



# MAGLUMI® Human Parainfluenza Virus IgM (CLIA)

### INTENDED USE

The kit is an *in vitro* chemiluminescence immunoassay for the qualitative determination of Human Parainfluenza Virus(HPIV) IgM in human serum and plasma using the MAGLUMI series Fully-auto chemiluminescence immunoassay analyzer and Biolumi series Integrated System, and the assay is used for an aid in the diagnosis of individuals with suspected or confirmed HPIV infection.

### SUMMARY

HPIV is an important pathogen causing lower respiratory infections in infants and young children, and its morbidity is second only to respiratory syncytial virus<sup>1</sup>. The virus is spread through person-to-person direct contact and respiratory droplets, and the infection is distributed globally with a high rate of reinfection<sup>2,3</sup>. HPIV belongs to the genus *paramyxovirus* and is a negative single-stranded RNA virus, which can be divided into 4 types according to genetics, HPIV1-4, HPIV4 is further divided into HPIV4a and HPIV4b<sup>1,4,5</sup>. Among the four serotypes, HPIV1-3 is the main virus subtype that causes lower respiratory infection in infants, the immunocompromised, the elderly and chronic patients<sup>1</sup>. After infection, it can cause acute laryngotracheobronchitis, bronchiolitis, pneumonia, tracheobronchitis, otitis media, pharyngitis and other related inflammation, and the main clinical manifestations are fever, expiratory wheezing, rales, etc<sup>1,6</sup>. Serological studies have shown that up to 50% of infants are infected with HPIV3 before the age of 1, while HPIV1 and HPIV2 mainly affect preschoolers. HPIV1 and HPIV2 are common in autumn and are endemic once every two years, while HPIV3 occurs throughout the year<sup>7</sup>. Studies have shown that specific IgM antibodies are produced in serum shortly after infection with the HPIV pathogen<sup>1</sup>.

### TEST PRINCIPLE

Capture chemiluminescence immunoassay. The sample, buffer, magnetic microbeads coated with anti-human IgM antibody are mixed thoroughly and incubated, performing a wash cycle after a precipitation in a magnetic field. ABEI labeled with HPIV antigen are then added and incubated, reacting to form immuno-complexes. After precipitation in a magnetic field, the supernatant is decanted and then a wash cycle is performed. Subsequently, the Starter 1+2 are added to initiate a chemiluminescent reaction. The light signal is measured by a photomultiplier as relative light units (RLUs), which is proportional to the concentration of HPIV IgM present in the sample.

### REAGENTS

#### Kit Contents

| Component                               | Description                                                                                                    | 100 tests/kit | 50 tests/kit |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------|--------------|
| Magnetic Microbeads                     | Magnetic microbeads coated with anti-human IgM antibody (~10.0 µg/mL) in PBS buffer, NaN <sub>3</sub> (<0.1%). | 2.5 mL        | 1.5 mL       |
| Calibrator Low                          | A low concentration of HPIV IgM in PBS buffer, NaN <sub>3</sub> (<0.1%).                                       | 1.0 mL        | 1.0 mL       |
| Calibrator High                         | A high concentration of HPIV IgM in PBS buffer, NaN <sub>3</sub> (<0.1%).                                      | 1.0 mL        | 1.0 mL       |
| Buffer                                  | PBS buffer, NaN <sub>3</sub> (<0.1%).                                                                          | 22.5 mL       | 12.0 mL      |
| ABEI Label                              | ABEI labeled with HPIV antigen (~50.0 ng/mL) in PBS buffer, NaN <sub>3</sub> (<0.1%).                          | 22.5 mL       | 12.0 mL      |
| Negative Control                        | PBS buffer, NaN <sub>3</sub> (<0.1%).                                                                          | 1.0 mL        | 1.0 mL       |
| Positive Control                        | A high concentration of HPIV IgM (4.00 AU/mL) in PBS buffer, NaN <sub>3</sub> (<0.1%).                         | 1.0 mL        | 1.0 mL       |
| All reagents are provided ready-to-use. |                                                                                                                |               |              |

