

Instructions for use
L-Glutamine ELISA

FOR REFERENCE USE ONLY

REF

IS I-1100R



RUO

L-Glutamine ELISA

1. Intended use and principle of the test

Enzyme Immunoassay for the quantitative determination of L-Glutamine (Gln) in plasma samples or culture supernatant.

After extraction and derivatization L-Glutamine is quantitatively determined by ELISA.

The competitive ELISA uses the microtiter plate format. The antigen is bound to the solid phase of the microtiter plate. The processed standards, controls and samples and the solid phase bound analyte compete for a fixed number of antiserum binding sites. When the system is in equilibrium, free antigen and free antigen-antiserum complexes are removed by washing. The antibody bound to the solid phase is detected by an anti-rabbit IgG-peroxidase conjugate using TMB as a substrate. The reaction is monitored at 450 nm.

Quantification of unknown samples is achieved by comparing their absorbance with a reference curve prepared with known standards.

2. Procedural cautions, guidelines, warnings and limitations

2.1 Procedural cautions, guidelines and warnings

- (1) This kit is intended for professional use only. Users should have a thorough understanding of this protocol for the successful use of this kit. Only the test instruction provided with the kit is valid and has to be used to run the assay. Reliable performance will only be attained by strict and careful adherence to the instructions provided.
- (2) This assay was validated for certain types of samples as indicated in *Intended Use* (please refer to Chapter 1). Any off-label use of this kit is in the responsibility of the user and the manufacturer cannot be held liable.
- (3) The principles of Good Laboratory Practice (GLP) have to be followed.
- (4) In order to reduce exposure to potentially harmful substances, wear lab coats, disposable protective gloves and protective glasses where necessary.
- (5) All kit reagents and specimens should be brought to room temperature and mixed gently but thoroughly before use. Avoid repeated freezing and thawing of reagents and specimens.
- (6) For dilution or reconstitution purposes, use deionized, distilled or ultra-pure water.
- (7) The microplate contains snap-off strips. Unused wells must be stored at 2 °C to 8 °C in the sealed foil pouch with desiccant and used in the frame provided.
- (8) Duplicate determination of sample is highly recommended to be able to identify potential pipetting errors.
- (9) Once the test has been started, all steps should be completed without interruption. Make sure that the required reagents, materials and devices are prepared ready at the appropriate time.
- (10) Incubation times do influence the results. All wells should be handled in the same order and time intervals.
- (11) To avoid cross-contamination of reagents, use new disposable pipette tips for dispensing each reagent, sample, standard and control.
- (12) A standard curve must be established for each run.
- (13) The controls should be included in each run and fall within established confidence limits. The confidence limits are listed in the QC-Report.
- (14) Do not mix kit components with different lot numbers within a test and do not use reagents beyond expiry date as shown on the kit labels.
- (15) Avoid contact with Stop Solution containing 0.25 M H₂SO₄. It may cause skin irritation and burns. In case of contact with eyes or skin, rinse off immediately with water.
- (16) TMB substrate has an irritant effect on skin and mucosa. In case of possible contact, wash eyes with an abundant volume of water and skin with soap and abundant water. Wash contaminated objects before reusing them.
- (17) For information on hazardous substances included in the kit please refer to Safety Data Sheet (SDS). The Safety Data Sheet for this product is made available directly on the website of the manufacturer or upon request.
- (18) The expected reference values reported in this test instruction are only indicative. It is recommended that each laboratory establishes its own reference intervals.
- (19) The results obtained with this test kit should not be taken as the sole reason for any therapeutic consequence but have to be correlated to other diagnostic tests and clinical observations.
- (20) Kit reagents must be regarded as hazardous waste and disposed of according to national regulations.

2.2 Limitations

Any inappropriate handling of samples or modification of this test might influence the results.

Samples containing precipitates or fibrin strands or which are haemolytic or lipemic might cause inaccurate results.

3. Storage and stability

Store the unopened reagents at 2 - 8 °C until expiration date. Do not use components beyond the expiry date indicated on the kit labels. Once opened the reagents are stable for 1 month when stored at 2 - 8 °C. Once the resealable pouch has been opened, care should be taken to close it tightly with desiccant again.

