




Instructions for Use


Serotonin High Sensitive ELISA

(for High Sensitivity and for Small Sample Volume)

Highly Sensitive Enzyme Immunoassay
for the Quantitative Determination of Serotonin

REF EA 630/96

 12 x 8

 2 – 8 °C

DLD Gesellschaft für Diagnostika und medizinische Geräte mbH
Adlerhorst 15 • 22459 Hamburg • Germany
Tel +49-40-555 87 10 • Fax +49-40-555 87 111
Internet: <http://www.dld-diagnostika.de> • E-Mail: contact@dld-diagnostika.de

Contents

1. Introduction and Principle of the Test	Page	4
2. Precautions	Page	5
3. Storage and Stability	Page	5
4. Contents of the Kit	Page	5
5. Sample Collection	Page	7
6. Preparation of Reagents and Samples	Page	8
7. Test Procedure (ELISA)	Page	12
8. Calculation of the Results	Page	13
9. Assay Characteristics	Page	14
10. Literature	Page	15
Pipetting Scheme	Page	16

1. Introduction and Principle of the Test

Serotonin (5-Hydroxytryptamine), a biogenic amine, is a product of the tryptophan metabolism. It is a well evaluated neurotransmitter of the central nervous system and can be found in high concentrations in the chromaffine cells of the intestinal mucosa, in the platelets and the serotonergic neurones of the brain.

Central-serotonergic neurones influence physiological functions such as sleep and the hormonal and cardio-vascular regulation. Increased serum levels can be found with malignant carcinoid, endogenous depression and schizophrenia.

The assay kit provides materials for the quantitative measurement of derivated serotonin in low concentrated samples and for small sample volumes. The derivation is performed during the preparation of the samples. By using the acylation reagent the serotonin is quantitatively derivated into N-acylserotonin.

The competitive Serotonin ELISA kit uses the microtitre plate format. Derivated serotonin 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 serotonin is detected by anti-rabbit/peroxidase. The substrate TMB / peroxidase reaction is monitored at 450 nm. The amount of antibody bound to the solid phase serotonin is inversely proportional to the serotonin concentration of the sample.

2. Precautions

- For in vitro use only.
- Disposable gloves and safety glasses should be used.
- Material of animal origin used in the preparation of the kit has been obtained from animals certified as healthy but these materials should be handled as potentially infectious.
- Some components of this kit are containing hazardous reagents. These components are marked with the adequate hazard label.

3. Storage and Stability

On arrival, store the kit at 2-8 °C. Once opened the kit is stable until its expiry date. For stability of prepared reagents refer to Preparation of Reagents.

Do not use components beyond the expiration date shown on the kit labels.

Do not mix various lots of any kit component within an individual assay.

4. Contents of the Kit

4.1	MT-Strips 8 wells each, break apart precoated with serotonin	STRIPS	12 strips
4.2	Standard 4 ml, concentrated concentration: 500 ng/ml Dilute concentrate to working concentrations (see 6.1.2.)	CAL	1 vial
4.3	Control 1 & 2 Each 4 ml, concentrated Dilute 1:500 (see 6.1.3.) Range: see q.c. certificate	CON 1 & 2	2 vials

