

# Mercodia

# Proinsulin ELISA

Directions for Use

**10-1118-01**  
**Reagents for 96 determinations**

For *in vitro* diagnostic use in EU/EEA, UK and Canada



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<https://www.mercodia.com/product/proinsulin-elisa/>






oder/ou/o/eller/of email: [info-global@mercodia.com](mailto:info-global@mercodia.com)

Regulatory status in the rest of the world: For research use only.  
Not for use in diagnostic procedures.

Manufactured by

**Mercodia AB**  
Sylveniusgatan 8A  
SE-754 50 Uppsala  
Sweden

## Explanation of symbols used on labels

 $\Sigma = 96$	Reagents for 96 determinations
	Expiry date
	Store between 2–8°C
	Lot No.
	For <i>in vitro</i> diagnostic use

## **Intended use**

Mercodia Proinsulin ELISA provides a method for the quantitative determination of human proinsulin in serum or plasma.

## **Summary and explanation of the test**

Proinsulin is the precursor of insulin which is the principal hormone responsible for the control of glucose metabolism. It is synthesized in the  $\beta$ -cells of the Islets of Langerhans and is subsequently processed to form C-peptide and insulin. High proinsulin concentrations are usually noted in patients with benign or malignant  $\beta$ -cell tumors of the pancreas. Most patients with  $\beta$ -cell tumors have increased insulin, C-peptide and proinsulin concentrations, but occasionally only proinsulin is elevated. Despite its low biological activity, proinsulin may be increased sufficiently to produce hypoglycemia. Increased proinsulin concentrations may also be detected in patients with renal failure, cirrhosis or hyperthyroidism.

## **Principle of the procedure**

Mercodia Proinsulin ELISA is a solid phase two-site enzyme immunoassay. It is based on the sandwich technique in which two monoclonal antibodies are directed against separate antigenic determinants on the proinsulin molecule. During incubation, proinsulin in the sample reacts with anti-proinsulin antibodies bound to microtitration well. After washing, peroxidase-conjugated anti-proinsulin antibodies are added and after the second incubation and a simple washing step that removes unbound enzyme labeled antibody, the bound conjugate is detected by reaction with 3,3',5,5'-tetramethylbenzidine (TMB). The reaction is stopped by adding acid to give a colorimetric endpoint that is read spectrophotometrically.

## Warnings and precautions

- For *in vitro* diagnostic use in EU/EEA, UK and Canada. Not for internal or external use in humans or animals.
- Regulatory Status in the rest of the world: For Research Use Only. Not For Use in Diagnostic Procedures.
- All samples should be handled as if capable of transmitting infections.
- Each well can only be used once.
- The Stop Solution contains <5% Sulphuric acid.  
The Stop Solution is labeled:



### Danger

H318 – Causes serious eye damage.

H315 – Causes skin irritation.

P280 – Wear protective gloves. Wear eye or face protection.

P264 – Wash hands thoroughly after handling.

P302 + P352 + P362 + P364 – IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse.

P332 + P313 – If skin irritation occurs: Get medical attention.

P305 + P351 + P338 + P310 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

- The Enzyme Conjugate Buffer, Cal 0, 1, 2, 3, 4, Wash Buffer and Assay Buffer contain <0.06% 5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-2H-isothiazol-3-one (3:1).

The Enzyme Conjugate Buffer, the Calibrators, Wash Buffer and Assay Buffer are labeled:



### Warning

H317 – May cause an allergic skin reaction.

P280 – Wear protective gloves.

P261 – Avoid breathing vapour.

P272 – Contaminated work clothing should not be allowed out of the workplace.

P302 + P352 – IF ON SKIN: Wash with plenty of soap and water.

P333 + P313 – If skin irritation or rash occurs: Get medical attention.

P501 – Dispose of contents and container in accordance with all local, regional, national and international regulations.

