DRG® Melatonin ELISA (EIA-1431)

Revised 1 May 2006

INTENDED USE

Enzyme immunoassay for the *in-vitro diagnostic* quantitative determination of melatonin in human serum and plasma. In the United States, this kit is intended for Research Use Only.

SUMMARY AND EXPLANATION

The pineal gland ("corpus pineale") has been called a neuroendocrine transducer because of its important role in photoperiodism. The major hormone of the pineal gland is N-acetyl-5-methoxy-tryptamine or melatonin which is synthesized from the amino acid tryptophane. Melatonin has its highest levels in plasma during nighttime. Its characteristic nocturnal surge appears to encode temporal information such as length of night. Regulation of the melatonin secretion is under neural control. Sympathetic innervation seems to play a major role via its release of noradrenaline. Altered patterns and/or levels of melatonin secretion have been reported to coincide with sleep disorders, “jet lag“, depression, stress, schizophrenia, hypothalamic amenorrhea, pregnancy, anorexia nervosa, some forms of cancer, immunological disorders as well as control of sexual maturation during puberty.
Most of the circulating melatonin is metabolized in the liver to 6-hydroxymelatonin and subsequently to 6-sulfatoxymelatonin which is excreted into the urine.
The concentration of 6-Hydroxymelatonin Sulfate in urine correlates well with the total level of melatonin in the blood during the collection period.

TEST PRINCIPLE

The assay procedure follows the basic principle of competitive ELISA whereby there is competition between a biotinylated and a non-biotinylated antigen for a fixed number of antibody binding sites. The amount of biotinylated antigen bound to the antibody is inversely proportional to the analyte concentration of the sample. When the system is in equilibrium, the free biotinylated antigen is removed by a washing step and the antibody bound biotinylated antigen is determined by use of anti-biotin alkaline phosphatase as marker and p-nitrophenyl phosphate as substrate. Quantification of unknowns is achieved by comparing the enzymatic activity of unknowns with a response curve prepared by using known standards.

WARNINGS AND PRECAUTIONS

1. For in-vitro diagnostic use only. For professional use only. In the United States, this kit is intended for Research Use Only.
2. Before starting the assay, read the instructions completely and carefully. Use the valid version of the package insert provided with the kit. Be sure that everything is understood.
3. In case of severe damage of the kit package please contact DRG® or your supplier in written form, latest one week after receiving the kit. Do not use damaged components in test runs, but keep safe for complaint related issues.
4. Obey lot number and expiry date. Do not mix reagents of different lots. Do not use expired reagents.
5. Follow good laboratory practice and safety guidelines. Wear lab coats, disposable latex gloves and protective glasses where necessary.
6. Reagents of this kit containing hazardous material may cause eye and skin irritations. See MATERIALS SUPPLIED and labels for details. Material Safety Data Sheets for this product are available upon request.

7. Chemicals and prepared or used reagents have to be treated as hazardous waste according to national biohazard and safety guidelines or regulations.
8. Avoid contact with Stop solution. It may cause skin irritations and burns.
9. All reagents of this kit containing human serum or plasma have been tested and were found negative for HIV I/II, HBsAg and HCV. However, a presence of these or other infectious agents cannot be excluded absolutely and therefore reagents should be treated as potential biohazards in use and for disposal.

STORAGE AND STABILITY

The kit is shipped at ambient temperature and should be stored at 2-8°C. Keep away from heat or direct sun light. The storage and stability of specimen and prepared reagents is stated in the corresponding chapters.

The microtiter strips are stable up to the expiry date of the kit in the broken, but tightly closed bag when stored at 2–8°C.

After elution with methanol the Extraction Columns may be used for extraction of the next samples or stored at 2-8°C protected from dust. Extraction Columns may be re-used up to 4 times.

SPECIMEN COLLECTION AND STORAGE

Serum, Plasma (EDTA, Heparin)

The usual precautions for venipuncture should be observed. It is important to preserve the chemical integrity of a blood specimen from the moment it is collected until it is assayed. Do not use grossly hemolytic, icteric or grossly lipemic specimens. Samples appearing turbid should be centrifuged before testing to remove any particulate material.

