

ELISA Kit Catalog # KMB3441

Mouse **Aβ42**

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PURPOSE

The Mouse $A\beta42$ ELISA is to be used for the quantitative determination of mouse and rat $A\beta42$ in samples (e.g., tissue culture supernatant, tissue homogenate, cerebrospinal fluid [CSF]). This assay was validated using tissue culture supernatant from a Neuro-2a cell culture which releases Mouse $A\beta42$ into the surrounding medium. The assay will recognize both natural and synthetic forms of mouse and rat $A\beta42$. The anti-mouse $A\beta42$ antibody used in this kit is capable of selectively detecting $A\beta42$ and not $A\beta40$ or $A\beta43$.

INTRODUCTION

Alzheimer's Disease (AD) is characterized by the presence of extracellular plaques and intracellular neurofibrillary tangles (NFTs) in the brain. The major protein component of these plaques is beta amyloid peptide (A β), a 40 to 43 amino acid peptide cleaved from amyloid precursor protein by β -secretase (e.g., BACE) and a putative γ (gamma) secretase. Increased release of the 'longer forms' of A β peptide, A β 42 or A β 43, which have a greater tendency to aggregate than A β 40, occurs in individuals expressing certain genetic mutations, expressing certain ApoE alleles, or may involve other, still undiscovered, factors. Many researchers theorize that it is this increased release of A β 42/A β 43 which leads to the abnormal deposition of A β and the associated neurotoxicity in the brains of affected individuals. In patients with AD, reduced levels of A β 42 in CSF have been described as predictive of AD.

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Read entire protocol before use.

PRINCIPLE OF THE METHOD

The Ms $A\beta42$ kit is a solid phase sandwich <u>Enzyme Linked-Immuno-S</u>orbent <u>Assay</u> (ELISA). A monoclonal antibody to the NH₂-terminus of Ms $A\beta$ has been coated onto the wells of the microtiter strips provided. Samples, including standards of known Ms $A\beta42$ content, control specimens and unknowns, are pipetted into these wells. The $A\beta$ antigen binds to the immobilized (capture) antibody. After washing, a rabbit monoclonal antibody* specific for the COOH-terminus of the 1-42 $A\beta$ sequence is added to the wells. Bound rabbit antibody is detected by the use of a horseradish peroxidase-labeled anti-rabbit antibody.

After removal of excess anti-rabbit antibody, a substrate solution is added, which is acted upon by the bound enzyme to produce color. The intensity of this colored product is directly proportional to the concentration of Ms A β 42 present in the original specimen.

^{*}Rabbit monoclonal antibodies produced using technology from Epitomics, Inc. Patent #5675063.

REAGENTS PROVIDED

Note: *Store all unopened reagents at 2 to 8°C.*

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Reagent	Test Kit
Ms Aβ42 Standard. Lyophilized synthetic peptide. Contains	1 vial
0.1% sodium azide. Refer to vial label for quantity and reconstitution volume.	
Standard Diluent Buffer. Contains 0.1% sodium azide; red dye*; 25 mL per bottle.	1 bottle
Antibody Coated Wells, 12 x 8 Well Strips. Plate pre-coated with mAb to NH ₂ terminus of A β .	1 plate
Ms Aβ42 Detection Antibody. Contains 0.1% sodium azide; blue dye*; 11 mL per bottle.	1 bottle
Anti-Rabbit IgG HRP (100X). Contains 3.3 mM thymol; 0.125 mL per vial.	1 vial
HRP Diluent. Contains 3.3 mM thymol; yellow dye*; 25 mL per bottle.	1 bottle
Stabilized Chromogen. Tetramethylbenzidine (TMB); 25 mL per bottle.	1 bottle
Stop Solution; 25 mL per bottle.	1 bottle
Wash Buffer Concentrate (25X); 100 mL per bottle.	1 bottle
Plate Covers, adhesive strips.	2

^{*} In order to help our customers avoid any mistakes in pipetting the reagents, we provide colored *Standard Diluent Buffer*, *Detection Antibody*, and *HRP Diluent* to help monitor the addition of solution to the reaction well. This does not in any way interfere with the test results.

