Lumella® Preeclampsia Test System

Instructions For Use

REF 2001/2002

CE IVD

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INTENDED USE

The Lumella® Preeclampsia Test System provides a semi-quantitative measurement of glycosylated fibronectin in fingerstick whole blood. The test is used as an aid in the assessment of preeclampsia in conjunction with other clinical and laboratory information. The system is for *In Vitro* Diagnostic and professional use only.

SUMMARY OF TEST

Fibronectin plays an important role in inflammation, wound healing, and vascular modelling. [1,2] Elevated levels of glycosylated fibronectin (GlyFn) is a risk factor for preeclampsia [2]. The Lumella® system comprises test cartridges and a Reader. A lot-specific RFID tag that contains the calibration curve, lot number and the test kit expiration date is provided with each pack of test kits. After the test cartridge is inserted into the Reader and the treated blood sample is applied to the cartridge, test results are displayed in 10 minutes. Results can also be printed by an optional Bluetooth printer.

PRINCIPLES OF THE TEST

When a diluted blood sample is applied to the Test Cartridge Sample Application Port, colloidal gold nanoparticles coated with an anti-glycosylated fibronectin monoclonal antibody are rehydrated and interact with glycosylated fibronectin in the sample resulting in colloidal gold-fibronectin complexes. These complexes migrate via capillary action to the test membrane where another anti-glycosylated fibronectin monoclonal antibody is bound at the Test Line

allowing capture of the colloidal gold-fibronectin complexes forming a reddish-purple line. The color intensity of the Test Line measured by the Lumella® Reader is proportional to the concentration of glycosylated fibronectin in the blood sample. The Reader converts this color reading into a test result that is displayed on the screen. This procedure is based on the "sandwich immunoassay method."

MATERIALS PROVIDED

(Quantities are listed per Test Kit unless noted)

- Lumella® Preeclampsia Test Cartridges (1)
- Lot specific RFID Card with RFID tag affixed (1 per box)
- Auto-disabling, single use lancing device (1)
- Capillary blood collection micropipette (2)
- Vial containing Sample Buffer (1 vial with 1.75 mL Sample Buffer)
- Alcohol wipe (1)
- Bandage (1)
- Sample transfer pipette (2)
- Instructions for use (this document) (1 per box)
- Quick Reference Guide (1 per box)

MATERIALS AND EQUIPMENT NEEDED BUT NOT PROVIDED

Quality Control Materials – Please refer to the Product Insert for the Lumella® Preeclampsia Control Kit for directions for use.

The Lumella® Reader is required for each test (available in the Lumella® PE Test System (Cat. No. 2002)

The Lumella® Reader Calibration Cartridge (is included with the Lumella® Reader referenced above).

STORAGE AND HANDLING

- Store Test Kits in a cool, dry place between 2–30 °C, (35–86 °F). Test cartridges stored in a refrigerator at 2–8 °C (35–46 °F) must be brought to room temperature before opening and using. Do not freeze.
- The test has only been verified to perform accordingly through a temperature range of 18–30 °C).
- Keep away from heat and direct sunlight.
- Do not open the pouch until the sample is ready to be tested.
- Use a test cartridge as soon as you have removed it from the foil pouch.

WARNINGS AND PRECAUTIONS

- For *in vitro* diagnostic use only.
- Intended for professional use only.
- The test is to be used only as an aid in the assessment of preeclampsia, in conjunction with other clinical and laboratory information. This test should not be relied upon as the sole indicator of risk for preeclampsia.
- Test results are not meant to be visually determined. All test results must be determined using the Lumella® Reader.
- Lumella® Preeclampsia Test Cartridges can only be used in the Lumella® brand Reader.
- Make sure that the lot numbers printed on the RFID Card and test cartridges match. Never use an RFID tag from a different lot than the test cartridges being used.
- Out-of-date or expired cartridges cannot be used. Check box or foil pouch for expiration date.
- Discard the test cartridge after using. Cartridges are to be read once. Never insert or read a used test cartridge.
- **Do not ingest any of the supplied materials.**

