

ab115058 – Histone H3 (pan-methyl K4) Quantification Kit (Colorimetric)

Instructions for Use

For the measurement of global histone H3K4 mono-, di-, and tri-methylation

This product is for research use only and is not intended for diagnostic use.

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1. BACKGROUND

Epigenetic activation or inactivation of genes plays a critical role in many important human diseases, especially in cancer. A major mechanism for epigenetic inactivation of the genes is methylation of CpG islands in genome DNA caused by DNA methyltransferases. Histone methyltransferases (HMTs) control or regulate DNA methylation through chromatin-dependent transcription repression or activation. HMTs transfer 1-3 methyl groups from S-adenosyl-L-methionine to the lysine and arginine residues of histone proteins. SET1, SET7/9, Ash1, ALL-1, MLL, ALR, Trx, and SMYD3 are histone methyltransferases that catalyze methylation of histone H3 at lysine 4 (H3K4) in mammalian cells. H3K4 monomethylation is associated with silenced euchromatin regions in the genome and may serve as a global epigenetic mark and function in gene repression. In contrast, di- and trimethylation is associated with transcriptionally active euchromatin regions in the genome and may serve as a global epigenetic mark of highly transcribed genes. Increased global H3K4 methylation is also found to be involved in some pathological processes such as cancer progression. The patterns of global H3K4 methylation can also be changed by inhibition or activation of HMTs. Thus, quantitative detection of the patterns of global histone H3K4 methylation would provide useful information for better understanding epigenetic regulation of gene activation and for developing HMT-targeted drugs.

ab115058 provides a tool for measuring global mono-, di-, and trimethylation of histone H3K4.

This kit has the following features:

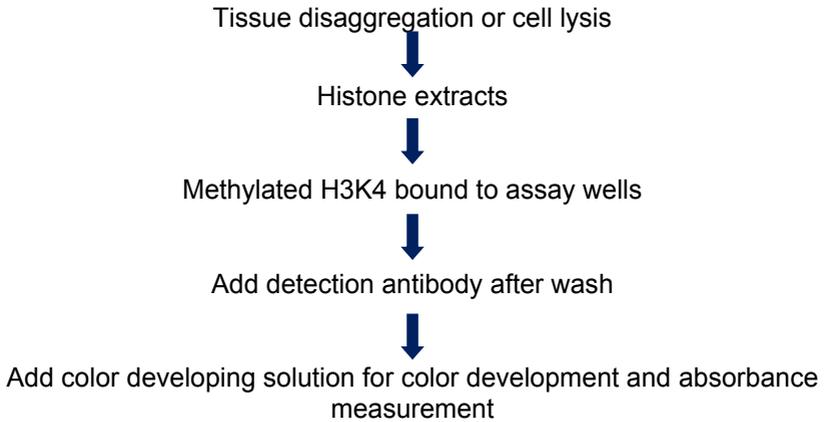
- Quick and efficient procedure, which can be finished within 2.5 hours
- Innovative colorimetric assay without the need for radioactivity, electrophoresis, or chromatography

INTRODUCTION

- Simultaneous quantification of mono-, di-, and tri-methylated H3K4 with the detection limit as low as 2 ng/well and detection range from 20 ng-5 µg/well of histone extracts
- The control is conveniently included for the quantification of the amount of mono-, di-, and tri-methylated H3K4
- Strip microplate format makes the assay flexible: manual or high throughput
- Simple, reliable, and consistent assay conditions

The Histone H3 (pan-methyl K4) Quantification Kit (Colorimetric) is designed for simultaneously measuring global histone H3K4 mono-, di-, and tri-methylation. In an assay with this kit, the methylated histone H3 at lysine 4 is captured to the strip wells coated with antibodies specifically for mono-, di-, and tri-methyl H3K4. The captured mono-, di-, and tri-methylated histone H3K4 can then be detected with a labeled detection antibody, followed by a color development reagent. The ratio of mono-, di-, and tri-methylated H3K4 is proportional to the intensity of absorbance. The absolute amount of methylated H3K4 can be quantified by comparing to the standard control.

2. ASSAY SUMMARY



3. PRECAUTIONS

Please read these instructions carefully prior to beginning the assay.

All kit components have been formulated and quality control tested to function successfully as a kit. Modifications to the kit components or procedures may result in loss of performance.