Disposal Note: This kit contains materials with small quantities of sodium azide. Sodium azide reacts with lead and copper plumbing to form explosive metal azides. Upon disposal, flush drains with a large volume of water to prevent azide accumulation. Avoid ingestion and contact with eyes, skin and mucous membranes. In case of contact, rinse affected area with plenty of water. Observe all federal, state and local regulations for disposal.

SUPPLIES REQUIRED BUT NOT PROVIDED

- Standard Reconstitution Buffer (55 mM Sodium Bicarbonate Buffer [NaHCO₃, ultrapure grade], pH 9.0).
- Calibrated adjustable precision pipettes, preferably with disposable plastic tips (a manifold multi-channel pipette is desirable for large assays), beakers and graduated cylinders.
- Reagent reservoirs for dispensing standards, antibody solutions and substrate.
- Plate washer: automated or manual (squirt bottle, manifold dispenser, etc.).
- Distilled or deionized water.
- 6. Microtiter plate reader capable of measurement at or near 450 nm.
- Disposable 12 x 75 mm polypropylene tubes for diluting standards and samples.
- 4-(2-aminoethyl)-benzenesulfonyl fluoride (AEBSF) or protease inhibitor cocktail containing AEBSF.
- 9. Absorbent paper towels.
- 10. Data analysis and graphing software. Graph paper: linear (Cartesian), log-log, or semi-log, as desired.

PROCEDURAL NOTES/LAB QUALITY CONTROL

- 1. When not in use, kit components should be stored at 2 to 8°C. All reagents should be warmed to room temperature before use.
- 2. **Microtiter plates should be allowed to come to room temperature before opening the foil bags.** Once the desired number of strips has been removed, immediately reseal the bag and store at 2 to 8°C to maintain plate integrity.
- 3. Samples should be collected in pyrogen/endotoxin-free polypropylene tubes.
- Samples should be frozen if not analyzed shortly after collection. Avoid multiple freeze-thaw cycles of frozen samples. Thaw completely, microfuge and mix well with diluent prior to analysis.
- 5. When analyzing samples, add a protease inhibitor cocktail with AEBSF (a serine protease inhibitor) and prepare the standard dilutions using the same diluent as used with the biological samples. Serine proteases can rapidly degrade Aβ peptides, thus using AEBSF (water soluble and less toxic than PMSF) at a 1 mM final concentration is very helpful. Keep samples on ice until ready to apply to plate.
- It is recommended that all standards and samples be run in duplicate. We recommend diluting samples 1:2 to 1:10 for Aβ42.
- Samples that are >200 pg/mL should be diluted with Standard Diluent Buffer.

- When pipetting reagents, maintain a consistent order of addition from well-to-well. This ensures equal incubation times for all wells
- Do not mix or interchange different reagent lots from various kit lots.
- 10. Do not use reagents after the kit expiration date.
- 11. Read absorbances within 2 hours of assay completion.
- We recommend covering plate with adhesive plate covers during incubation steps.
- 13. All residual wash liquid must be drained from the wells by efficient aspiration or by decantation followed by tapping the plate forcefully on absorbent paper. *Never* insert absorbent paper directly into the wells.
- 14. Because *Stabilized Chromogen* is light sensitive, avoid prolonged exposure to light. Also avoid contact between *Stabilized Chromogen* and metal, or color may develop.

SAFETY

All blood components and biological materials should be handled as potentially hazardous. Follow universal precautions as established by the Centers for Disease Control and Prevention and by the Occupational Safety and Health Administration when handling and disposing of infectious agents.

DIRECTIONS FOR WASHING

Incomplete washing will adversely affect the test outcome. All washing must be performed with the *Wash Buffer Concentrate (25X)* provided.

Washing can be performed manually as follows: completely aspirate the liquid from all wells by gently lowering an aspiration tip (aspiration device) into the bottom of each well. Take care not to touch the inside of the well.

After aspiration, fill the wells with at least 0.4 mL of diluted wash solution. Let soak for 15 to 30 seconds, then aspirate the liquid. Repeat as directed under **ASSAY METHOD**. After the washing procedure, the plate is inverted and tapped dry on absorbent tissue.