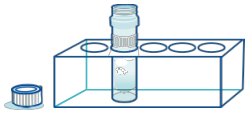
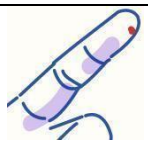
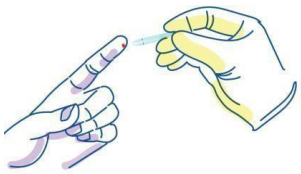
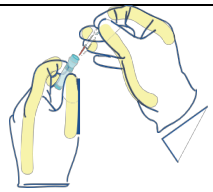
SPECIMEN COLLECTION AND PREPARATION

Lumella® Preeclampsia Test Kits are designed for use with fresh capillary (fingerstick) whole blood. To obtain a drop of blood from a fingerstick, follow the steps below:

Procedure for Getting a Good Drop of Blood:

1. Warm the fingers to increase blood flow.
2. Instruct the patient to wash hands in warm, soapy water. Rinse well and dry completely.
3. After wiping the finger with the provided alcohol wipe, let the finger air dry before testing. The site **must be allowed to air dry** to provide effective disinfection, and to prevent possible hemolysis or erroneous results from residual alcohol.
4. Let the arm hang down at the person's side briefly to allow blood flow to the fingertips.
5. Use the provided sterile, auto-disabling, single use lancet to puncture the side of the fingertip instead of the center.
6. Allow a small drop of blood to collect at the puncture site. Do not "milk" the finger. If necessary, hold the finger below elbow level to obtain sufficient sample volume. Excessive squeezing of the finger may alter test results.

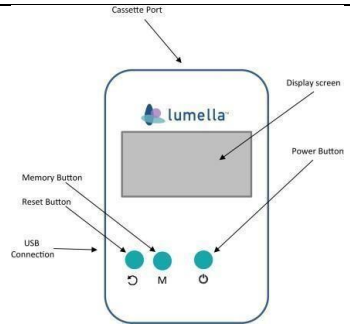
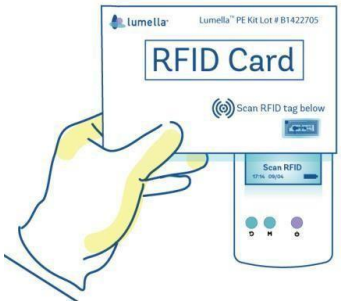
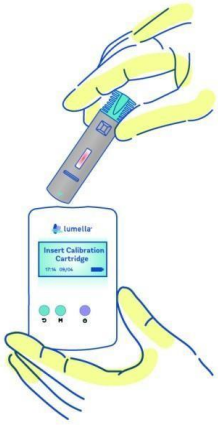
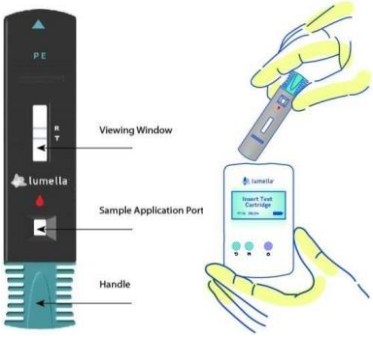
To obtain a sample:

