Melatonin-Sulfate Urine ELISA

Enzyme immunoassay for the in-vitro-diagnostic quantitative determination of melatonin sulfate (synonyms: 6-hydroxymelatonin sulfate, 6-sulfatoxymelatonin) in human urine.

REF 40-371-25006

Σ 96

2-8 °C

EU: For research use only.

U.S.: For research use only.
Not for use in diagnostic procedures.

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1. **INTENDED USE**
Enzyme immunoassay for the *in-vitro diagnostic* quantitative determination of Melatonin Sulfate (synonyms: 6-hydroxymelatonin sulfate, 6-sulfatoxymelatonin) in human urine.

2. **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 synthesised 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.

3. **TEST PRINCIPLE**
Solid phase enzyme-linked immunosorbent assay (ELISA) based on the competition principle. An unknown amount of antigen present in the sample and a fixed amount of enzyme labelled antigen compete for the binding sites of the antibodies coated onto the wells. After incubation the wells are washed to stop the competition reaction. After the substrate reaction the intensity of the developed colour is inversely proportional to the amount of the antigen in the sample. Results of samples can be determined directly using the standard curve.

4. **WARNINGS AND PRECAUTIONS**
1. For *in-vitro diagnostic* use only. For professional 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 us 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.
7. Chemicals and prepared or used reagents have to be treated as hazardous waste according to national biohazard and safety guidelines or regulations.
8. The cleaning staff should be guided by the professionals regarding potential hazards and handling.
9. Avoid contact with Stop solution. It may cause skin irritations and burns.

5. **STORAGE AND STABILITY**
The kit is shipped at ambient temperature and should be stored at 2-8 °C. Keep away from heat or direct sunlight. The storage and stability of specimens 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.
6. SPECIMEN COLLECTION AND STORAGE

Urine
It is possible to use spontaneous as well as 24 h urine. The total volume of urine excreted during a 24 h period should be collected and mixed in a single bottle. Preservation is not necessary. Determine total volume for calculation of results. Mix and centrifuge samples before use in the assay.

| Storage:  | 2-8°C | ≤ -20°C (Aliquots) | Keep away from heat or direct sunlight. Avoid repeated freeze-thaw cycles. For more details see: Griefahn et al. (2001). |
| Stability: | 4 days | 15 years |

7. MATERIALS SUPPLIED

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Symbol</th>
<th>Component</th>
</tr>
</thead>
</table>
| 1 x 12 x 8 | MTP | Microtiter Plate  
Break apart strips. Coated with anti-rabbit IgG (goat, polyclonal). |
| 1 x 5 mL | ANTISERUM | Melatonin Sulfate Antiserum  
Ready to use. Contains: Antiserum (rabbit), Tris buffer, 0.01 % Thimerosal. |
| 1 x 0.2 mL | ENZCONJ CONC | Enzyme Conjugate, Concentrate (40x)  
Contains: Melatonin Sulfate, conjugated to peroxidase, phosphate buffer, 0.01 % Thimerosal. |
| 1 x 7 x 0.1 mL | CAL A-G | Standard A-G  
0; 1.7; 5.2; 15.6; 46.7; 140; 420 ng/mL  
0; 5.2; 15.9; 47.6; 142; 427; 1281 nmol/L  
Ready to use. Contains: Melatonin Sulfate, Tris buffer, 0.01 % Thimerosal. |
| 1 x 2 x 0.1 mL | CONTROL 1+2 | Control 1+2  
Ready to use. Contains: 0.02 % Thimerosal. Concentrations / acceptable ranges see QC certificate. |
| 1 x 60 mL | ASSAYBUF | Assay Buffer  
Red colored. Ready to use. Contains: Tris buffer, BSA, 0.01 % Thimerosal. |
| 1 x 50 mL | WASHBUF CONC | Wash Buffer, Concentrate (20x)  
Contains: phosphate buffer, Tween, 0.1 % Thimerosal. |
| 1 x 15 mL | TMB SUBS | TMB Substrate Solution  
Ready to use. Contains: TMB, Buffer, stabilizers. |
| 1 x 15 mL | TMB STOP | TMB Stop Solution  
Ready to use. 1 M H₂SO₄. |
| 3 x | FOIL | Adhesive Foil |