Alternatively, the wash solution may be put into a squirt bottle. If a squirt bottle is used, flood the plate with *Wash Buffer*, completely filling all wells. After the washing procedure, the plate is inverted and tapped dry on absorbent tissue.

If using an automated washer, the operating instructions for washing equipment should be carefully followed. If your automated washer allows, 30 second soak cycles should be programmed into the wash cycle.

REAGENT PREPARATION AND STORAGE

This assay has been calibrated against the mass determination of highly purified native Ms $A\beta42$ where mass was corrected for peptide content by amino acid analysis.

A. Preparation of Standard Reconstitution Buffer

Dissolve 2.31 grams of sodium bicarbonate in 500 mL of deionized water. Add 2 N sodium hydroxide until pH is 9.0. Filter solution through a $0.2~\mu m$ filter unit.

B. Reconstitution and Dilution of Ms A\u00e342 Standard

Note: Polypropylene tubes may be used for standard dilutions.

- Remove the Ms Aβ42 Standard vial from storage and let equilibrate to room temperature (RT). Reconstitute the Ms Aβ42 Standard to 200 ng/mL with Standard Reconstitution Buffer (55 mM sodium bicarbonate, pH 9.0). Refer to the standard vial label for instructions. Swirl or mix gently and allow vial to sit for 10 minutes at room temperature. Briefly vortex prior to preparing standards.
- Add 0.010 mL of the reconstituted standard to a tube containing 0.990 mL Standard Diluent Buffer. Label as 2,000 pg/mL Ms Aβ42. Mix.
- Add 0.300 mL of the 2,000 pg/mL intermediate to 2.7 mL of Standard Diluent Buffer. Label as 200 pg/mL Ms Aβ42.
- 4. Add 0.25 mL of *Standard Diluent Buffer* to each of 6 tubes labeled 100, 50, 25, 12.5, 6.25, 3.12, and 0 pg/mL Ms Aβ42.

Make serial dilutions of the standard as described in the dilution table below. Mix thoroughly between steps.

Standard:	Add:	Into:
200 pg/mL	Prepare by adding 0.300 mL of 2,000 pg/mL standard to 2.7 mL of Diluent Buffer.	
100 pg/mL	0.25 mL of the 200 pg/mL std.	0.25 mL of the Diluent Buffer
50 pg/mL	0.25 mL of the 100 pg/mL std.	0.25 mL of the Diluent Buffer
25 pg/mL	0.25 mL of the 50 pg/mL std.	0.25 mL of the Diluent Buffer
12.5 pg/mL	0.25 mL of the 25 pg/mL std.	0.25 mL of the Diluent Buffer
6.25 pg/mL	0.25 mL of the 12.5 pg/mL std.	0.25 mL of the Diluent Buffer
3.12 pg/mL	0.25 mL of the 6.25 pg/mL std.	0.25 mL of the Diluent Buffer
0 pg/mL	0.25 mL of the Diluent Buffer	An empty tube

Remaining reconstituted Ms A β 42 standard may be stored in aliquots at -80°C for up to 4 months. Standard can be frozen and thawed one time only without loss of immunoreactivity.

C. Preparation of Samples

Prepare one or more dilutions of each sample. These dilutions should be made in *Standard Diluent Buffer*, although the exact dilution must be determined empirically (e.g., 1:2 and 1:10 represent a reasonable range). This dilution must be performed because certain components in samples can interfere with the detection of the A β peptides or to bring the levels of A β within the range of this assay. AEBSF should be added to the diluted samples at a final concentration of 1 mM in order to prevent proteolysis of the A β peptides.

Refer to Appendix for procedure for homogenization of mouse brains.

D. Preparation of Wash Buffer

Allow the *Wash Buffer Concentrate (25X)* to reach room temperature and mix to ensure that any precipitated salts have dissolved. Dilute 1 volume of the *Wash Buffer Concentrate (25X)* with 24 volumes of deionized water (e.g., 100mL may be diluted up to 2.50 liters). Label as Working Wash Buffer.