4. Materials

4.1 Contents of the kit

BA D-0090	FOILS	Adhesive Foil - Ready to use
Contents:	Adhesive Foils in a resealable pouch	
Volume:	1 x 4 foils	
IS I-0324	REAC-PLATE	Reaction Plate - Ready to use
Contents:	1 x 96 well plate, empty in a resealable pouch	
BA E-0030	WASH-CONC 50x	Wash Buffer Concentrate - Concentrated 50x
Contents:	Buffer with a non-ionic detergent and physiological pH	
Volume:	1 x 20 mL/vial, light purple cap	
BA E-0040	CONJUGATE	Enzyme Conjugate - Ready to use
Contents:	Goat anti-rabbit immunoglobulins conjugated with peroxidase	
Volume:	1 x 12 mL/vial, red cap	
BA E-0055	SUBSTRATE	Substrate - Ready to use
Contents:	Chromogenic substrate containing tetramethylbenzidine, substrate buffer and hydrogen peroxide	
Volume:	1 x 12 mL/black vial, black cap	
BA E-0080	STOP-SOLN	Stop Solution - Ready to use
Contents:	0.25 M sulfuric acid	
Volume:	1 x 12 mL/vial, light grey cap	
Hazards identification:		H290 May be corrosive to metals.
IS I-1131	ITL GLN	Microtiter Strips - Ready to use
Contents:	1 x 96 well (12x8) antigen precoated microwell plate in a resealable pouch with desiccant, silver bag	
IS I-1110	AS GLN	L-Glutamine Antiserum - Ready to use
Contents:	Rabbit anti-L-Glutamine antibody, yellow coloured	
Volume:	1 x 12 mL/vial, green cap	
BA E-2413	ASSAY-BUFF	Assay Buffer - Ready to use
Contents:	Buffer with alkaline pH	
Volume:	1 x 20 mL/vial, yellow cap	
BA E-2428	EQUA-REAG	Equalizing Reagent - Lyophilized
Contents:	Lyophilized protein	
Volume:	1 vial, brown cap	
BA E-2446	D-REAGENT	D-Reagent - Ready to use
Contents:	Crosslinking agent in dimethylsulfoxide	
Volume:	1 x 3 mL/vial, white cap	
BA E-0429	RED-CONC 100x	Reducing Concentrate - Concentrated 100X
Contents:	Reducing agent in sodium hydroxide	

Volume: 1 x 1 mL/vial, pink cap

Hazards identification :



H290 May be corrosive to metals.

H301 Toxic if swallowed.

H314 Causes severe skin burns and eye damage.

H360FD May damage fertility. May damage the unborn child

IS I-0488 **PBS** **PBS** - Ready to use

Contents: Phosphate Buffered Saline

Volume: 1 x 50 mL/vial, orange cap

BA E-2721 **PREC-REAG** **Precipitating Reagent** - Ready to use

Contents: Acidic reagent for precipitation of plasma/serum proteins, red coloured

Volume: 2 x 4 mL/vial, white cap

IS I-1141 **DILUENT** **Diluent** - Ready to use

Contents: Buffer to dilute samples if necessary

Volume: 1 x 50 mL/vial, light green cap

IS I-1107 **STD BUFFER** **Standard Buffer** - Ready to use

Contents: Buffer to dilute standards and controls

Volume: 1 x 20 mL/vial, white cap

IS I-1108 **STD STOCK SOLUTION** **Standard Stock Solution** – Lyophilized

Contents: Lyophilized stock solution to produce standards

Volume: 1 vial, white cap

Standards and Controls – Need to be prepared freshly from Standard Stock Solution

Component	Concentration µg/mL	Concentration µmol/L
STANDARD A	0	0
STANDARD B	11,7	80
STANDARD C	29,2	200
STANDARD D	73,1	500
STANDARD E	182,7	1250
STANDARD F	456,7	3125
CONTROL 1	58,5	400
CONTROL 2	146,2	1000

Conversion: L-Glutamine (µg/mL) x 6,84 = L-Glutamine (µmol/L)

4.2 Additional materials and equipment required but not provided in the kit

- Calibrated precision pipettes to dispense volumes between 10 – 300 µL; 12.5 mL
- Polystyrene or polypropylene tubes (0.5 mL and 1 mL) and suitable rack
- Microtiter plate washing device (manual, semi-automated or automated)
- ELISA reader capable of reading absorbance at 450 nm and if possible 620 - 650 nm
- Microtiter plate shaker (shaking amplitude 3 mm; approx. 600 rpm)
- Absorbent material (paper towel)
- Water (deionized, distilled or ultra-pure)
- Vortex mixer

5. Sample collection and storage

EDTA Plasma

Whole blood should be collected into centrifuge tubes containing EDTA as anti-coagulant (Monovette™ or Vacuette™ for plasma) and centrifuged according to manufacturer's instructions at room temperature immediately after collection.