#### Warnings and Precautions

- For *in vitro* diagnostic use.
- For professional use only.
- Exercise the normal precautions required for handling all laboratory reagents.
- Personal protective measures should be taken to prevent any part of the human body from contacting samples, reagents, and controls, and should comply with local operating requirements for the assay.
- A skillful technique and strict adherence to the package insert are necessary to obtain reliable results.
- Do not use kit beyond the expiration date indicated on the label.
- Do not interchange reagent components from different reagents or lots.
- Avoid foam formation in all reagents and sample types (specimens, calibrators and controls).
- All waste associated with biological samples, biological reagents and disposable materials used for the assay should be considered potentially infectious and should be disposed of in accordance with local guidelines.
- This product contains sodium azide. Sodium azide may react with lead or copper plumbing to form highly explosive metal azides. Immediately after disposal, flush with a large volume of water to prevent azide build-up. For additional information, see Safety Data Sheets available for professional user on request.

Note: If any serious incident has occurred in relation to the device, please report to Shenzhen New Industries Biomedical Engineering Co., Ltd. (Snibe) or our authorized representative and the competent authority of the Member State in which you are established.

#### Reagent Handling

- To avoid contamination, wear clean gloves when operating with a reagent kit and sample. When handling reagent kit, replace the gloves that have been in contact with samples, since introduction of samples will result in unreliable results.
- Do not use kit in malfunction conditions; e.g., the kit leaking at the sealing film or elsewhere, obviously turbid or precipitation is found in reagents (except for Magnetic Microbeads) or control value is out of the specified range repeatedly. When kit in malfunction conditions, please contact Snibe or our authorized distributor.
- To avoid evaporation of the liquid in the opened reagent kits in refrigerator, it is recommended that the opened reagent kits to be sealed with reagent seals contained within the packaging. The reagent seals are single use, and if more seals are needed, please contact Snibe or our authorized distributor.
- Over time, residual liquids may dry on the septum surface. These are typically dried salts and have no effect on assay efficacy.
- Use always the same analyzer for an opened reagent integral.
- For magnetic microbeads mixing instructions, refer to the Preparation of the Reagent section of this package insert.
- For further information about the reagent handing during system operation, please refer to Analyzer Operating Instructions.

#### Storage and Stability

- Do not freeze the integral reagents.
- Store the reagent kit upright to ensure complete availability of the magnetic microbeads.
- Protect from direct sunlight.

| Stability of the Reagents |                                  |
|---------------------------|----------------------------------|
| Unopened at 2-8°C         | until the stated expiration date |
| Opened at 2-8°C           | 6 weeks                          |
| On-board                  | 4 weeks                          |

| Stability of Controls |                                  |
|-----------------------|----------------------------------|
| Unopened at 2-8°C     | until the stated expiration date |
| Opened at 10-30°C     | 6 hours                          |
| Opened at 2-8°C       | 6 weeks                          |

|                          |                      |
|--------------------------|----------------------|
| Frozen at -20°C          | 3 months             |
| Frozen and thawed cycles | no more than 3 times |

### SPECIMEN COLLECTION AND PREPARATION

#### Specimen Types

Only the specimens listed below were tested and found acceptable.

| Specimen Types | Collection Tubes                                                                                 |
|----------------|--------------------------------------------------------------------------------------------------|
| Serum          | Tubes without additive/accessory, or tubes containing clot activator or clot activator with gel. |
| Plasma         | K2-EDTA, Li-heparin                                                                              |

- The sample types listed were tested with a selection of sample collection tubes 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. Follow tube manufacturers' instructions carefully when using collection tubes.

#### Specimen Conditions

- Do not use grossly hemolyzed/hyperlipidaemia specimens and specimens with obvious microbial contamination.
- Ensure that complete clot formation in serum specimens has taken place prior to centrifugation. Some serum specimens, especially those from patients receiving anticoagulant or thrombolytic therapy, may exhibit increased clotting time. If the serum specimen is centrifuged before a complete clotting, the presence of fibrin may cause erroneous results.
- Samples must be free of fibrin and other particulate matter.
- To prevent cross contamination, use of disposable pipettes or pipette tips are recommended.