Storage:	2-8°C	≤ -20°C (Aliquots)	≤ -70°C (Aliquots)	Keep away from heat or direct sun light. Avoid repeated freeze-thaw cycles.
Stability:	24 h	3 mon	1 y	

MATERIALS SUPPLIED

NOTE: The reagents provided with this kit are sufficient for single determinations in the sample preparation (extraction) and duplicates in the assay. Additional reagents are available upon request.

Quantity	Component
1 x 12x8	**Microtiter Plate** Break apart strips. Coated with anti-rabbit IgG (goat, polyclonal).
3 x 2 mL	**Melatonin Biotin,** lyophilized Contains stabilizers.
3 x 2 mL	**Melatonin Antiserum** lyophilized Contains Antiserum (rabbit, polyclonal), stabilizers.
1 x 250 µL	**Enzyme Conjugate** Concentrate (80x). Contains anti-Biotin antibodies (goat), conjugated to alkaline phosphatase, Tris buffer, stabilizers.

DRG® Melatonin ELISA (EIA-1431)

Revised 1 May 2006

Quantity	Component
1 x 6 x 2 mL	**Standard A-F,** lyophilized Contains stabilizers. For exact concentrations see vial labels or QC Certificate.
1 x 2 x 2 mL	**Control 1+2,** lyophilized Contains stabilizers. Concentrations / acceptable ranges see QC Certificate.
1 x 50 mL	**Assay Buffer,** Concentrate (10x) Contains phosphate buffer, Tween, stabilizers.
1 x 9x	**PNPP Substrate Tablets** In one foil packet. Contains p-nitrophenyl phosphate (PNPP).
1 x 27 mL	**PNPP Substrate Buffer** Ready to use. Contains diethanolamine, water.
1 x 5 mL	**PNPP Stop Solution** Ready to use. Contains 1 M NaOH, 0.25 M EDTA.
2 x 10	**Extraction Columns** Ready to use. C18 RP. 1 cm^3/100 mg. Additional extraction columns can be ordered separately.
3 x	**Adhesive Foil**

MATERIALS REQUIRED BUT NOT SUPPLIED

1. Micropipettes (Multipette Eppendorf or similar devices, < 3% CV). Volumes: 50; 500 µL
2. Disposable glass test tubes or round-bottom polystyrene test tubes (12 x 75 mm)
3. Orbital shaker (400-600 rpm)
4. Vortex mixer
5. 8-Channel Micropipettor with reagent reservoirs
6. Wash bottle, automated or semi-automated microtiter plate washing system
7. Centrifuge (preferably refrigerated); 200-500 x g
   alternatively: Vacuum manifold (e.g. Mallinekrodt-Baker or Waters)
8. Methanol (HPLC grade)
9. Evaporator centrifuge (Speed-Vac)
   alternatively: Sample concentrator by use of nitrogen (e.g. Techne)
10. Microtiter plate reader capable of reading absorbance at 405 nm (reference wavelength 600-650 nm)
11. Bidistilled or deionised water
12. Paper towels, pipette tips and timer

Revised 1 May 2006

PROCEDURE NOTES

1. Any improper handling of samples or modification of the test procedure may influence the results. The indicated pipetting volumes, incubation times, temperatures and pretreatment steps have to be performed strictly according to the instructions. Use calibrated pipettes and devices only.
2. Once the test has been started, all steps should be completed without interruption. Make sure that required reagents, materials and devices are prepared ready at the appropriate time. Allow all reagents and specimens to reach room temperature (18-25 °C) and gently swirl each vial of liquid reagent and sample before use. Mix reagents without foaming.
3. Avoid contamination of reagents, pipettes and wells/tubes. Use new disposable plastic pipette tips for each reagent, standard or specimen. Do not interchange caps. Always cap not used vials. Do not reuse wells/tubes or reagents.
4. It is advised to determine samples in duplicate to be able to identify potential pipetting errors.
5. Use a pipetting scheme to verify an appropriate plate layout.
6. Incubation time affects results. All wells should be handled in the same order and time sequences. It is recommended to use an 8-channel Micropipettor for pipetting of solutions in all wells.
7. Microplate washing is important. Improperly washed wells will give erroneous results. It is recommended to use a multichannel pipette or an automatic microplate washing system. Do not allow the wells to dry between incubations. Do not scratch coated wells during rinsing and aspiration. Rinse and fill all reagents with care. While rinsing, check that all wells are filled precisely with Wash Buffer, and that there are no residues in the wells.
8. Humidity affects the coated wells/tubes. Do not open the pouch until it reaches room temperature. Unused wells/tubes should be returned immediately to the resealed pouch including the desiccant.
9. The relative centrifugal force (g) is not equivalent to rounds per minute (rpm) but it has to be calculated depending on the radius of the centrifuge.

