

# Mercodia

# Feline Insulin

# ELISA

Directions for Use





**10-1233-01**  
**REAGENTS FOR 96 DETERMINATIONS**

For Research Use Only

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.

## **INTENDED USE**

Mercodia Feline Insulin ELISA provides a method for the quantitative determination of insulin levels in feline serum and plasma.

## **SUMMARY AND EXPLANATION OF THE TEST**

Insulin is the principal hormone responsible for the control of glucose metabolism. It is synthesised in the  $\beta$ -cells of the islets of Langerhans as the precursor, proinsulin, which is processed to form C-peptide and insulin. Both are secreted in equimolar amounts into the portal circulation. The mature insulin molecule comprises two polypeptide chains, the A chain and the B chain. The two chains are linked together by two inter-chain disulphide bridges. There is also an intra-chain disulphide bridge in the A chain.

Secretion of insulin is mainly controlled by plasma glucose concentration, and the hormone has a number of important metabolic actions. Its principal function is to control the uptake and utilisation of glucose in peripheral tissues via the glucose transporter. This and other hypoglycaemic activities, such as the inhibition of hepatic gluconeogenesis and glycogenolysis are counteracted by the hyperglycaemic hormones including glucagon, epinephrine (adrenaline), growth hormone and cortisol.

Diabetes mellitus is one of the most common endocrine disorder in cats, with a form that closely resembles human type 2 diabetes (1-2). Its incidence rate among cats appears to be increasing, probably due to an increase in obesity and a decrease in physical activation in the cat population (1-2). Obesity increases the risk for diabetes 3- to 5-fold (2). Diabetes occurs in a wide range of cats, but most cats are over six years of age when diagnosed (1-2). Diabetic cats may go into remission and studies have shown that different insulin therapy treatments may have an influence on this (3).

## **PRINCIPLE OF THE PROCEDURE**

Mercodia Feline Insulin ELISA is a solid phase two-site enzyme immunoassay. It is based on the direct sandwich technique in which two monoclonal antibodies are directed against separate antigenic determinants on the insulin molecule. During incubation, insulin in the sample reacts with peroxidase-conjugated anti-insulin antibodies and anti-insulin antibodies bound to the microplate. After a simple washing step that removes unbound enzyme labelled antibody, the bound conjugate is detected by reaction with 3,3',5,5'-tetramethylbenzidine (TMB). The reaction is stopped by the addition of acid, giving a colorimetric endpoint that can be read spectrophotometrically.

## WARNINGS AND PRECAUTIONS

- The contents of this kit and their residues must not be allowed to come into contact with ruminating animals or swine.
- All samples should be handled as capable of transmitting infections.
- Not for internal or external use in humans or animals.
- Each well can only be used once.
- For Research Use Only.
- 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, 5 and Wash 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 and Wash 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 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 Feline Insulin ELISA kit contains reagents for 96 wells, sufficient for 42 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-insulin 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, 5</b> Feline insulin Color coded yellow Concentration stated on vial label Storage after reconstitution: 2-8°C for 2 months For storage of reconstituted Calibrators for more than 2 months, store at -20°C.	5 vials	1000 µL	Lyophilized Add 1000 µL redistilled
<b>Calibrator 0</b> Color coded yellow	1 vial	5 mL	Ready for use
<b>Enzyme Conjugate 11X</b> Peroxidase conjugated mouse monoclonal anti-insulin	1 vial	2.5 mL	Preparation, see below
<b>Enzyme Conjugate Buffer</b> Color coded blue	1 vial	25 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 11X, (1+10) in Enzyme Conjugate Buffer according to the table below. Mix gently.

When preparing enzyme conjugate 1X solution for the whole plate or if the reagents are to be used within 2 weeks, pour all of the Enzyme Conjugate 11X into the Enzyme Conjugate Buffer bottle.

Number of strips	Enzyme Conjugate 11X	Enzyme Conjugate Buffer
12 strips	1 vial	1 bottle
6 strips	1000 µL	10 mL
4 strips	800 µL	8 mL

Storage after dilution: 2-8°C for 2 weeks.

## 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, citrate 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

Samples containing >700 ng/L should be diluted at least 1/10 v/v with calibrator 0.

*Note!* Buffers containing sodium azide (NaN<sub>3</sub>) can not be used for sample dilution.