Store both the concentrate and the Working Wash Buffer at 2 to 8°C. The diluted buffer should be used within 14 days.

E. Preparation of Secondary Antibody Solution

Please Note: The *Anti-Rabbit IgG HRP (100X)* is in 50% glycerol. This solution is viscous. To ensure accurate dilution, allow *Anti-Rabbit IgG HRP (100X)* to reach room temperature. Gently mix. Pipette *Anti-Rabbit IgG HRP (100X)* slowly. Remove excess concentrate solution from pipette tip by gently wiping with clean absorbent paper.

 Dilute 10 μL of this 100X concentrated solution with 1 mL of HRP Diluent for each 8-well strip used in the assay. Label as Anti-rabbit IgG-HRP Working Solution.

For Example:

2. Store the unused Anti-Rabbit IgG HRP (100X) at 2 to 8°C.

# of 8-Well Strips	Volume of Anti-Rabbit IgG HRP (100X)	Volume of HRP Diluent
2	20 μL solution	2 mL
4	40 μL solution	4 mL
6	60 μL solution	6 mL
8	80 μL solution	8 mL
10	100 μL solution	10 mL
12	120 μL solution	12 mL

ASSAY METHOD: PROCEDURE AND CALCULATIONS

Note: The protocol described below has been developed to provide sensitive and reproducible detection of A β 42 peptides. Although the assay uses a standard double antibody ELISA approach combined with colorimetric detection, the inherent complexity in handling/detecting A β peptides must be recognized.

- Determine the number of 8-well strips needed for the assay. Insert these in the frame(s) for current use. (Re-bag extra strips and frame. Store these in the refrigerator for future use.)
- Add 100 μL of the Standard Diluent Buffer to zero wells. Well(s) reserved for chromogen blank should be left empty.
- Add 100 μL of standards, samples or controls to the appropriate microtiter wells. Tap gently on side of plate to thoroughly mix. (See REAGENT PREPARATION AND STORAGE)
- Cover plate with plate cover and incubate for 2 hours at room temperature.
- Thoroughly aspirate or decant solution from wells and discard the liquid. Wash wells 4 times. See DIRECTIONS FOR WASHING.
- Pipette 100 μL of Ms Aβ42 Detection Antibody solution into each well except the chromogen blank(s). This solution will have a blue color. Tap gently on the side of the plate to mix.
- Cover plate with *plate cover* and incubate for 1 hour at room temperature.

- Thoroughly aspirate or decant solution form wells and discard the liquid. Wash wells 4 times. See **DIRECTIONS FOR** WASHING.
- Add 100 μL of Anti-Rabbit IgG HRP Working Solution to each well except the chromogen blank(s). This solution will have a yellow color. (Prepare the working dilution as described in REAGENT PREPARATION AND STORAGE)
- Cover plate with *plate cover* and incubate for 30 minutes at room temperature.
- Thoroughly aspirate or decant solution from wells and discard the liquid. Wash wells 4 times. See DIRECTIONS FOR WASHING.
- 12. Add 100 μ L of *Stabilized Chromogen* to each well. The liquid in the wells will begin to turn blue.
- 13. Incubate for 30 minutes at room temperature and in the dark. *Please Note*: Do not cover the plate with aluminum foil or metalized mylar. The incubation time for chromogen substrate is often determined by the microtiter plate reader used. Many plate readers have the capacity to record a maximum optical density (O.D.) of 2.0. The O.D. values should be monitored and the substrate reaction stopped before the O.D. of the positive wells exceed the limits of the instrument. The O.D. values at 450 nm can only be read after the *Stop Solution* has been added to each well. If using a reader that records only to 2.0 O.D., stopping the assay after 20 to 25 minutes is suggested.

