBV, HSV, E. coli, Toxoplasma gondii, Rubella, and Treponema pallidum were observed.

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**Anti-HBc IgM**

Measurements were performed on each of the pathogens listed above using ≥ 8 serum or plasma samples which were positive for antibodies to the above-mentioned pathogens or contained autoantibodies (SLE, ANA).

**Cutoff sensitivity**

Approx. 100 PEI−/U/mL for the Elecsys Anti−HBc IgM assay. Assays of other manufacturers may be set differently.

**Clinical sensitivity**

<table>
<thead>
<tr>
<th>Elecsys Anti−HBc IgM assay</th>
<th>Anti−HBc IgM comparison test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute HBV infection clinically and serologically manifested</strong></td>
<td></td>
</tr>
<tr>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>48</td>
<td>-</td>
</tr>
<tr>
<td><strong>Acute HBV infection clinically manifested</strong></td>
<td></td>
</tr>
<tr>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td><strong>Acute HBV infection serologically manifested</strong></td>
<td></td>
</tr>
<tr>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>57</td>
<td>6</td>
</tr>
<tr>
<td>Serologically manifested no clinical information</td>
<td></td>
</tr>
<tr>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>145</td>
<td>292</td>
</tr>
</tbody>
</table>

1) positive
2) negative
3) In the comparison test, the discrepant samples were weakly positive.

**Clinical specificity**

To investigate the specificity, samples from randomly selected blood donors were tested with the Elecsys Anti−HBc IgM assay in comparison to licensed enzyme immunoassays.

1003/1003 samples from blood donors were negative with the Elecsys Anti−HBc IgM assay (100 % specificity for this cohort).

990/1003 were negative with a comparison test (98.7 % specificity).

242/242 samples from hospitalized patients, pregnant women, and dialysis patients with no indication of an HBV infection were negative with both the Elecsys Anti−HBc IgM assay and the comparison test (100 % specificity for this cohort).

**References**


For further information, please refer to the appropriate operator’s manual for the analyzer concerned, the respective application sheets, the product information and the Method Sheets of all necessary components (if available in your country).

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

**Symbols**

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223−1 standard (for USA: see https://usdiagnostics.roche.com for definition of symbols used):

- **CONTENT**
  - Contents of kit
  - Analyzers/Instruments on which reagents can be used
  - Reagent
  - Calibrator
- **GTR**
  - Volume after reconstitution or mixing
  - Global Trade Item Number

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