- 4.4 **Acylation Buffer** **ACYL-BUFF** 1 vial
 lyophilised, dissolve content with 4 ml distilled water,
 add 200 µl of Acylation Buffer concentrate **ACYL-BUFF-CONC**
 Mix carefully in order to minimize foam formation. (see 6.1.4.)
- 4.5 **Acylation Buffer Concentrate** **ACYL-BUFF-CONC** 1 vial
 1 ml, concentrated; colour coded yellow
- 4.6 **Acylation Reagent** **ACYL-REAG** 2 x 2 vials
 lyophilised, dissolve content
 in 2.5 ml **Solvent** (see 6.1.5.)
- 4.7 **Deactivator** **DEAC** 1 vial
 3 ml, ready for use; colour coded blue
- 4.8 **Enzyme Conjugate** **CONJ** 1 vial
 12 ml, ready for use
 Goat anti-rabbit-IgG-peroxidase
- 4.9 **Wash Buffer** **WASH** 1 vial
 20 ml, concentrated
 Dilute content with distilled water to 500 ml total volume.
- 4.10 **Substrate** **SUB** 1 vial
 12 ml TMB solution, ready for use
- 4.11 **Stop Solution** **STOP** 1 vial
 12 ml, ready for use
 Contains 0.3 M sulphuric acid
- 4.12 **Solvent** **SOLVENT** 2 vials
 6 ml solvent to dissolve the Acylation reagent
 Contains Acetone, ready for use
- 4.13 **Ascorbic acid** **ASC-ACID 10%** 1 vial
 2 ml, ready for use
 Contains 10% ascorbic acid
- 4.14 **Standard Buffer** **STD-BUFF** 1 vial
 50 ml
 Contains 10 mM PBS (0,9 % NaCl), stabilized
 Before use enrich to 0.1 % ascorbic acid (see 6.1.1.).

4.15 Reaction plate for Acylation, ready for use	ACYL-PLATE	1 piece
4.16 Adhesive Foil ready for use	FOIL	2 pieces

Additional materials and equipment required but not provided:

- Pipettes (10, 20, 25, 50, 100 and 200 µl)
- Orbital shaker
- Multichannel pipette or Microplate washing device
- Microplate photometer (450 nm)
- Distilled water

5. Sample Collection

The test is intended for small sample volumes, for low concentrated samples (e.g. tissue homogenates, dialysates) and in general for diluted samples.

For the protection of serotonin against oxidative degradation the samples must contain 0.1% ascorbic acid.

The samples can be stored up to 6 hours at 2 - 8 °C. For a longer storage the samples must be frozen at -20 °C
Repeated freezing and thawing should be avoided.

Different dilution buffers are suitable but have to be tested beforehand. Evaluation was done with Ringer buffer and PBS (0.9% NaCl). Alternatively, the Standard Buffer included in the kit can be used. All applied buffers must contain 0.1% ascorbic acid.

For small sample volumes (< 20 µl) a volume correction is necessary. Add dilution buffer (alternatively Standard Buffer) to correct for volume. For example:

Sample volume	Volume dilution buffer
1 µl	19 µl
2 µl	18 µl
5 µl	15 µl
10 µl	10 µl
15 µl	5 µl
20 µl	/

6. Preparation of Reagents and Samples

6.1. Preparation of Reagents

6.1.1. Standard Buffer

STD-BUFF

The Standard Buffer has to be enriched to 0.1 % ascorbic acid prior use: e.g. 50 ml Standard Buffer + 0.5 ml **ASC-ACID 10%**.

The prepared Standard Buffer should be stored frozen at -20 °C and is stable for a minimum of 1 year.

6.1.2. Standard

CAL

The concentration of the standard is 500 ng/ml (= 10.000 pg/sample) serotonin.

Dilute Standard for obtaining working concentrations as follows:

0 / 0,67 / 2 / 6,7 / 20 / 100 pg/sample.

Std 6	100 pg/sample	990 µl Dilution buffer	10 µl CAL
Std 5	20 pg/sample	800 µl Dilution buffer	200 µl Std 6 (100 pg/sample)
Std 4	6.7 pg/sample	933 µl Dilution buffer	67 µl Std 6 (100 pg/sample)
Std 3	2 pg/sample	980 µl Dilution buffer	20 µl Std 6 (100 pg/sample)
Std 2	0.67 pg/sample	993 µl Dilution buffer	6.7 µl Std 6 (100 pg/sample)
Std 1	0 pg/sample	1000 µl Dilution buffer	

Use the same dilution buffer for dilution of standards, sample and for the experiment.