- Add 100 μL of Stop Solution to each well. Tap side of plate gently to mix. The solution in the wells should change from blue to vellow.
- 15. Read the absorbance of each well at 450 nm having blanked the plate reader against a chromogen blank composed of 100 μL each of *Stabilized Chromogen* and *Stop Solution*. Read the plate within 2 hours after adding the *Stop Solution*.
- 16. Plot the absorbance of the standards against the standard concentration. (Optimally, the background absorbance may be subtracted from all data points, including standards, unknowns, and controls, prior to plotting.) Draw the best smooth curve through these points to construct the standard curve. If using curve fitting software, the four parameter algorithm provides the best curve fit
- 17. Read the Ms Aβ42 concentrations for unknown samples and controls from the standard curve plotted in step 16. (Samples producing signals greater than the highest standard (200 pg/mL) should be further diluted in *Standard Diluent Buffer* and reanalyzed, multiplying the concentration found by the appropriate dilution factor.)

TYPICAL DATA

The following data were obtained for the various standards over the range of 0 to 200 pg/mL Ms A β 42.

Standard Ms Aβ42 (pg/mL)	Optical Density (450 nm)
0	0.227
3.12	0.316
6.25	0.367
12.5	0.497
25	0.845
50	1.328
100	2.344
200	3.269

LIMITATIONS OF THE PROCEDURE

Do not extrapolate the standard curve beyond the 200 pg/mL standard point; the dose-response is non-linear in this region and accuracy is difficult to obtain. Dilute samples >200 pg/mL with *Standard Diluent Buffer*; reanalyze these and multiply results by the appropriate dilution factor.

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PERFORMANCE CHARACTERISTICS

SENSITIVITY

The minimum detectable dose of Ms A β 42 is <3 pg/mL. This was determined by adding two standard deviations to the mean absorbance obtained when the zero standard was assayed 30 times.

PRECISION

1. Intra-Assay Precision

Samples of known Ms A β 42 concentrations were assayed in replicates of 12 to determine precision within assays.

	Sample 1	Sample 2	Sample 3
Mean (pg/mL)	103.04	47.55	14.20
SD	5.98	1.40	1.16
%CV	5.80	3.96	8.01

SD = Standard Deviation

CV = Coefficient of Variation

2. Inter-Assay Precision

Samples were assayed 36 times in multiple assays to determine precision between assays.

	Sample 1	Sample 2	Sample 3
Mean (pg/mL)	103.60	51.01	14.70
SD	5.00	3.90	1.30
%CV	4.80	7.60	8.80

SD = Standard Deviation

LINEARITY OF DILUTION

Tissue culture supernatant from a Neuro-2a cell culture was serially diluted in *Standard Diluent Buffer* over the range of the assay and measured for mouse A β 42 content. Linear regression analysis of samples versus the expected concentration yielded a correlation coefficient of 0.99.

Tissue Culture Supernatant			
Dilution	Measured (pg/mL)	Expected (pg/mL)	% Expected
1/2	36.6	36.6	100.0
1/4	13.4	18.3	73.1
1/8	6.17	9.16	67.3
1/16	4.71	4.58	102.9
1/32	1.77	2.29	77.2

RECOVERY

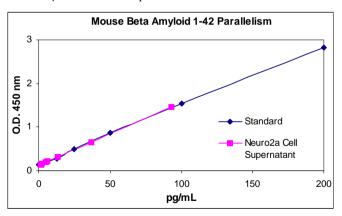
The recovery of mouse A β 42 added to human cerebral spinal fluid (CSF), mouse serum and plasma averaged 125%, 68% and 77%, respectively. The recovery of mouse A β 42 added to tissue culture medium containing 10% fetal calf serum averaged 78%.

SPECIFICITY

Buffered solutions of mouse A β 1-40 (240 ng/mL), human APP (250 ng/mL), human A β (1-40) (100 ng/mL), and human A β (1-42) (100 ng/mL) were assayed with the Mouse β Amyloid 1-42 kit and found to have no cross-reactivity. Only Ms A β 42 was able to be detected in this assay.

PARALLELISM

Natural Ms $A\beta42$ was spiked into *Standard Diluent Buffer* and measured against the standard used in this kit. Parallelism demonstrated by the figure below indicated that the standard accurately reflects $A\beta42$ content in samples.