4. STORAGE AND STABILITY

Store kit as given in the table upon receipt and away from light.

Observe the storage conditions for individual prepared components in sections 9 & 10.

For maximum recovery of the products, centrifuge the original vial prior to opening the cap.

Check if the 10X Wash Buffer and Antibody Buffer contain salt precipitates before use. If so, warm at room temperature or 37°C and shake the buffer until the salts are re-dissolved.

5. MATERIALS SUPPLIED

| Item | Quantity | Storage Condition (Before Preparation) |
|----------------------------------|----------|--|
| 10X Wash Buffer | 20 mL | 4°C |
| Antibody Buffer | 12 mL | 4°C |
| Detection Antibody, 1 mg/mL | 10 µL | -20°C |
| Color Developer | 10 mL | 4°C |
| Stop Solution | 6 mL | 4°C |
| Standard Control, 100 µg/mL | 20 µL | -20°C |
| 8-Well Assay Strip (with Frame) | 9 | 4°C |
| 8-Well Standard Control Strips** | 3 | 4°C |

*These have a green rim around the wells to help with identification.

6. MATERIALS REQUIRED, NOT SUPPLIED

These materials are not included in the kit, but will be required to successfully utilize this assay:

- Orbital shaker
- Pipettes and pipette tips
- Reagent reservoir
- Microplate reader

7. LIMITATIONS

- Assay kit intended for research use only. Not for use in diagnostic procedures
- Do not use kit or components if it has exceeded the expiration date on the kit labels
- Do not mix or substitute reagents or materials from other kit lots or vendors. Kits are QC tested as a set of components and performance cannot be guaranteed if utilized separately or substituted
- Any variation in operator, pipetting technique, washing technique, incubation time or temperature, and kit age can cause variation in binding

8. TECHNICAL HINTS

- Avoid foaming or bubbles when mixing or reconstituting components
- Avoid cross contamination of samples or reagents by changing tips between sample, standard and reagent additions
- Ensure plates are properly sealed or covered during incubation steps
- Complete removal of all solutions and buffers during wash steps
- **This kit is sold based on number of tests. A ‘test’ simply refers to a single assay well. The number of wells that contain sample, control or standard will vary by product. Review the protocol completely to confirm this kit meets your requirements. Please contact our Technical Support staff with any questions**

9. REAGENT PREPARATION

Prepare fresh reagents immediately prior to use.

9.1 **1X Wash Buffer**

Dilute 10X Wash Buffer with distilled water (pH 7.2-7.5) at a 1:10 ratio (e.g. 1 mL of 10X Wash Buffer + 9 mL of water).

9.2 **Diluted Detection Antibody**

Dilute Detection Antibody (at a 1:1000 ratio) to 1 µg/mL with Antibody Buffer.

10. SAMPLE PREPARATION

Prepare histone extracts from cells/tissues treated or untreated by using your own successful method (acid extraction or high salt extraction). For your convenience and the best results, Abcam offers the Histone Extraction Kit (ab113476) optimized for use in Abcam's modified histone quantification series. Alternatively, preparation of histone extracts can also be performed using the procedure below:

10.1 For tissues (treated and untreated), weigh the sample and cut the sample into small pieces (1-2 mm³) with a scalpel or scissors. Transfer tissue pieces to a Dounce homogenizer. Add TEB buffer (PBS containing 0.5% Triton X 100, 2 mM PMSF and 0.02% NaN₃) at 200 mg/mL, and disaggregate tissue pieces by 50-60 strokes. Transfer homogenized mixture to a 15 mL conical tube and centrifuge at 3000 rpm for 5 minutes at 4°C. If total mixture volume is less than 2 mL, transfer mixture to a 2 mL vial and centrifuge at 10,000 rpm for 1 minute at 4°C. Remove supernatant.

For cells (treated and untreated), harvest cells and pellet the cells by centrifugation at 1000 rpm for 5 minutes at 4°C. Resuspend cells in TEB buffer at 10⁷ cells/mL and lyse cells on ice for 10 minutes with gentle stirring. Centrifuge at 3000 rpm for 5 minutes at 4°C. If total volume is less than 2 mL, transfer cell lysates to a 2 mL vial and centrifuge at 10,000 rpm for 1 minute at 4°C. Remove supernatant.