8. MATERIALS REQUIRED BUT NOT SUPPLIED
1. Micropipettes (Multipette Eppendorf or similar devices, < 3 % CV). Volume: 10; 50; 100; 1000 µL  
2. Round-bottom polystyrene test tubes (12 x 75 mm)  
3. Rack for test tubes  
4. Orbital shaker (500 rpm)  
5. Vortex mixer  
6. 8-Channel Micropipettor with reagent reservoirs  
7. Wash bottle, automated or semi-automated microtiter plate washing system  
8. Microtiter plate reader capable of reading absorbance at 450 nm (reference wavelength 600-650 nm)  
9. Bidistilled or deionised water  
10. Paper towels, pipette tips and timer

9. 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 component and specimen. Do not interchange caps. Always cap not used vials. Do not reuse wells/tubes or reagents.

4. Some components contain \( \leq 250 \, \mu\text{L} \) solution. Take care that the solution is completely on the bottom of the vial before opening.

5. It is advised to determine samples in duplicate to be able to identify potential pipetting errors.

6. Use a pipetting scheme to verify an appropriate plate layout.

7. 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.

8. Microtiter plate washing is important. Improperly washed wells will give erroneous results. It is recommended to use a multichannel pipette or an automatic microtiter plate 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.

9. 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.

10. **PRE-TEST SETUP INSTRUCTIONS**

    The contents of the kit for 96 determinations can be divided into 3 separate runs.

    **The volumes stated below are for one run with 4 strips (32 determinations).**

10.1. Preparation of concentrated components

<table>
<thead>
<tr>
<th>Dilute / dissolve</th>
<th>Component</th>
<th>Diluent</th>
<th>Relation</th>
<th>Remarks</th>
<th>Storage</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 mL</td>
<td>WASHBUF CONC</td>
<td>ad 300 mL bidist. water</td>
<td>1:20</td>
<td>Resolve crystals at 18-25°C.</td>
<td>2-8°C</td>
<td>4 weeks</td>
</tr>
<tr>
<td>50 µL</td>
<td>ENZCONJ CONC</td>
<td>with 2 mL ASSAYBUF</td>
<td>1:41</td>
<td>Prepare freshly and use only once.</td>
<td>18-25°C</td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

10.2. Dilution of Standards, Controls and Patient Urine Samples

1. Pipette 10 µL of each Standard, Control and patient urine sample into polystyrene, polypropylene or glass tubes. Avoid direct sun light.

2. Pipette 500 µL of Assay Buffer into each tube. Vortex.

Samples containing concentrations higher than the highest standard have to be further diluted with Assay Buffer.

11. **TEST PROCEDURE**

1. Pipette 50 µL of each diluted Standard, diluted Control and diluted patient sample into the respective wells of the Microtiter Plate.

2. Pipette 50 µL of freshly prepared Enzyme Conjugate into each well.

3. Pipette 50 µL of Melatonin Sulfate Antiserum into each well.


5. Remove adhesive foil. Discard incubation solution. Wash plate 4 x with 250 µL of diluted Wash Buffer. Remove excess solution by tapping the inverted plate on a paper towel.

6. 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.

7. Pipette 100 µL of TMB Substrate Solution into each well.

8. **Incubate 30 min at RT (18-25°C)** on an orbital shaker (500 rpm).

9. Stop the substrate reaction by adding 100 µL of TMB Stop Solution into each well. Briefly mix contents by gently shaking the plate.