#### Preparation for Analysis

- Inspect all specimens for foam. Remove foam with an applicator stick before analysis. Use a new applicator stick for each specimen to prevent cross contamination.
- Frozen specimens must be completely thawed before mixing. Mix thawed specimens thoroughly by low speed vortexing or by gently inverting. Visually inspect the specimens. If layering or stratification is observed, mix until specimens are visibly homogeneous. If specimens are not mixed thoroughly, inconsistent results may be obtained.
- For reliable results, specimens should be free of fibrin, red blood cells, or other particulate matter. Specimens must be centrifuged prior to testing, transfer clarified specimen to a sample cup or secondary tube for testing. For centrifuged specimens with a lipid layer, transfer only the clarified specimen and not the lipemic material.
- The sample volume required for a single determination of this assay is 10 µL.

#### Specimen Storage

Specimens removed from the separator, red blood cells or clot may be stored up to 8 hours at 10-30°C or 14 days at 2-8°C, or 12 months frozen at -20°C. Frozen specimens subjected to up to 3 freeze/thaw cycles have been evaluated.

#### Specimen Shipping

- Package and label specimens in compliance with applicable local regulations covering the transport of clinical specimens and infectious substances.
- Do not exceed the storage limitations listed above.

### PROCEDURE

#### Materials Provided

Human Parainfluenza Virus IgM (CLIA) assay, control barcode labels.

#### Materials Required (But Not Provided)

- General laboratory equipment.
- Fully-auto chemiluminescence immunoassay analyzer Maglumi 600, Maglumi 800, Maglumi 1000, Maglumi 2000, Maglumi 2000 Plus, Maglumi 4000, Maglumi 4000 Plus, MAGLUMI X3, MAGLUMI X6, MAGLUMI X8, or Integrated System Biolumi 8000 and Biolumi CX8.
- Additional accessories of test required for the above analyzers include Reaction Module, Starter 1+2, Wash Concentrate, Light Check, Tip, and Reaction Cup. Specific accessories and accessories' specification for each model refer to corresponding Analyzer Operating Instructions.
- Please use accessories specified by Snibe to ensure the reliability of the test results.

#### Assay Procedure

##### Preparation of the Reagent

- Take the reagent kit out of the box and visually inspect the integral vials for leaking at the sealing film or elsewhere. If there is no leakage, please tear off the sealing film carefully.
- Open the reagent area door; hold the reagent handle to get the RFID label close to the RFID reader (for about 2s); the buzzer will beep; one beep sound indicates successful sensing.
- Keeping the reagent straight insert to the bottom along the blank reagent track.
- Observe whether the reagent information is displayed successfully in the software interface, otherwise repeat the above two steps.
- Resuspension of the magnetic microbeads takes place automatically when the kit is loaded successfully, ensuring the magnetic microbeads are totally resuspended homogenous prior to use.

##### Assay Calibration

- Select the assay to be calibrated and execute calibration operation in reagent area interface. For specific information on registrating calibrations, refer to the calibration section of Analyzer Operating Instructions.
- Execute recalibration according to the calibration interval required in this package insert.

##### Quality Control

- When new lot used, check or edit the quality control information.
- Scan the control barcode, choose corresponding quality control information and execute testing. For specific information on registrating quality controls, refer to the quality control section of the Analyzer Operating Instructions.

##### Sample Testing

- After successfully loading the sample, select the sample in interface and edit the assay for the sample to be tested and execute testing. For specific information on registrating samples, refer to the sample section of the Analyzer Operating Instructions.

To ensure proper test performance, strictly adhere to Analyzer Operating Instructions.

##### Calibration

Traceability: This method has been standardized against the Snibe internal reference standard.

Test of assay specific calibrators allows the detected relative light unit (RLU) values to adjust the master curve.

Recalibration is recommended as follows:

- Whenever a new lot of Reagent or Starter 1+2 is used.
- Every 14 days.
- The analyzer has been serviced.
- Control values lie outside the specified range.

##### Quality Control

Controls are recommended for the determination of quality control requirements for this assay and should be run in singlicate to monitor the assay performance. Refer to published guidelines for general quality control recommendations, for example Clinical and Laboratory Standards Institute (CLSI) Guideline C24 or other published guidelines<sup>8</sup>.