## Material required but not provided

- Pipettes with appropriate volumes (repeating pipettes preferred for addition of Assay Buffer, enzyme conjugate 1X solution, Substrate TMB and Stop Solution)
- Tubes, beakers and cylinders for reagent preparation
- Redistilled water
- Magnetic stirrer
- Vortex mixer
- Microplate reader with 450 nm filter
- Microplate shaker (700–900 cycles per minute, orbital movement)
- Microplate washing device with overflow function (recommended but not required)

## Reagents

Each Mercodia Proinsulin ELISA kit contains reagents for 96 wells, sufficient for 43 samples and one calibrator curve in duplicate. For larger series of assays, use pooled reagents from packages bearing identical lot numbers. The expiry date for the complete kit is stated on the outer label. The recommended storage temperature is 2–8°C.

<b>Coated Plate</b> Mouse monoclonal anti-proinsulin For unused microplate strips, reseal the bag using adhesive tape, store at 2–8°C and use within 2 months	1 plate	96 wells 8-well strips	Ready for use
<b>Calibrators 1, 2, 3, 4</b> Recombinant human proinsulin Color coded yellow Concentration stated on vial label Storage after reconstitution: 2–8°C for 1 month For storage of reconstituted Calibrators for more than 1 month, store at -20°C	4 vials	1000 µL	Lyophilized Add 1000 µL redistilled water per vial
<b>Calibrator 0</b> Color coded yellow	1 vial	5 mL	Ready for use
<b>Assay Buffer</b> Color coded red	1 vial	6 mL	Ready for use
<b>Enzyme Conjugate 21X</b> Peroxidase conjugated mouse monoclonal anti-proinsulin	1 vial	600 µL	Preparation, see below
<b>Enzyme Conjugate Buffer</b> Color coded blue	1 vial	12 mL	Ready for use
<b>Wash Buffer 21X</b> Storage after dilution: 2–8°C for 2 months	1 bottle	50 mL	Dilute with 1000 mL redistilled water to make wash buffer 1X solution.
<b>Substrate TMB</b> Colorless solution <i>Note! Light sensitive!</i>	1 bottle	22 mL	Ready for use
<b>Stop Solution</b> 0.5 M H <sub>2</sub> SO <sub>4</sub>	1 vial	7 mL	Ready for use

## Preparation of enzyme conjugate 1X solution

Prepare the needed volume of enzyme conjugate 1X solution by dilution of Enzyme Conjugate 21X in Enzyme Conjugate Buffer according to the table below.

When preparing enzyme conjugate 1X solution for the whole plate, pour all of the Enzyme Conjugate Buffer into the Enzyme Conjugate 21X vial. Mix gently before use.

Number of strips	Enzyme Conjugate 21X	Enzyme Conjugate Buffer
12 strips	1 vial	1 vial
8 strips	350 $\mu$ L	7 mL
4 strips	200 $\mu$ L	4 mL

Storage after dilution: 2–8°C for 2 months.

## Specimen collection and handling

### Serum

Collect blood by venipuncture, allow to clot, and separate the serum by centrifugation. Samples can be stored at 2–8°C up to 24 hours. For longer periods store samples at –20° C. Avoid repeated freezing and thawing.

### Plasma

Collect blood by venipuncture into tubes containing heparin or EDTA as anticoagulant, and separate the plasma fraction by centrifugation. Samples can be stored at 2–8°C up to 24 hours. For longer periods store samples at –20°C. Avoid repeated freezing and thawing.

### Preparation of samples

No dilution is normally required for serum and plasma samples, however, samples with a concentration above Calibrator 4 should be diluted in Calibrator 0 (or Merckodia Diabetes Sample Buffer, 10-1195-01).

## Test procedure

All reagents and samples must be brought to room temperature before use. Prepare a calibrator curve for each assay run. The product has been optimized and validated without plate sealer.