## TEST PROCEDURE

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

1. Prepare enzyme conjugate 1X solution (according to the table on previous page) and wash buffer 1X solution.
2. Prepare sufficient microplate wells to accommodate Calibrators, controls and samples in duplicate.
3. Pipette 10  $\mu\text{L}$  each of Calibrators, controls and samples into appropriate wells.
4. Add 200  $\mu\text{L}$  of enzyme conjugate 1X solution into each well.
5. Incubate on a plate shaker (700-900 rpm) for 2 hours at room temperature (18-25°C).
6. Wash 6 times with 700  $\mu\text{L}$  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  $\mu\text{L}$  wash buffer 1X solution to each well. Discard the wash buffer 1X solution, tap firmly several times against absorbent paper to remove excess liquid. Repeat 5 times. Avoid prolonged soaking during washing.
7. Add 200  $\mu\text{L}$  Substrate TMB into each well.
8. Incubate on the bench for 30 minutes at room temperature (18-25°C).
9. Add 50  $\mu\text{L}$  Stop Solution to each well.  
Place the plate on the shaker for approximately 5 seconds to ensure mixing.
10. 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 and/or internal serum pools with low, intermediate and high feline insulin concentrations should routinely be assayed as samples, and results charted from day to day. It is good laboratory practice to record the following data for each assay: kit lot number; dilution and/or reconstitution dates of kit components; OD values for the blank, Calibrators and controls.

## CALCULATION OF RESULTS

### Computerized calculation

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

### Manual calculation

1. Plot the absorbance values obtained for the Calibrators, except Calibrator 0, against the feline insulin concentration on a lin-lin paper and construct a calibrator curve.
2. Read the concentration of the unknown samples from the calibrator curve.

### Example of results

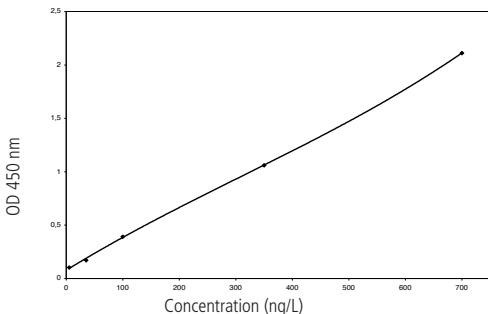
Wells	Identity	A <sub>450</sub>	Mean conc. mU/L
1A-B	Calibrator 0	0.100/0.084	
1C-D	Calibrator 1*	0.120/0.112	
1E-F	Calibrator 2*	0.193/0.184	
1G-H	Calibrator 3*	0.368/0.356	
2A-B	Calibrator 4*	1.076/0.969	
2C-D	Calibrator 5*	2.293/2.157	
2E-F	Sample 1	0.177/0.170	28.9
2G-H	Sample 2	0.334/0.328	94.3
3A-B	Sample 3	0.768/0.761	254

\*Exact 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

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.

## PERFORMANCE CHARACTERISTICS

### Detection limit

Detection limit is defined as the Capability of Detection according to ISO11843-Part 1. Capability of Detection should be seen as part of a method validation, rather than the lowest concentration that can be measured.

The detection limit is  $\leq 9.2$  (ng/L) as determined with the methodology described in ISO11843-Part 4.

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 addition is 84-101 % (mean 95 %).

Recovery upon dilution is 91-128 % (mean 107 %).

## Hook effect

Samples with a concentration up to 27 600 µg/L can be measured without giving falsely low results.

## Precision

Each sample was analyzed in 4 replicates on 16 different occasions.

The analysis were done in 2 laboratories with 2 kit lots and by 4 technicians.

Sample	Mean value (µg/L)	Coefficient of variation		
		within assay %	between assay %	total assay %
1	31.2	6.8	12.5	13.0
2	88.6	4.3	7.3	7.7
3	257	6.1	6.7	7.4

## Specificity

The following cross reaction have been found:

NovoRapid (Insulin aspart) 7.4 %

Levemir (Insulin detemir) < 0.09 %

Lantus (Insulin glargin) 10.6 %

Humalog (Insulin lispro) n.d.

Apidra (Insulin gluisine) n.d.

Vetsulin, Caninsulin 72 %

n.d. = not detected

## CALIBRATION

Mercodia Feline Insulin ELISA is calibrated against an inhouse reference preparation of feline insulin.

## **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 authorized distributors, in such event, shall not be liable for damages indirect or consequential.

## **REFERENCES**

1. Rand JS, Fleeman LM, Farrow HE, Appleton DJ, Lederer R (2004) Canine and Feline Diabetes Mellitus: Nature or Nurture? *J Nutr* 134:2072S-2080S
2. Hoenig M (2002) Comparative aspects of diabetes mellitus in dogs and cats. *Mol Cell Endocrin* 197:221-229
3. Michiels L, Reusch CE, Boari A, Petrie G, Mandigers P, Thollot IG, Rosenberg D, Mooney C, Bonfanti U, Font A, Sparkes A, Bewig K, Clercx C, Jensen AL, Horspool LJI (2008) Treatment with 46 cats with porcine lente insulin – a prospective, multicentre study. *J Fel Med Sur* 10:439-451



## NOTES





	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

### Merckodia Feline Insulin ELISA

Add Calibrators, controls* and samples	10 $\mu$ L
Add enzyme conjugate 1X solution	200 $\mu$ L
Incubate	2 hours 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	30 minutes at 18-25°C
Add Stop Solution	50 $\mu$ L Shake for 5 seconds to ensure mixing
Measure $A_{450}$	Evaluate results

\*not included

For full details see page 7

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