Quality control is recommended once per day of use, or in accordance with local regulations or accreditation requirements and your laboratory's quality control procedures, quality control could be performed by running the HPIV IgM assay:

- Whenever the kit is calibrated.
- Whenever a new lot of Starter 1+2 or Wash Concentrate is used.

Controls are only applicable with MAGLUMI and Biolumi systems and only used matching with the same top seven LOT numbers of corresponding reagents. For

each target value and range refer to the label.

The performance of other controls should be evaluated for compatibility with this assay before they are used. Appropriate value ranges should be established for all quality control materials used.

Control values must lie within the specified range, whenever one of the controls lies outside the specified range, calibration should be repeated and controls retested. If control values lie repeatedly outside the predefined ranges after successful calibration, patient results must not be reported and take the following actions:

- Verify that the materials are not expired.
- Verify that required maintenance was performed.
- Verify that the assay was performed according to the package insert.
- If necessary, contact Snibe or our authorized distributors for assistance.

If the controls in kit are not enough for use, please order Human Parainfluenza Virus IgM (CLIA) Controls (REF: 160201275MT) from Snibe or our authorized distributors for more.

■ RESULTS

Calculation

The analyzer automatically calculates the HPIV IgM concentration in each sample by means of a calibration curve which is generated by a 2-point calibration master curve procedure. The results are expressed in AU/mL. For further information please refer to the Analyzer Operating Instructions.

Interpretation of Results

The expected range for the HPIV IgM assay was obtained by testing 169 HPIV IgM positive patients and 201 HPIV IgM negative people, gave the following expected value by ROC curve:

- Non-reactive: A result less than 1.00 AU/mL (<1.00 AU/mL) is considered to be negative.
- Reactive: A result greater than or equal to 1.00 AU/mL (≥1.00 AU/mL) is considered to be positive.

Results may differ between laboratories due to variations in population and test method. It is recommended that each laboratory establish its own reference interval.

■ LIMITATIONS

- Results should be used in conjunction with patient's medical history, clinical examination and other findings.
- If the HPIV IgM results are inconsistent with clinical evidence, additional testing is needed to confirm the result.
- Specimens from patients who have received preparations of mouse monoclonal antibodies for diagnosis or therapy may contain human anti-mouse antibodies (HAMA). Such specimens may show either falsely elevated or depressed values when tested with assay kits which employ mouse monoclonal antibodies<sup>9,10</sup>. Additional information may be required for diagnosis.
- Heterophilic antibodies in human serum can react with reagent immunoglobulins, interfering with *in vitro* immunoassays. Patients routinely exposed to animals or animal serum products can be prone to this interference and anomalous values may be observed<sup>11</sup>.
- Bacterial contamination of the specimens may affect the test results.

■ SPECIFIC PERFORMANCE CHARACTERISTICS

Representative performance data are provided in this section. Results obtained in individual laboratories may vary.

Precision

Precision was determined using the assay, samples and controls in a protocol (EP05-A2,EP05-A3) of the CLSI (Clinical and Laboratory Standards Institute): duplicates at two independent runs per day for 20 days at three different sites using three lots of reagent kits (n = 720). The following results were obtained:

| Sample           | Mean (AU/mL)<br>(n=720) | Within-Run |      | Between-Run |      | Reproducibility |       |
|------------------|-------------------------|------------|------|-------------|------|-----------------|-------|
|                  |                         | SD (AU/mL) | %CV  | SD (AU/mL)  | %CV  | SD (AU/mL)      | %CV   |
| Serum Pool 1     | 0.700                   | NA         | NA   | NA          | NA   | NA              | NA    |
| Serum Pool 2     | 1.485                   | 0.040      | 2.72 | 0.039       | 2.64 | 0.126           | 8.46  |
| Serum Pool 3     | 6.099                   | 0.149      | 2.45 | 0.130       | 2.13 | 0.418           | 6.85  |
| Plasma Pool 1    | 0.688                   | NA         | NA   | NA          | NA   | NA              | NA    |
| Plasma Pool 2    | 1.498                   | 0.043      | 2.88 | 0.044       | 2.91 | 0.136           | 9.05  |
| Plasma Pool 3    | 6.000                   | 0.153      | 2.55 | 0.116       | 1.93 | 0.731           | 12.19 |
| Negative Control | 0.193                   | NA         | NA   | NA          | NA   | NA              | NA    |
| Positive Control | 4.022                   | 0.109      | 2.72 | 0.087       | 2.15 | 0.559           | 13.90 |