1. Prepare enzyme conjugate 1X solution and wash buffer 1X solution.
2. Prepare sufficient microplate wells to accommodate Calibrators, controls and samples in duplicate.
3. Pipette 50  $\mu$ L each of Calibrators, controls and samples into appropriate wells.
4. Add 50  $\mu$ L Assay Buffer to each well.
5. Incubate on a plate shaker (700–900 rpm) for 1 hour at room temperature (18–25°C).
6. Wash 6 times with 700  $\mu$ L wash buffer 1X solution per well using an automatic plate washer with overflow-wash function. After final wash, invert and tap the plate firmly against absorbent paper. Do not include soak step in washing procedure.  
Or manually,  
discard the reaction volume by inverting the microplate over a sink. Add 350  $\mu$ L wash buffer 1X solution to each well. Discard the wash solution, tap firmly several times against absorbent paper to remove excess liquid. Repeat 5 times. Avoid prolonged soaking during washing procedure.
7. Add 100  $\mu$ L enzyme conjugate 1X solution to each well.
8. Incubate on a plate shaker (700–900 rpm) for 1 hour at room temperature (18–25°C).
9. Wash as described in 6.
10. Add 200  $\mu$ L Substrate TMB.
11. Incubate for 15 minutes on the bench at room temperature (18–25°C).
12. Add 50  $\mu$ L Stop Solution to each well.  
Place plate on a shaker for approximately 5 seconds to ensure mixing.
13. Read optical density at 450 nm and calculate results.  
Read within 30 minutes.

*Note!* Be extra careful not to contaminate the Substrate TMB with enzyme conjugate solution.

## Internal quality control

Commercial controls such as Mercodia Diabetes Antigen Control (Code No. 10-1134-01/10-1164-01) and/or internal serum pools with low, intermediate and high proinsulin concentrations should routinely be assayed as unknowns, and results charted from day to day. It is good laboratory practice to record the following data for each assay: kit lot number, preparation dates of kit components, OD values for the blank, Calibrators and controls.

Laboratories should follow government regulations or accreditation requirements for quality control frequency.

## Calculation of results

The concentration of proinsulin is obtained by computerized data reduction of the absorbance for the Calibrators, except for Calibrator 0, versus the concentration using cubic spline regression.

## Example of worksheet

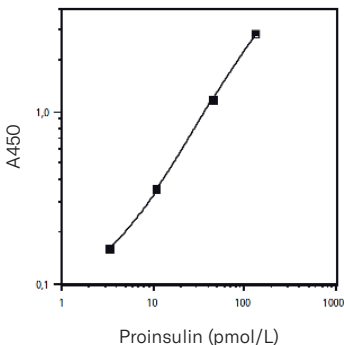
Wells	Identity	A <sub>450 nm</sub>	Mean conc. pmol/L
1A-B	Calibrator 0	0.070/0.069	
1C-D	Calibrator 1*	0.156/0.163	
1E-F	Calibrator 2*	0.347/0.354	
1G-H	Calibrator 3*	1.157/1.176	
2A-B	Calibrator 4*	2.862/2.831	
2C-D	Sample 1	0.208/0.208	5.25
2E-F	Sample 2	0.252/0.254	7.07
2G-H	Sample 3	0.563/0.589	19.8
3A-B	Sample 4	1.592/1.571	63.2

\*Concentration stated on vial label.



## Example of calibrator curve

A typical calibrator curve is shown here. Do not use this curve to determine actual assay results.



## Limitations of the procedure

As with all diagnostic tests, a definitive clinical diagnosis should not be based on the results of a single test, but should be made by the physician after all clinical findings have been evaluated. Application of this test to individuals already undergoing insulin therapy is complicated by formation of anti-insulin antibodies that are capable of interfering in the assay.

Grossly lipemic, icteric or hemolyzed samples do not interfere in the assay. However, hemolysis in serum and plasma samples may result in a degradation of insulin. The degradation is dependent on time, temperature and the hemoglobin concentration. Keep hemolyzed samples cold or on ice to prevent the insulin degradation.

## Expected values

Good practice dictates that each laboratory establishes its own expected range of values. The following results may serve as a guide until the laboratory has gathered sufficient data of its own. Fasting levels for 112 tested, apparently healthy individuals, yielded a mean of 10 pmol/L, a median of 7 pmol/L and a range corresponding to the central 95 % of the observations of 3.3-28 pmol/L.

## Performance characteristics

### Detection limit

The detection limit is 1.7 pmol/L as determined by the methodology described in ISO11843- Part 4.