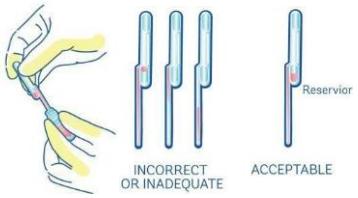
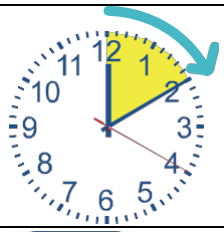
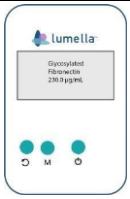
1. Clean the finger with the alcohol swab. Allow the finger to air dry.	
2. Open the Sample Buffer Vial and place it in the holder provided. Retain cap.	
3. Use a new, self-disabling, single use lancet to puncture the skin after twisting off and removing the bottom of the lancet.	
4. Allow a small drop of blood to collect at the puncture site.	
5. Hold the blood collection micropipette gently such that it is not depressed. DO NOT SQUEEZE THE PIPETTE. Position the micropipette horizontally and place only the tip of the pipette on the surface of the blood drop. The pipette will begin to fill automatically. Pay careful attention to the amount of blood taken. When the blood reaches the line on the pipette, carefully withdraw the pipette from the blood. The blood should fill the pipette to the line as indicated in the diagram. If the blood fills the pipette past the line, discard the pipette and use a new blood collection device. DO NOT WIPE THE TIP.	 
6. Insert the tip of the blood collection micropipette into the buffer. Expel blood by pressing the bulb gently. Rinse the pipette 3 to 4 times until there is no indication of blood present.	
7. Replace the cap securely on the sample buffer tube and mix by inverting 8-10 times. DO NOT SHAKE. Remove the cap and place the vial in the holder	

Caution: Handle and dispose of all materials coming in contact with blood according to universal precautions and guidelines.

INSTRUCTIONS FOR TESTING

IMPORTANT: Read all instructions carefully before testing.

1. Turn on the Lumella® Reader by pressing the Power Button . After a brief self-test check, the reader will display the previous test result followed by "Scan RFID". Turn on the optional Lumella® Bluetooth Printer by pressing its Power Button	
2. Position the RFID Card such that the metallic tag is over the Lumella® logo on the top of the Reader (above the display). After a few seconds you should hear a series of beeps indicating that the Reader has received the RFID data. After a few more seconds "Insert Calibration Cartridge" will be displayed.	
3. Remove the Calibration Cartridge from its holder. With the Reader positioned horizontally and level on a table, hold the Calibration Cartridge by the handle and insert it into the Reader as far as it will go into the cartridge slot, arrow side first. If the Reader passes its internal calibration check, the display will read "Insert Test Cartridge". If the Reader fails the calibration, "Error 2" will be displayed. See Section VIII, Troubleshooting, of the Reader User Guide, for more information.	
4. Remove the Lumella® Preeclampsia Test Cartridge from the foil pouch. Only open the foil pouch immediately prior to running the test. Position the Reader horizontally and level on a table. Hold the test cartridge by the handle and insert it into the Reader as far as it will go into the cartridge slot, arrow side first. When the test cartridge has been recognized by the Reader, "Apply Sample" will be displayed.	

5. Press the transfer pipette bulb completely and then immerse the tip into the buffer vial as far as it will go. Release the bulb to fill the pipette. Any excess sample will fall into the reservoir. Ensure there are no bubbles in the pipette.	
6. Touch the tip of the transfer pipette to the white square in the Sample Application Port and gently squeeze the bulb slowly to add the sample to the cartridge all at once. If the bulb is squeezed too rapidly, some of the sample may spray outside of the Application Port resulting in erroneous results.	
7. When the sample has been detected, a 10-minute countdown timer will be displayed, and the LCD screen will be dimmed to preserve battery power. The test will run automatically. Do not move or touch the Reader while the test is running.	
8. When the test is complete, the Reader will beep and display the test results.	
9. To run another test immediately, press the Reset Button ↺. "Scan RFID" will be displayed. Go to Step I.	
10. To turn off the Reader, press and hold the Power Button ⏻ for 3 seconds then release.	

INTERPRETATION OF RESULTS

Glycosylated Fibronectin Expected Values

- "Normal" – Glycosylated fibronectin levels are in the range of 50 – 350 µg/mL
- "Positive" – Glycosylated fibronectin levels are in the range of 351 – 600 µg/mL This is associated with an increased risk of preeclampsia.
- "High Positive" – Glycosylated fibronectin levels are greater than 600 µg/mL This is associated with an increased risk of severe preeclampsia.

MEASURING RANGE

The Lumella® Preeclampsia Test System will detect glycosylated fibronectin levels through a range of 50 to 800 µg/mL.