Haemolytic and especially lipemic samples should not be used for the assay.

Storage: up to 48 hours at 2 - 8 °C, for longer period (up to 6 month) at -20 °C.

Repeated freezing and thawing should be avoided.

Culture Media

Culture media should be collected into centrifuge tubes and centrifuged to pellet cells. Supernatant could be processed immediately or frozen undiluted at -80°C for longer period.

Repeated freezing and thawing should be avoided.

6. Test procedure

Allow all reagents and samples to reach room temperature and mix thoroughly by gentle inversion before use. Duplicate determinations are recommended. To do that, perform duplicates after derivatization (1 derivatization well = 2 competition wells).

It is recommended to number the strips of the microwell plate before usage to avoid any mix-up.

The binding of the antisera and of the enzyme conjugate and the activity of the enzyme are temperature dependent, and the absorbance values may vary if a thermostat is not used. The higher the temperature, the higher the extinction values will be. Corresponding variations also apply to the incubation times. The optimal temperature during the Enzyme Immunoassay is between 20 – 25 °C.

6.1 Preparation of standards and Controls

NOTE: Use polypropylene tubes of 1mL for diluting standards

1. Dissolve the lyophilizate of Standard Stock Solution into **1mL** of Standard Buffer.

NOTE: Reconstituted Standard Stock Solution which is not used immediately has to be stored in aliquots for max 1 month at -20°C and may be thawed only once.

2. Briefly vortex the vial of Standard Stock Solution to ensure the contents are mixed.

3. Add 10 µL of Standard Stock Solution to one tube containing 630 µL Standard Buffer and label as Standard F.

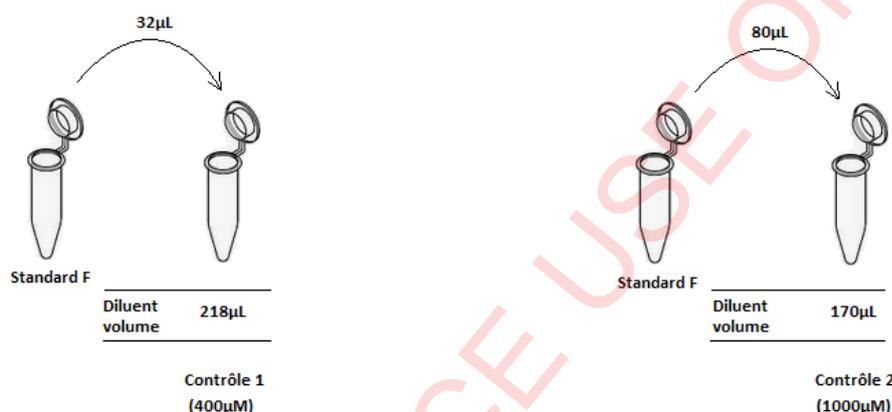
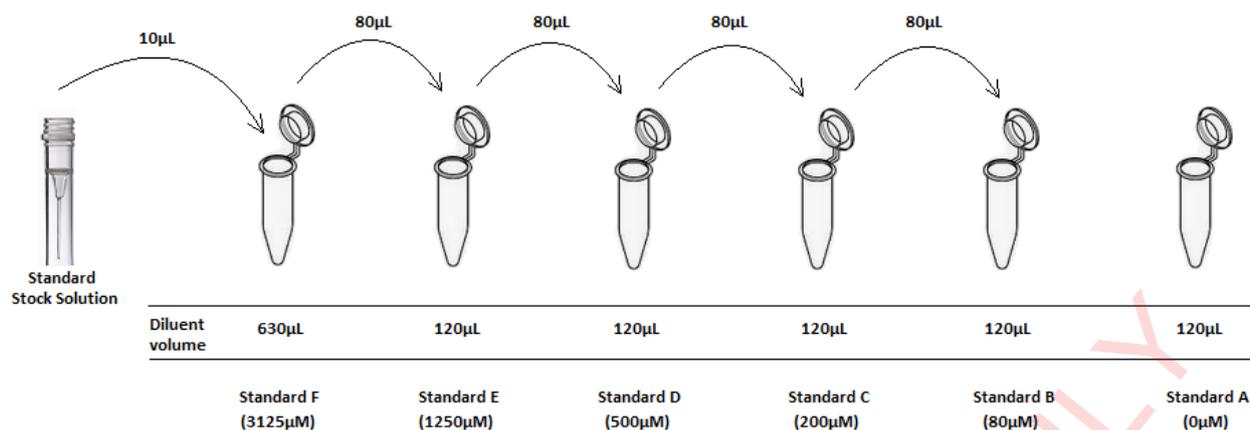
4. Add 120 µL Standard Buffer to each of 5 tubes labelled as follows: Standard E, Standard D, Standard C, Standard B, Standard A.