Alternatively, the Standard Buffer can be used for dilution of standards and samples.

All applied buffers must contain 0.1% ascorbic acid (Standard Buffer, too).

Dilution should be done in polypropylene (PP) tubes or polypropylene (PP) microtubes.

The diluted standards have always to be prepared immediately before use. After use they have to be discarded.

6.1.3. Kontrolle 1 & 2

CON 1 & 2

The controls have to be diluted 1:500 prior to use:

dil. control 1 (1:500):	5,000 µl dilution buffer	10 µl Control 1
dil. control 2 (1:500):	5,000 µl dilution buffer	10 µl Control 2

Use the same dilution buffer for controls and standards.

6.1.4. Acylation Buffer

ACYL-BUFF

Dissolve the content with 4 ml distilled water. Add 200 µl of Acylation Buffer concentrate **ACYL-BUFF-CONC**.

Mix shortly and leave on a roll mixer for 30 minutes. Handle carefully in order to minimize foam formation. The reconstituted Acylation Buffer should be stored frozen at -20 °C and is stable until the expiration date printed on the vial label.

6.1.5. Acylation Reagent

ACYL-REAG

Dissolve the content of one bottle in 2.5 ml **Solvent** and shake for 5 minutes on an orbital shaker. The Acylation Reagent has always to be prepared immediately before use. After use the reagent has to be discarded. The kit contains 4 vials allowing for a maximum of 4 assay runs.

Please note that solvent reacts with many plastic materials including plastic trays; solvent does not react with normal pipette tips and with glass devices.

Solvent is volatile and the dissolved Acylation Reagent evaporates quickly. Therefore, please do not use a tray with big surface together with a multichannel pipette for pipetting Acylation Reagent. Rather, use an Eppendorf multipipette (or similar device), fill the syringe directly from the vial with dissolved Acylation Reagent and add well by well.

6.1.6. Wash Buffer

WASH

Dilute the content with distilled water to a total volume of 500 ml.

For further use the diluted wash buffer must be stored at 2 - 8 °C for a maximum period of 4 weeks.

All other reagents are ready for use.

6.2. Preparation of Samples (Acylation)

Allow reagents and samples to reach room temperature.
Determinations in duplicates are recommended.

The wells of the reaction plate for the acylation can be used only once.
Therefore, please mark the respective wells before use.

1. Pipette each **25 µl Acylation Buffer** into the respective wells of the reaction plate.
2. Pipette each **20 µl diluted standard 1 - 6, diluted control 1 & 2 and Sample** into the respective wells.
3. Mix the reaction plate for 10 seconds.
4. Pipette each **10 µl Acylation Reagent** into all wells (colour changed to red) and continue with step 5. **immediately.**
Please note that solvent reacts with many plastic materials including plastic trays; solvent does not react with normal pipette tips and with glass devices.
Solvent is volatile and the dissolved Acylation Reagent evaporates quickly. Therefore, please do not use a tray with big surface together with a multichannel pipette for pipetting Acylation Reagent. Rather, use an Eppendorf multipipette (or similar device), fill the syringe directly from the vial with dissolved Acylation Reagent and well by well.
5. Incubate for 60 minutes at room temperature on an orbital shaker. Avoid direct sunlight.
Do not cover the wells or the plate; leave the plate open on the shaker.
6. Pipette each **25 µl Deactivator** into all wells.
7. Cover the plate with adhesive foil.
Incubate for 3 hours at room temperature on an orbital shaker. Avoid direct sunlight.

Take each 50 µl for the ELISA.

7. Test Procedure ELISA

Allow reagents and samples to reach room temperature.
Determinations in duplicates are recommended.