- 10.2 Resuspend cell/tissue pellet in 3 volumes (approx. 200 $\mu\text{L}/10^7$ cells or 200 mg tissues) of extraction buffer (0.5N HCl + 10% glycerol) and incubate on ice for 30 minutes.
- 10.3 Centrifuge at 12,000 rpm for 5 minutes at 4°C and remove the supernatant fraction to a new vial.
- 10.4 Add 8 volumes (approx. 0.6 mL/ 10^7 cells or 200 mg tissues) of acetone and leave at -20°C overnight.
- 10.5 Centrifuge at 12,000 rpm for 5 minutes and air-dry the pellet. Dissolve the pellet in distilled water (30-50 $\mu\text{L}/10^7$ cells or 200 mg tissues).
- 10.6 Quantify the protein concentration. Aliquot the extract and store the extract at -20°C or -80°C.

Histone extracts can be used immediately or stored at -80°C for future use.

11. ASSAY PROCEDURE

- 11.1 Determine the number of strip wells required. Leave these strips in the plate frame (remaining unused strips can be placed back in the bag. Seal the bag tightly and store at 4°C).
- 11.2 Add 50 µL of Antibody Buffer into each well. For the sample, add 1-2 µg of the histone extract into the sample wells. For the standard curve, dilute Standard Control with Antibody Buffer to 1-100 ng/µL at 5-7 points (e.g. 1.5, 3, 6, 12, 25, 50, and 100 ng/µL). Add 1 µL of Standard Control at the different concentrations into the Standard Control Wells (marked with green rims). For the blank, do not add any nuclear extracts or standard control protein. Mix and cover the strip wells with Parafilm M and incubate at room temperature for 1-2 hours.
- 11.3 Aspirate and wash the wells with 150 µL of 1X Wash Buffer three times.
- 11.4 Add 50 µL of diluted Detection Antibody to each well and incubate at room temperature for 60 minutes on an orbital shaker (100 rpm).
- 11.5 Aspirate and wash the wells with 150 µL of 1X Wash Buffer six times.
- 11.6 Add 100 µL of Color Developer into the wells and incubate at room temperature for 2-10 minutes away from light. Monitor the color development in the sample and standard wells (blue).
- 11.7 Add 50 µL of Stop Solution to each well to stop enzyme reaction when the color in the standard wells containing the higher concentrations of standard control turns medium blue. The color should change to yellow and absorbance can be read on a microplate reader at 450 nm within 2-15 minutes.

12. ANALYSIS

Calculate % H3K4 mono-, di- and tri-methylation:

$$\text{Methylation \%} = \frac{\text{Treated (Tested) Sample OD} - \text{Blank OD}}{\text{Untreated (Control) Sample OD} - \text{Blank OD}} \times 100\%$$

For the amount quantification plot OD versus amount of Standard Control and determine the slope as delta OD/ng.

Calculate the amount of methylated H3K4 using the following formula:

$$\text{Amount (ng/mg protein)} = \frac{\text{Sample OD} - \text{Blank OD}}{\text{Protein } (\mu\text{g})^* \times \text{Slope}} \times 1000$$

*Histone extract amount added into the sample well at step 11.2.

13. TROUBLESHOOTING

| Problem | Cause | Solution |
|---|--|---|
| No Signal for Both the Standard Control and the Samples | Reagents are added incorrectly | Check if reagents are added in order and if some steps of the procedure are omitted by mistake |
| | Incubation time and temperature is incorrect | Ensure the incubation time and temperature described in the protocol is followed correctly |
| No Signal or Very Weak Signal for Only the Standard Control | The amount of Standard Control is not added into the standard control wells or is added insufficiently | Ensure a sufficient amount of control is added to the well |
| No Signal for Only the Sample | The protein sample is not properly extracted | Ensure the procedure and reagents are correct for the nuclear protein extraction |
| | The protein amount is added into well insufficiently | Ensure extract contains a sufficient amount of protein |
| | Protein extracts are incorrectly stored | Ensure the protein extracts are stored at -20°C or -80°C |
| High Background Present for the Blank | The well is not washed sufficiently | Check if wash at each step is performed according to the protocol |
| | Contaminated by the Standard control | Ensure the well is not contaminated from adding the control protein or by using control protein contaminated tips |
| | Overdevelopment | Decrease development time in step 11.6 |

14. NOTES

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