APPENDIX

β Amyloid Application: Procedure for homogenization of mouse brains

For Tissue Homogenization, Prepare the Following Solutions:

- A. 5 M guanidine HCl 50 mM Tris HCl, pH 8.0
- B. Reaction Buffer BSAT-DPBS (Dulbecco's phosphate buffered saline with 5% BSA and 0.03% Tween-20, see formulation below) supplemented with 1x Protease Inhibitor Cocktail (e.g., Calbiochem catalog code 539131; contains AEBSF, aprotinin, E64, EDTA, and leupeptin).

BSAT-DPBS Formulation

0.2 g/L KCl

0.2 g/L KH₂PO₄

8.0 g/L NaCl

1.150 g/L Na₂HPO₄

5% BSA

0.03% Tween-20

q.s. to 1 L with ultrapure water and adjust the pH to 7.4.

Protocol:

- 1. Determine the wet mass of the mouse or rat hemibrain (100 mg) in an Eppendorf tube (Fisher K749520-0000).
- Add 8x mass of cold 5 M guanidine HCl/50 mM Tris HCl (Solution "A", above) to the tube by 50 - 100 μL aliquots and grind thoroughly with a hand-held motor (Fisher K749540-0000) after each addition. (Optional: transfer the homogenate from above to a 1 mL Dounce homogenizer and homogenize thoroughly.)
- Mix the homogenate at room temperature for 3 4 hours. The sample is stable and can be freeze-thawed many times at this stage.
- 4. Dilute the sample with cold Reaction Buffer (Solution "B", above). Centrifuge (microfuge or Sorvall) at 16,000 x g for 20 minutes at 4°C. This dilution factor requires adjustment depending on the quantity of Aβ present and on inhibition of the standard curve development due to the presence of guanidine. The optimal dilution factor should be determined for each specific experimental determination. (Note: we have determined that the standard curve can withstand the presence of 0.1 M or less guanidine solution. Inclusion of guanidine at a concentration higher than 0.1 M will result in significant depression of the standard curve.)
- Carefully decant the supernatant and store on ice until use with the β Amyloid ELISA kit.

Alternative Procedure:

Homogenization can be performed with cold 4x volume of PBS supplemented with the 1x protease inhibitor cocktail, followed by the addition of a solution of 8.2 M guanidine / 82 mM Tris HCl (pH 8.0) to yield a solution with 5 M final guanidine concentration.

References for Homogenization Procedure:

- Masliah, E., et al. (2001) β-amyloid peptides enhance α-synuclein accumulation and neuronal deficits in a transgenic mouse model linking Alzheimer's disease and Parkinson's disease. Proc. Nat'l. Acad. Sci. 98(21):12245-12250.
- Johnson-Wood, K., et al. (1997) Amyloid precursor protein processing and A beta42 deposition in a transgenic mouse model of Alzheimer disease. Proc. Nat'l. Acad. Sci. 94:1550-1555.
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- Andreasen, N., et al. (1999) Cerebrospinal fluid β-amyloid (1-42) in Alzheimer disease: differences between early- and late-onset Alzheimer disease and stability during the course of disease. *Arch. Neurol.* 56 (6):673-680.

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Explanation of symbols

Explanation of symbols			
Symbol	Description	Symbol	Description
REF	Catalogue Number	LOT	Batch code
RUO	Research Use Only	IVD	In vitro diagnostic medical device
\searrow	Use by	ł	Temperature limitation
***	Manufacturer	EC REP	European Community authorised representative
[-]	Without, does not contain	[+]	With, contains
from Light	Protect from light	Æ	Consult accompanying documents
\prod_i	Directs the user to consult instructions for use (IFU), accompanying the product.		

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Mouse Aβ42 Assay Summary

Incubate 100 μ L Standard and Samples for 2 hours at RT





aspirate and wash 4x

Incubate 100 μ L of Detection Antibody for 1 hour at RT





aspirate and wash 4x

Incubate 100 μ L of HRP Anti-Rabbit Antibody for 30 minutes at RT





aspirate and wash 4x

Incubate 100 µL of Stabilized Chromogen for 30 minutes at RT





Add 100 µL of Stop Solution and read at 450 nm











Detection Antibody