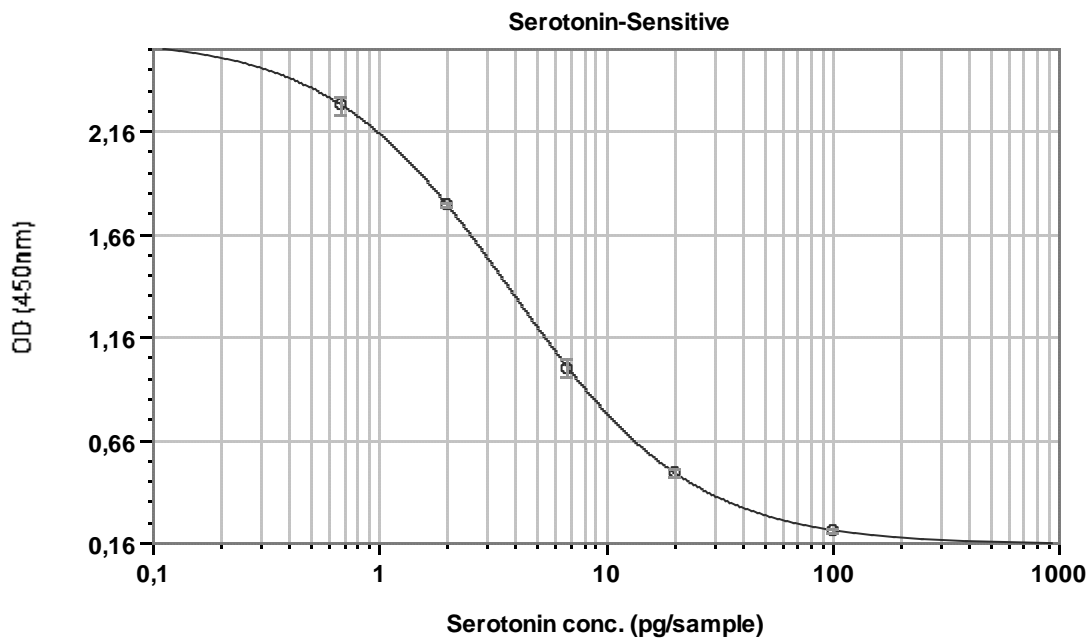
1. Pipette each **50 µl prepared Standards 1 to 6, controls and Samples** into the respective wells of the coated microtiter strips
2. Cover the plate with adhesive foil and incubate for 15 – 20 hours (overnight) at 2-8°C.
3. Discard or aspirate the contents of the wells and wash thoroughly with each **300 µl Wash Buffer**. Repeat the washing procedure 3 to 4 times. Remove residual liquid by tapping the inverted plate on clean absorbent paper.
4. Pipette each **100 µl Enzyme Conjugate** into all wells.
5. Incubate for 60 minutes at room temperature on an orbital shaker.
8. Washing: Repeat step 3.
9. Pipette each **100 µl Substrate** into all wells.
10. Incubate for 20 to 30 minutes at room temperature (20 °C - 25 °C) on an orbital shaker.
11. Pipette each **100 µl Stop Solution** into all wells.
12. Read the optical density at 450 nm (reference wavelength between 570 and 650 nm) in a microplate photometer within 10 minutes.

8. Calculation of the Results

On a semilogarithmic graph paper the concentration of the standards (x-axis, logarithmic) are plotted against their corresponding optical density (y-axis, linear). Alternatively, the optical density of each standard and sample can be related to the optical density of the zero standard, expressed as the ratio OD/OD_{max} , and then plotted on the y-axis.

The concentration of the controls and samples (pg/sample) can be read directly from this standard curve by using their average optical density.

Typical standard curve:



$$y = \left(\frac{A - D}{1 + (x/C)^B} \right) + D$$

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>R²</u>
○ Std (Standards: Concentration vs MeanValue)	2,612	1,089	3,791	0,154	1

9. Assay Characteristics

9.1 Sensitivity

The lower limit of detection was determined by taking the 2fold standard deviation of the absorbance of the Zero Reference and reading the corresponding value from the standard curve.