10. **Measure** optical density with a photometer at 450 nm (Reference-wavelength: 600-650 nm) within 60 min after pipetting of the Stop Solution.
12. 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 comparable standards/laws. User and/or laboratory must have a validated system to get diagnosis according to GLP. All kit controls must be found within the acceptable ranges as stated on the labels and 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. It is recommended to participate at appropriate quality assessment trials.
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.

13. 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 Logistics 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.
The initial dilution has been taken into consideration when reading the results from the graph. Results of samples of higher predilution have to be multiplied with the dilution factor.
Samples showing concentrations above the highest standard have to be diluted as described in PRE-TEST SETUP INSTRUCTIONS and reassayed.
Calculate the 24 h excretion for each urine sample: $\text{µg/24 h} = \text{µg/L} \times \text{L/24 h}$
Conversion:
Melatonin Sulfate (ng/mL) x 3.05 = nmol/L

Typical Calibration Curve
(Example. Do not use for calculation!)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Melatonin Sulfate (ng/mL)</th>
<th>OD$_{\text{Mean}}$</th>
<th>OD$<em>{\text{OD</em>{max}}}$ x (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.0</td>
<td>1.805</td>
<td>100.0</td>
</tr>
<tr>
<td>B</td>
<td>1.7</td>
<td>1.741</td>
<td>96.5</td>
</tr>
<tr>
<td>C</td>
<td>5.2</td>
<td>1.536</td>
<td>85.1</td>
</tr>
<tr>
<td>D</td>
<td>15.6</td>
<td>1.185</td>
<td>65.7</td>
</tr>
<tr>
<td>E</td>
<td>46.7</td>
<td>0.773</td>
<td>42.8</td>
</tr>
<tr>
<td>F</td>
<td>140.0</td>
<td>0.341</td>
<td>18.9</td>
</tr>
<tr>
<td>G</td>
<td>420.0</td>
<td>0.164</td>
<td>9.1</td>
</tr>
</tbody>
</table>

14. 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.
Apparently healthy subjects show the following values:

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>24h (µg)* Mean</th>
<th>24h (µg)* 90% percentile</th>
<th>night fraction (µg/h) Mean</th>
<th>night fraction (µg/h) 90% percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-35</td>
<td>26</td>
<td>36.8</td>
<td>15.6 - 58.1</td>
<td>2.8</td>
<td>0.9 – 5.6</td>
</tr>
<tr>
<td>36-50</td>
<td>17</td>
<td>29.6</td>
<td>9.9 – 52.9</td>
<td>2.1</td>
<td>0.6 – 3.6</td>
</tr>
<tr>
<td>51-65</td>
<td>16</td>
<td>20.4</td>
<td>12.3 – 32.8</td>
<td>1.5</td>
<td>0.9 – 2.5</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>16</td>
<td>15.8</td>
<td>7.5 – 32.7</td>
<td>1.0</td>
<td>0.3 – 2.3</td>
</tr>
</tbody>
</table>

* 24-h excretion was calculated as sum of four collection periods. For further details see: Mahlberg R. et al. Normative data on the daily profile of urinary 6-sulfatoxymelatonin in healthy subjects between the ages of 20 and 84. Psychoneuroendocrinology (2006) 31, 634-641

It is recommended that each laboratory establishes its own range of normal values.
15. LIMITATIONS OF THE PROCEDURE
Specimen collection and storage have a significant effect on the test results. See SPECIMEN COLLECTION AND STORAGE for details.
For cross-reactivities, see PERFORMANCE.