Analytical Specificity

Interference

Interference was determined using the assay, three samples containing different concentrations of analyte were spiked with potential endogenous and exogenous interferences in a protocol (EP7-A2) of the CLSI. The measurement deviation of the interference substance is within ±10%. The following results were obtained:

| Interference      | No interference up to | Interference         | No interference up to |
|-------------------|-----------------------|----------------------|-----------------------|
| Hemoglobin        | 1500 mg/dL            | HPIV IgG             | 1:128(titer)          |
| Intralipid        | 1500 mg/dL            | K2-EDTA              | 9 mg/mL               |
| Bilirubin         | 30 mg/dL              | Heparin lithium salt | 80 IU/mL              |
| HAMA              | 30 ng/mL              | Oseltamivir          | 75 mg/L               |
| ANA               | 398 AU/mL             | Zanamivir            | 10 mg/L               |
| Rheumatoid factor | 1500 IU/mL            | Peramivir            | 600 mg/L              |
| Total IgG         | 4086 mg/dL            | Arbidol              | 200 mg/L              |
| Total IgM         | 364 mg/dL             |                      |                       |

Cross-Reactivity

The assay is highly specific for HPIV IgM antibodies, with no observed cross-reactivity to Influenza A virus IgM, Influenza B virus IgM, HPIV IgG, *Legionella pneumophila* IgM, Respiratory syncytial virus IgM, Adenovirus IgM, Coxsackie virus B group IgM, *Mycoplasma pneumoniae* IgM, *Chlamydia pneumoniae* IgM, *Streptococcus pneumoniae* IgM, *Haemophilus influenzae* IgM, *Klebsiella pneumoniae* IgM, *Mycobacterium tuberculosis* IgM, Anti-*Treponema pallidum*, Measles virus IgM, Mumps virus IgM, Herpes simplex virus type 1 IgM, Cytomegalovirus IgM, Rhinovirus IgM, Human metapneumovirus IgM, *Toxoplasma gondii* IgM, Rubella virus IgM, EB virus nucleocapsid antigen IgM, Varicella zoster virus IgM.

High-Dose Hook

No high-dose hook effect was seen for HPIV IgM concentrations up to 2600 AU/mL.

Relative Sensitivity

The relative sensitivity of the HPIV IgM assay was determined by testing 146 samples collected from expected positive population with commercial assay confirmation of HPIV IgM positive result.

| N of samples | Reactive | Relative Sensitivity | 95% CI        |
|--------------|----------|----------------------|---------------|
| 146          | 143      | 97.95%               | 94.13%-99.30% |

Relative Specificity

The relative specificity of the HPIV IgM assay was determined by testing 915 samples collected from expected negative population with commercial assay confirmation of HPIV IgM negative result.

| N of samples | Non-reactive | Relative Specificity | 95% CI        |
|--------------|--------------|----------------------|---------------|
| 915          | 910          | 99.45%               | 98.73%-99.77% |

■ REFERENCES

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■ SYMBOLS EXPLANATIONS

|  |                                           |  |                                                     |
|--|-------------------------------------------|--|-----------------------------------------------------|
|  | Consult instructions for use              |  | Manufacturer                                        |
|  | Temperature limit<br>(Store at 2-8°C)     |  | Use-by date                                         |
|  | Contains sufficient for<n> tests          |  | Keep away from sunlight                             |
|  | This way up                               |  | Authorized representative in the European Community |
|  | <i>In vitro</i> diagnostic medical device |  | Kit component                                       |
|  | Catalogue number                          |  | Batch code                                          |
|  | CE marking with notified body ID number   |  |                                                     |

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