PRE-TEST SETUP INSTRUCTIONS

NOTE: The contents of the kit for 96 determinations can be divided into 3 separate runs.
The volume stated below are for one run with 4 strips (32 determinations).

Revised 1 May 2006

Preparation of lyophilized or concentrated Components

Dilute/ dissolve	Component		Diluent	Rela-tion	Remarks	Storage	Stability
15 mL	**Assay Buffer**	add 150 mL	bidist. Water	1:10		2-8°C	4 w
	Standards, Controls	with 2.0 mL	bidist. Water		Let stand for 15 min. Mix without foaming.	≤ -20°C (Aliquots)	until Exp. Date
	Melatonin Biotin	with 2.0 mL	Assay Buffer (diluted)		Let stand for 15 min. Mix without foaming.	Prepare freshly and use only once.	
	Melatonin Antiserum	with 2.0 mL	bidist. Water		Let stand for 15 min. Mix without foaming.		
70 µL	**Enzyme Conjugate**	with 5.6 mL	Assay Buffer (diluted)	1:81			
3	**PNPP Substrate Tablets**	with 8 mL	PNPP Substrate Buffer				
10 mL	**Methanol (undiluted)**	ad 100 mL	bidist. Water	10 % (v/v)			

If a larger volume is needed, vials can be pooled. Avoid repeated freeze-thaw cycles.

Dilution of Samples

Samples suspected to contain concentrations higher than the highest standard have to be diluted with diluted Assay Buffer prior to extraction step.

Extraction of Samples, Standards and Controls (Extraction Column)

The yield of extraction with this procedure is approx. 90 - 100 %.
Filter or centrifuge the samples prior to extraction in order to avoid clogging of the columns.

NOTE: Each sample, Standard and Control has to be extracted. Extraction may be performed in advance. The dried extracts (after evaporation of methanol) may be stored at 2-8°C or ≤ -20°C for up to 24 h.
After elution with methanol the Extraction Columns may be used for extraction of the next samples or stored at 2-8°C protected from dust. Extraction Columns may be re-used up to 4 times. In case of re-use, start again with A.1 (Column Conditioning).

Revised 1 May 2006

A. Standard version: Procedure for Centrifuge and Evaporator Centrifuge

1. Column Conditioning:

1. Place the Extraction Columns into polystyrene or glass tubes (12 x 75 mm).
2. Add **2 x 1 mL** of **methanol (undiluted)** to the columns. Let the solvent pass through the column by centrifugation for 1 min at 200 x g. Discard eluate.
3. Add **2 x 1 mL** of **bidist. water** to the columns. Let the solvent pass through the column by centrifugation for 1 min at 200 x g. Discard eluate.
4. Proceed with sample application without delay in order to avoid the columns getting dry.

2. Sample Application:

5. Place the Extraction Columns into correspondingly marked polystyrene or glass tubes (12 x 75 mm).
6. Add **0.5 mL** of Standards, Controls and samples to the columns. Let pass through the column by centrifugation for 1 min at 200 x g. Discard eluate.

3. Washing:

7. Add **2 x 1 mL** of **10 % methanol in bidist. water (v/v)** to the columns. Let the solvent pass through the column by centrifugation for 1 min at 500 x g. Discard eluate.