LIMITATIONS OF THE PROCEDURE

1. Only fingerstick whole blood should be tested. **Do not use anticoagulated blood samples. EDTA and Heparin interfere with the test.**
2. The Lumella® PE Test was evaluated for possible interference from high levels of endogenous blood components, based on guidelines described in CLSI EP7. Serum samples were tested that contained hemoglobin, bilirubin, or triglycerides at concentrations above physiological levels. None of the endogenous blood components affected test performance.

CLINICAL PERFORMANCE

Clinical Study 1

A total of 798 pregnant women at ≥20 weeks of gestation were enrolled in a prospective case-control study[2]. Study participants included 469 normotensive women with urinary mg protein/mmol creatinine ratio <0.3, 135 with PE (hypertension with urinary mg protein/mmol creatinine ratio ≥0.3) and 194 with gestational hypertension (hypertension with urinary mg protein/mmol creatinine ratio <0.3).

GlyFn levels were determined using the Lumella® Preeclampsia Test. Performance was assessed using logistic regression modeling and receiver-operating characteristic (ROC) curves.

	Control	PE	GH	Group Difference *P-value*
n	469	135	194	N/A
GlyFn (µg/ml)	169(86)	412(212)	266(136)	<0.001

Data are presented as median (interquartile range).

GlyFn performance characteristics for diagnosis of PE				
	Sensitivity	Specificity	NPV*	PPV*
GlyFn	98.50%	92.80%	99.70%	73.70%

*Based on PE prevalence in the study

Clinical Study 2

151 women with risk factors for or clinical signs and symptoms of preeclampsia were selected from a prospective cohort. Maternal serum samples were collected between 20 and 37 weeks of gestation. Clinical suspicion of preeclampsia was defined as presence of new-onset proteinuria, or clinical symptoms of preeclampsia. Subjects with a clinical diagnosis of preeclampsia at the time of enrollment were excluded[3].

GlyFn levels were determined using the Lumella® Preeclampsia Test. Performance was assessed using logistic regression modeling and receiver-operating characteristic (ROC) curves.

	At-risk women without PE	At-risk women with PE	Group Difference *P-value*
n	119	32	N/A
GlyFn (µg/ml)	233(92)	457(206)	<0.001

Data are presented as median (interquartile range).

GlyFn performance characteristics for short term prediction of PE				
	Sensitivity	Specificity	NPV*	PPV*
GlyFn	91.20%	86.40%	97.00%	64.50%

*Based on PE prevalence in the study

REFERENCES

1. Pankov R, Yamada KM (Oct 2002). "Fibronectin at a glance". Journal of Cell Science. 115 (Pt 20): 3861–3.
2. Nagalla SR, Janaki V, Vijayalakshmi AR, Chayadevi K, Pratibha D, Rao PV, Sage KM, Nair-Schaef D, Bean E, Roberts CT Jr, Gravett MG. BJOG. 2020 Dec;127(13):1687-1694. doi: 10.1111/1471-0528.16323. Epub 2020 Jun 16. PMID: 32426899
3. Huhn EA, Hoffmann I, Martinez De Tejada B, Lange S, Sage KM, Roberts CT, Gravett MG, Nagalla SR, Lapaire O.BMC Pregnancy Childbirth. 2020 Feb 24;20(1):128. doi: 10.1186/s12884-020-2809-2.PMID: 32093623

ORDERING INFORMATION AND TECHNICAL SERVICE

For technical assistance or to place an order, contact:

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EXPLANATION OF SYMBOLS

	Consult Instructions for Use	REF	Component Number
	Storage Temperature	EC REP	Authorized Representative in the European Community
IVD	For in vitro Diagnostic Use		Date of Manufacture
SN	Serial Number	CE	European Conformity
	Manufacturer		Do Not Reuse
	Separate collection for waste of electrical and electronic equipment	LOT	Batch Code, Lot Number
	Caution		Use By Date
	Radio Frequency		Battery Strength