Sensitivity : 0.39 pg/sample

9.2. Specificity (Cross Reactivity)

Structural related components were tested for possible interference with the antisera against serotonin used in the ELISA method.

Substance	ED-50-Value (ng/ml)	Cross Reactivity (%)
Serotonin	4.3	100
Tryptamine	1,996	0.22
5-Methoxytryptamine	17,083	0.025
5-Hydroxytryptophan	207,551	0.0021
Melatonin	677,434	< 0.001
5-HIAA	> 2,000,000	< 0.001
L-Tryptophan	> 20,000,000	< 0.0001

9.3. Reproducibility

The reproducibility of the ELISA method was investigated by determination of the intra-assay-coefficients of variation (cv) by repeated measurements of two samples with different serotonin concentrations.

Concentrations in ng/ml

Intra-Assay

sample	n	mean value	sd	cv (%)
1	40	4.7	0.41	8.7
2	40	11.9	0.79	6.6

10. Literatur

- Harenberg, J., Huhle, G., Giese, Ch., Wang, L., Feuring, M., Song, X., Hofmann, U.
Determination of serotonin release from platelets by enzyme immunoassay in the diagnosis of heparin-induced thrombocytopenia
British Journal of Hematology, **109**, 182-186 (2000)
- Balaskas, E., Bamihas, G., Karamouzis, M., Voyiatzis, G., Tourkantonis, A.
Histamine and Serotonin in uremic pruritus: effect of ondansetron in CAPD-pruritic patients
Nephron, **78:395-402** (1998)
- Stratz, T., Samborski, W., Hrycaj, P., Pap, T., Mackiewicz, S., Mennet, P., Müller, W.
Die Serotoninkonzentration im Serum bei Patienten mit generalisierter Tendomyopathie (Fibromyalgie) und chronischer Polyarthrit
Medizinische Klinik, **88**, 458-462 (1993)
- Attanasio, A. et al.
Diurnal rhythms of N-acetylserotonin and serotonin
J. Pineal res. **3** (1986), 251 - 256
- Kema, I.P. et al.
Influence of a Serotonin- and Dopamine-Rich Diet on Platelet Serotonin Content and Urinary Excretion of Biogenic Amines and Their Metabolites
Clin. Chem. **38/9** (1992), p.1730 – 1736
- Kema, I.P. et al.
Improved Diagnosis of Carcinoid Tumors by Measurement of Platelet Serotonin
Clin. Chem. **38/4** (1992), p. 534 - 540

Pipetting Scheme Sample Preparation

		Standard	Control	Sample
Acyl. Buffer	μl	25	25	25
Dil. Standard 1- 6	μl	20		
Dil. Control 1 & 2	μl		20	
Sample	μl			20

Shake for 10 seconds

Freshly prepared Acyl. Reagent	μl	10	10	10
-----------------------------------	----	----	----	----

Incubate for 60 minutes at room temperature on an orbital shaker
Do not cover wells or plate, leave the plate open on the shaker
Avoid direct sunlight

Deactivator	μl	25	25	25
-------------	----	----	----	----

Cover plate with adhesive foil
Incubate for 3 hours at room temperature on an orbital shaker.
Avoid direct sunlight

take each 50 μl for the ELISA

Pipetting Scheme ELISA

		Standard	Control	Sample
Standard 1- 6	μl	50		
Control 1 & 2	μl		50	
Sample	μl			50

Cover plate with adhesive foil
Incubate for 15 – 20 hours (overnight) at 2-8°C

3 - 4 x washing

Enzyme Conjugate	μl	100	100	100
------------------	----	-----	-----	-----

60 minutes incubation at room temperature on an orbital shaker

3 - 4 x washing

Substrate	μl	100	100	100
-----------	----	-----	-----	-----

20 - 30 minutes incubation at room temperature on an orbital shaker

Stop Solution	μl	100	100	100
---------------	----	-----	-----	-----

Reading of absorbance at 450 nm