5. Make serial dilutions of the Standards as described below in the dilution diagram. Mix thoroughly between steps. Be careful, Standard A contains standard buffer only.

6. For the Control 1: Add 32 µL of Standard F to one tube containing 218 µL Standard Buffer and label as Control 1.

7. For the Control 2: Add 80 µL of Standard F to one tube containing 170 µL Standard Buffer and label as Control 2.

8. Use the Standards and Controls within 2 hours of preparation.



6.2 Preparation of reagents

Wash Buffer

Dilute the 20 mL Wash Buffer Concentrate with water (deionized, distilled or ultra-pure) to a final volume of 1000 mL.

Storage: 1 month at 2 – 8 °C

Equalizing Reagent

Reconstitute the Equalizing Reagent with **12.5 mL of Assay Buffer**.

Reconstituted Equalizing Reagent which is not used immediately has to be stored in aliquots for max 1 month at -20 °C and may be thawed only once.

D-Reagent

The D-Reagent has a freezing point of 18.5 °C. It must be ensured that the D-Reagent has reached room temperature and forms a homogeneous, crystal-free solution.

Reducing Solution

Dilute Reducing Concentrate 1:100 with water (deionized, distilled, or ultra-pure) and mix thoroughly. Use immediately!

Examples for the preparation of Reducing Solution:

Reducing Concentrate	40 µL	50 µL	80 µL	160 µL
Water	3.96 mL	4.95 mL	7.92 mL	15.84 mL

L-Glutamine Microtiter Strips

In rare cases residues of the blocking and stabilizing reagent can be seen in the wells as small, white dots or lines. These residues do not influence the quality of the product.

6.3 Precipitation

1. Pipette **10 µL** of **standards, controls** and **samples** into the respective tubes. If necessary, in particular **for culture media**, pre-dilute the sample in Diluent.

2.	Add 400 µL of PBS to all tubes.
3.	Add 50 µL Precipitating Reagent to all tubes.
4.	Mix the tubes thoroughly (vortex) and centrifuge for 15 minutes at 3000 x g .
	Take 25 µL of the clear supernatant for the derivatization .

6.4 Derivatization

1.	Pipette 25 µL of the precipitated standards, controls and samples into the appropriate wells of the Reaction Plate .
2.	Add 50 µL of the Equalizing Reagent into all wells.
3.	Mix 2 min at RT on a plate shaker at 700 rpm to homogenize the medium.
4.	Add 10 µL of the D-Reagent into all wells (immerse the tips into the reaction medium).
5.	Cover plate with Adhesive Foil and incubate for 2 h at RT (20 – 25 °C) on a shaker (approx. 500 rpm).
6.	Prepare Reducing Solution 1X from Reducing Concentrate 100X in sterile water (see 6.1) The Reducing Solution should be prepared directly prior to use!
7.	Add 100 µL of the Reducing Solution 1X into all wells.
8.	Incubate for 10 min at RT (20 – 25 °C) on a shaker (approx. 500 rpm).
	Use 10 µL for the ELISA!

6.5 L-Glutamine ELISA

1.	Pipette 10 µL of the prepared standards, controls and samples into the appropriate wells of the L-Glutamine Microtiter Strips . Be careful not to pipette bubbles!
2.	Add 90 µL of the L-Glutamine Antiserum into all wells and mix shortly.
3.	Cover plate with Adhesive Foil and incubate for 15 - 20 h (overnight) at 2 – 8 °C .
4.	Remove the foil. Discard or aspirate the content of the wells. Wash the plate 4 x by adding 300 µL of Wash Buffer , discarding the content and blotting dry each time by tapping the inverted plate on absorbent material.
5.	Pipette 100 µL of the Enzyme Conjugate into all wells.
6.	Incubate for 30 min at RT (20 – 25 °C) on a shaker (approx. 500 rpm).
7.	Discard or aspirate the content of the wells. Wash the plate 4 x by adding 300 µL of Wash Buffer , discarding the content and blotting dry each time by tapping the inverted plate on absorbent material.
8.	Pipette 100 µL of the Substrate into all wells and incubate for 15 - 25 min at RT (20 – 25 °C) on a shaker (approx. 500 rpm). Avoid exposure to direct sunlight!
9.	Add 100 µL of the Stop Solution to each well and shake the microtiter plate to ensure a homogeneous distribution of the solution.
10.	Read the absorbance of the solution in the wells within 10 minutes, using a microplate reader set to 450 nm (if available a reference wavelength between 620 nm and 650 nm is recommended).