Capability of Detection should be seen as part of a method validation, rather than the lowest concentration that can be measured. Concentration of samples with absorbance below Calibrator 1 should not be calculated, instead expressed as less or equal to ( $\leq$ ) the concentration indicated on the vial for Calibrator 1.

### Recovery

Recovery upon dilution 82%–118% (Mean 98%).

Recovery upon addition 93%–100% (Mean 95%).

### Hook effect

Samples with a concentration of up to 80 000 pmol/L can be measured without giving falsely low results.

### Precision

Each sample was analyzed in 4 replicates on 7 different occasions.

Sample	Mean value pmol/L	Coefficient of variation	
		Repeatability %*	Within laboratory %**
1	7.3	3.2	5.1
2	20.7	3.2	6.2
3	65.7	2.6	5.0

\*Within assay variation

\*\*Total Assay variation

## Specificity

The following cross reactions have been found:

	Crossreaction
Insulin	<0.03 %
C-peptide	<0.006 %
Proinsulin Des (64–65)	84 %
Proinsulin Split (65–66)	90 %
Proinsulin Des (31–32)	95 %
Proinsulin Split (32–33)	95 %
Porcine Proinsulin	4 %
Mouse Proinsulin I	3 %
Mouse Proinsulin II	16 %
Rat Proinsulin I	13 %
Rat Proinsulin II	10 %

## Calibration

Mercodia Proinsulin ELISA kit is calibrated against the International Reference Reagent for human proinsulin, IRR 84/611.

## Conversion factor

1 µg/L corresponds to 110 pmol/L

## Warranty

The performance data presented here was obtained using the procedure indicated. Any change or modification in the procedure not recommended by Mercodia AB may affect the results, in which event Mercodia AB disclaims all warranties expressed, implied or statutory, including the implied warranty of merchantability and fitness for use. Mercodia AB and its authorised distributors, in such event, shall not be liable for damages indirect or consequential.

## References

Gaines-Das, RE and Bristiw AF (1988) WHO International reference reagents for human proinsulin and human insulin C-peptide. *J Biol Stand* 16:179-186

Garcia CA, Prabakar KR, Diez J, Cao ZA, Allende G, Zeller M, Dogra R, Mendez A, Rosenkranz E, Dahl U, Ricordi C, Hanahan D, Pugliese A (2005) Dendritic cells in human thymus and periphery display a proinsulin epitope in a transcription-dependent, capture-independent fashion. *J Immunol* 175:2111-2122

Riserus U, Vessby B, Arner P, Zethelius B (2004) Supplementation with trans10cis12-conjugated linoleic acid induces hyperproinsulinaemia in obese men: close association with impaired insulin sensitivity. *Diabetologia* 47:1016-1019

Yin H, Berg AK, Westman J, Hellerstrom C, Frisk G (2002) Complete nucleotide sequence of a Coxsackievirus B-4 strain capable of establishing persistent infection in human pancreatic islet cells: effects on insulin release, proinsulin synthesis, and cell morphology. *J Med Virol* 68:544-557

Further references can be found on our website: [www.mercodia.com](http://www.mercodia.com)





	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

**Experiment:**

**Date:**

**KIT LOT#:**

**Summary of protocol sheet**  
**Mercodia Proinsulin ELISA**

Add Calibrators, controls* and samples	50 $\mu$ L
Add Assay Buffer	50 $\mu$ L
Incubate	1 hour at 18–25°C on a plate shaker (700–900 rpm)
Wash plate with wash buffer 1X solution	700 $\mu$ L, 6 times
Add enzyme conjugate 1X solution	100 $\mu$ L
Incubate	1 hour at 18–25°C on a plate shaker (700–900 rpm)
Wash plate with wash buffer 1X solution	700 $\mu$ L, 6 times
Add Substrate TMB	200 $\mu$ L
Incubate	15 minutes at 18–25 °C
Add Stop Solution	50 $\mu$ L Shake for 5 seconds to ensure mixing
Measure $A_{450\text{ nm}}$	Evaluate results

\*not included

For full details see page 7

For technical support please contact: [support@merckodia.com](mailto:support@merckodia.com)