4. Elution of Extract:

8. Place the Extraction Columns into new, correspondingly marked polystyrene or glass tubes (12 x 75 mm).
9. Add **1 mL** of **methanol (undiluted)** to the columns. Let the solvent pass through the column by centrifugation for 1 min at 200 x g.
10. Remove columns from the tubes. Avoid drops to be left at the columns.
11. Use columns for extraction of the next samples or store at 2-8°C protected from dust. Extraction Columns may be re-used up to 4 times.

5. Evaporation and Reconstitution of Extract:

12. **Evaporate** the methanol **to dryness** by use of evaporator centrifuge.
13. **Reconstitute** samples with **0.15 mL** of **bidist. water**.
14. Vortex at least 1 min and assay immediately.

B. Alternative version: Procedure for Vacuum Manifold instead of a Centrifuge

For the extraction scheme follow points A 1-5 accordingly. The volumes remain unchanged.
Let the **solvent** pass through the column using vacuum and a flow rate of **≤ 5mL/min**.
For the **samples and extracts** use a flow rate of **≤ 2 mL/min**.

Revised 1 May 2006

The evaporation of the solvent may be performed by using an evaporator centrifuge or by nitrogen.

TEST PROCEDURE

1. Pipette **50 µL** of each extracted **Standard,** extracted **Control and** extracted **sample** into the respective wells of the Microtiter Plate.
2. Pipette **50 µL** of **Melatonin Biotin** into each well.
3. Pipette **50 µL** of **Melatonin Antiserum** into each well.
4. Cover plate with adhesive foil. Shake plate carefully. **Incubate 14-20 h** at **2-8°C.**
5. Remove adhesive foil. Discard incubation solution. Wash plate **3 x** with **250 µL** of diluted **Assay Buffer**. Remove excess solution by tapping the inverted plate on a paper towel.
6. Pipette **150 µL** of freshly prepared **Enzyme Conjugate** into each well.
7. Cover plate with new adhesive foil. **Incubate 120 min** at **RT (18-25°C)** on an orbital shaker (500 rpm).
8. *Approx. 10 min before end of incubation prepare PNPP Substrate Solution.*
9. Remove adhesive foil. Discard incubation solution. Wash plate **3 x** with **250 µL** of diluted **Assay Buffer**. Remove excess solution by tapping the inverted plate on a paper towel.
10. For adding of Substrate and Stop Solution use, if available, an 8-channel Micropipettor. Pipetting should be carried out in the same time intervals for Substrate and Stop Solution. Use positive displacement and avoid formation of air bubbles.
11. Pipette **200 µL** of freshly prepared **PNPP Substrate Solution** into each well.
12. **Incubate 20 - 40 min** at **RT (18-25°C)** on an orbital shaker (500 rpm).
13. Stop the substrate reaction by adding **50 µL** of **PNPP Stop Solution** into each well. Briefly mix contents by gently shaking the plate.
14. **Measure** optical density with a photometer at **405 nm** (Reference-wavelength: 600-650 nm) within **60 min** after pipetting of the Stop Solution.

QUALITY CONTROL

The test results are only valid if the test has been performed following the instructions. Moreover the user must strictly adhere to the rules of GLP (Good Laboratory Practice) or other applicable standards/laws. All standards and kit controls must be found within the acceptable ranges as stated on the QC Certificate. If the criteria are not met, the run is not valid and should be repeated. Each laboratory should use known samples as further controls.

In case of any deviation the following technical issues should be proven: Expiration dates of (prepared) reagents, storage conditions, pipettes, devices, incubation conditions and washing methods.

It is recommended to participate at appropriate quality assessment trials.

Revised 1 May 2006

CALCULATION OF RESULTS

The obtained OD of the standards (y-axis, linear) are plotted against their concentration (x-axis, logarithmic) either on semi-logarithmic graph paper or using an automated method. A good fit is provided with cubic spline, 4 Parameter Logisitcs or Logit-Log.

For the calculation of the standard curve, apply each signal of the standards (one obvious outlier of duplicates might be omitted and the more plausible single value might be used).

The concentration of the samples can be read directly from the standard curve.

In case of diluted samples the values have to be multiplied with the corresponding dilution factor.