7. Calculation of results

Measuring range	L-Glutamine
	80 – 3125 µM

The calibration curve is obtained by plotting the absorbance readings (calculate the mean absorbance) of the standards (linear, y-axis) against the corresponding standard concentrations (logarithmic, x-axis). Use non-linear regression for curve fitting (e.g. spline, 4- parameter, akima).

 **This assay is a competitive assay. This means: the OD-values are decreasing with increasing concentrations of the analyte. OD-values found below the standard curve correspond to high concentrations of the analyte in the sample.**

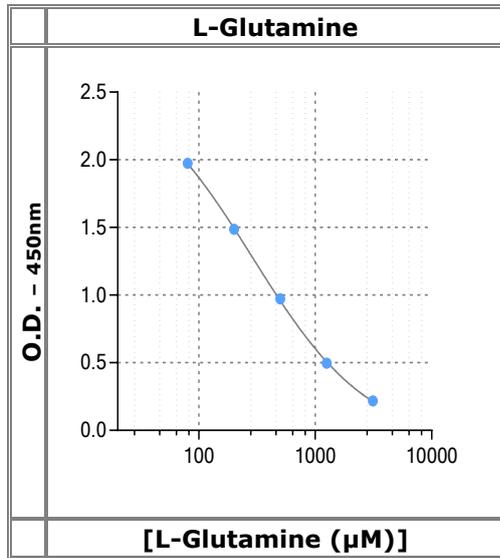
The concentrations of the samples and controls can be read directly from the standard curve.

7.1 Quality control

The confidence limits of the kit controls are indicated on the QC-Report.

7.2 Typical standard curve

⚠ Example, do not use for calculation!



8. Assay characteristics

Analytical Sensitivity (Limit of Detection)	L-Glutamine
	3 µM

Analytical Specificity (Cross Reactivity)	Substance	Cross Reactivity (%)
		L-Glutamine
	Ornithine	<0.1
	Arginine	<0.1
	Asparagine	<1
	D-Glutamine	<2
	L-Glutamic acid	<0.1

Intra-Assay			
Plasma	Mean (µM)	SD (µM)	CV (%)
1 (n = 8)	734	25	3
2 (n = 8)	1222	41	3
3 (n = 8)	2622	91	3
Culture supernatant	Mean (µM)	SD (µM)	CV (%)
1 (n = 8)	666	18	3
2 (n = 8)	1042	67	6
3 (n = 8)	2632	95	4

Linearity	Plasma (Serial dilution up to 1:32)	Range Linearity (%)	Mean Linearity (%)
	1	100 - 111	105
	2	100 - 107	104
	Culture supernatant (Serial dilution up to 1:64)	Range Linearity (%)	Mean Linearity (%)
	1	91 - 107	95
	2	91 - 107	94

Recovery	Plasma	Range Recovery (%)	Mean Recovery (%)
	1	99 - 110	103
	2	97 - 100	98
	Culture supernatant	Range Recovery (%)	Mean Recovery (%)
	1	91 - 101	95
	2	90 - 97	94

Method Comparison: ELISA vs LC-MS	Plasma	$[L\text{-Glutamine}]_{\text{ELISA}} = 1,148 * [L\text{-Glutamine}]_{\text{LC-MS}} - 61,39$	$R^2 = 0,99$ $N = 40$
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ELISA vs supplier value	Culture supernatant	Range Recovery (%) : 85 - 93	Mean Recovery (%) : 89
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 For updated literature or any other information please contact your local supplier.

Symbols:

 Storage temperature	 Manufacturer	 Contains sufficient for <n> tests
 Expiry date	 Batch code	 For research use only!
 Consult instructions for use	 Content	
 Caution	 Catalogue number	