16. PERFORMANCE

<table>
<thead>
<tr>
<th>Analytical Specificity (Cross Reactivity)</th>
<th>Substance</th>
<th>Cross Reactivity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Melatonin Sulfate</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Melatonin</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>6-OH-Melatonin</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>N-Acetyl-L-OH-Tryptamine</td>
<td>0.0005</td>
</tr>
<tr>
<td></td>
<td>N-Acetyl-L-Tryptophan</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td></td>
<td>5-Methoxy-Tryptamine</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td></td>
<td>Tryptamine</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td></td>
<td>5-HIAA</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

Cross-reactivity of other substances tested < 0.0001 %

<table>
<thead>
<tr>
<th>Analytical Sensitivity (Limit of Detection)</th>
<th>1.0 ng/mL</th>
<th>Mean signal (Zero-Standard) - 2SD</th>
</tr>
</thead>
</table>

Precision
- Intra-Assay: 5.8 - 204, CV (%): 5.2 – 12.2
- Inter-Assay: 12.4 – 220, CV (%): 5.1 – 14.9

Linearity
- Range (ng/mL): 96.5 – 248.8
- Serial dilution up to: 1:32
- Range (%): 80 - 116

Recovery
- Mean (%): 105.8
- Range (%): 91 - 122
- % Recovery after spiking

Method Comparison versus RIA
- ELISA-Assay = 1.15 x RIA + 4.2
- r = 0.96; n = 40

17. PRODUCT LITERATURE REFERENCES
<table>
<thead>
<tr>
<th>REF</th>
<th>Cat.-No.: / Kat.-Nr.: / No.- Cat.: / N.º Cat.: / N.–Cat.: / Αριθμός-Κατ.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOT</td>
<td>Lot-No.: / Chargen-Bez.: / No. Lot: / Lot-No.: / Lote n.: / Αριθμός-Παραγωγή:</td>
</tr>
<tr>
<td>Use by: / Verwendbar bis: / Utiliser à: / Usado por: / Usar até: / Da utilizzare entro: / Χρησιμοποιείται από:</td>
<td></td>
</tr>
<tr>
<td>CONC</td>
<td>Concentrate / Konzentrat / Concentré / Concentrar / Concentrado / Concentrato / Συμπύκνωμα</td>
</tr>
<tr>
<td>LYO</td>
<td>Lyophilized / Lyophilisat / Lyophilisé / Liofilizado / Liofilizzato / Λυοφιλιασµένο</td>
</tr>
<tr>
<td>IVD</td>
<td>In Vitro Diagnostic Medical Device. / In-vitro-Diagnostikum. / Appareil Médical pour Diagnostics In Vitro. / Equipamiento Médico para Diagnóstico In Vitro. / Dispositivo Medico Diagnostico In vitro. / Ιατρική συσκευή για In-Vitro Διάγνωση.</td>
</tr>
<tr>
<td>Evaluation kit. / Nur für Leistungsbewertungszwecke. / Kit pour évaluation. / Juego de Reactivos para Evaluación. / Kit de avaliação. / Kit di evaluazione. / Κιτ Αξιολόγησης.</td>
<td></td>
</tr>
<tr>
<td>Store at: / Lagern bei: / Stocker à: / Almacene a: / Armazenar a: / Conservare a: / Αποθήκευση στους:</td>
<td></td>
</tr>
<tr>
<td>Manufacturer: / Hersteller: / Fabricant: / Productor: / Fabricante: / Fabbricante: / Παραγωγός:</td>
<td></td>
</tr>
<tr>
<td>Caution! / Vorsicht! / Attention! / ¡Precaución! / Cuidado! / Attenzione! / Προσοχή!</td>
<td></td>
</tr>
</tbody>
</table>

Symbols of the kit components see MATERIALS SUPPLIED.
Die Symbole der Komponenten sind im Kapitel KOMPONENTEN DES KITS beschrieben.
Voir MATERIEL FOURNI pour les symboles des composants du kit.
Símbolos de los componentes del juego de reactivos, vea MATERIALES SUMINISTRADOS.
Para símbolos dos componentes do kit ver MATERIAIS FORNECIDOS.
Per i simboli dei componenti del kit si veda COMPONENTI DEL KIT.
Για τα σύμβολα των συστατικών του κιτ συμβουλευτείτε το ΠΑΡΕΞΟΜΕΝΑ ΥΛΙΚΑ.

Symbols Version 3.5