Samples showing concentrations above the highest standard have to be diluted as described in PRE-TEST SETUP INSTRUCTIONS and reassayed.

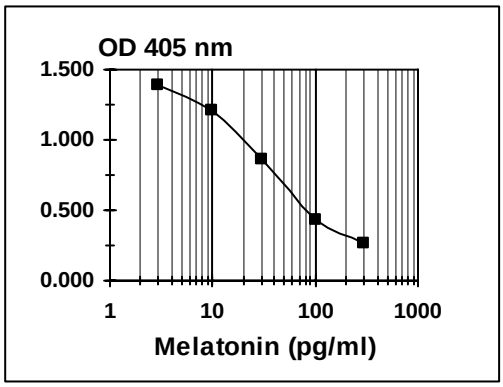
Conversion:

Melatonin (pg/mL) x 4.30 = pmol/L

Typical Calibration Curve

(Example. Do not use for calculation!)

Standard	Melatonin (pg/mL)	Mean OD	OD/OD_{max} (%)
A	0.0	1.517	100.0
B	3.0	1.383	91.1
C	10	1.214	80.1
D	30	0.867	57.1
E	100	0.434	28.6
F	300	0.260	17.1



EXPECTED VALUES

The results themselves should not be the only reason for any therapeutical consequences. They have to be correlated to other clinical observations and diagnostic tests.

A study with apparently healthy subjects has shown that the melatonin levels in humans have a marked circadian rhythmicity characterized by very low levels during day-time and high levels during night-time, and show a considerable inter-individual variation. Furthermore, the melatonin concentration is age dependent. The highest concentrations were found in samples of infants (up to 3 years).

In a group of six healthy volunteers the circadian rhythm of melatonin was studied. The mean value reaches a minimum of about 4.6 pg/ml during daytime at 4 p. m. and a maximum of about 77.5 pg/ml during night-time at 4 a.m.

The nocturnal melatonin peak among healthy individuals varies significantly.

It is recommended that each laboratory establishes its own range of normal values.

LIMITATIONS OF THE PROCEDURE

Specimen collection has a significant effect on the test results. See SPECIMEN COLLECTION AND STORAGE for details.

For cross-reactivities, see PERFORMANCE.

Revised 1 May 2006

The following blood components do not have a significant effect (+/- 15 % of expected) on the test results up to the concentrations stated below:

Hemoglobin	8.0 mg/mL
Bilirubin	0.36 mg/mL

PERFORMANCE

Analytical Specificity (Cross Reactivity)	Substance	Cross Reactivity (%)	Cross-reactivity of other substances tested< 0.01 %	
	5-Methoxy--Tryptophole	1.2		
	N-Acetyl-Serotonin	1.2		
	5-Methoxy-Tryptamine	2.5		
Analytical Sensitivity (Limit of Detection)	1.6 pg/mL	Mean signal (Zero-Standard) - 2SD		
Precision	Range (pg/mL)	CV (%)		
Intra-Assay	8.8 – 151.7	3.0 – 11.4		
Inter-Assay	5.6 – 134.3	6.4 – 19.3		
Linearity	Range (pg/mL)	Serial dilution up to	Range (%)	
	80.7 – 191.4	1:16	73 - 135	
Recovery	Mean (%)	Range (%)	% Recovery after spiking	
	102.4	83 - 125		
Method Comparison versus DRG® RIA	DRG® ELISA = 1.01 x DRG® RIA + 4.6		r = 0.98; n = 50	
Method Comparison versus other RIA	DRG® ELISA = 0.86 x other RIA + 5.33		r = 0.96; n = 46	

PRODUCT LITERATURE REFERENCES

1. Sharman E et al. Age-related changes in murine CNS mRNA gene expression are modulated by dietary melatonin. J. Pineal Res. Vol 36, Issue 3: 165ff. (2004)
2. Wagner H.-J. Mattheus U. Pineal organs in deep demersal fish. Cell Tissue Res 307:115-127 (2002)
3. Kunz D et al. Melatonin as a therapy in REM sleep behavior disorder patients: an open-labeled pilot study on the possible influence of melatonin on REM-sleep regulation. Movement Disorders, 14: 507-511 (1999)
4. Pfluger DH, Minder CE. Effects of exposure to 16.7 Hz magnetic fields on urinary 6-hydroxymelatonin sulfate excretion of Swiss railway workers. J. Pineal Res., 21: 91-100 (1996)

Revised 1 May 2006

5. Follenius M, Weibel L, Brandenberger G. Distinct modes of melatonin secretion in normal men. J. Pineal Res., 18: 135-140 (1995)
6. Dubbels R et al. Melatonin in edible plants identified by radioimmunoassay and by high performance liquid chromatography-mass spectrometry. J. Pineal Res., 18. 28-31 (1995)
7. Czeisler CA et al. Suppression of melatonin secretion in some blind patients by exposure to bright light. N. Engl. J. Med., 332: 6-11 (1995)

Symbols used with DRG® ELISA´s

Symbol	English	Deutsch	Francais	Espanol	Italiano

Revised 1 May 2006

	Consult instructions for use	Gebrauchsanweisung beachten	Consulter les instructions d'utilisation	Consulte las instrucciones de uso	Consultare le istruzioni per l'uso
CE	European Conformity	CE-Konfirmitäts-kennzeichnung	Conformité aux normes européennes	Conformidad europea	Conformità europea
IVD	In vitro diagnostic device	In-vitro-Diagnostikum	Ussage Diagnostic in vitro	Para uso Diagnóstico in vitro	Per uso Diagnostica in vitro
FRO	For research use only	Nur für Forschungszwecke		Sólo para uso en investigación	
REF	Catalogue number	Katalog-Nr.	Numéro de catalogue	Número de catálogo	Numero di Catalogo
LOT	Lot. No. / Batch code	Chargen-Nr.	Numéro de lot	Número de lote	Numero di lotto
	Contains sufficient for <n> tests/	Ausreichend für "n" Ansätze	Contenu suffisant pour "n" tests	Contenido suficiente para <n> ensayos	Contenuto sufficiente per "n" saggi
	Storage Temperature	Lagerungstemperatur	Temperature de conservation	Temperatura de conservación	Temperatura di conservazione
	Expiration Date	Mindesthaltbarkeits-datum	Date limite d'utilisation	Fecha de caducidad	Data di scadenza
	Legal Manufacturer	Hersteller	Fabricant	Fabricante	Fabbricante
Distributed by	Distributor	Distributeur	Distributeur	Distribuidor	Distributtore
Content	Content	Inhalt	Conditionnement	Contenido	Contenuto
Volume/No.	Volume / No.	Volumen/Anzahl	Volume/Quantité	Volumen/Número	Volume/Quantità

Symbol	Portugues	Dansk	Svenska	Ελληνικά
	Consulte as instruções de utilização	Se brugsanvisning	Se bruksanvisningen	Εγχειρίδιο χρήστη
CE	Conformidade com as normas europeias	Europaeisk overensstemmelse	Europeisk överensstämmelse	Ευρωπαϊκή Συμμόρφωση
IVD	Diagnóstico in vitro	In vitro diagnostik	Diagnostik in vitro	in vitro διαγνωστικό
FRO				
REF	Catálogo n.º	Katalognummer	Katalog nummer	Αριθμός καταλόγου
LOT	No do lote	Lot nummer	Batch-nummer	Αριθμός Παρτίδος
		Indeholder tilsttrækkeligt til "n" test	Innehåller tillräckligt till "n" tester	Περιεχόμενο επαρκές για «n» εξετάσεις
	Temperatura de conservação	Opbevarings-temperatur	Förvaringstempratur	Θερμοκρασία αποθήκευσης
	Prazo de validade	Udløbsdato	Bäst före datum	Ημερομηνία λήξης

Revised 1 May 2006

	Fabricante	Producent	Tillverkare	Κατασκευαστής
Distributed by				
Content	Conteúdo	Indhold	Innehåll	Περιεχόμενο
Volume/No.	Volume/Número	Volumen/antal	Volym/antal	Όγκος/αριθ..