

ab156068

**SIRT6 Activity Assay Kit
(Fluorometric)**

Instructions for Use

For the quantitative measurement of SIRT6 activity in cell lysates

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

Table of Contents

1. Background	3
2. Overview	5
3. Principle of the Assay	6
4. Protocol Summary	8
5. Materials Supplied	9
6. Storage and Stability	10
7. Materials Required, Not Supplied	11
8. Assay Protocol	12
9. Data Analysis	20
10. Sample Preparation	23
11. Troubleshooting	25

1. Background

Sir2 is a conserved protein and was recently shown to regulate lifespan extension both in budding yeast and nematode. In 2000, it was reported that the yeast Sir2 protein is a NAD(+)-dependent histone deacetylase that plays a critical role in transcriptional silencing, genome stability and longevity. In mammals, the homologs of Sir2 have been named Sirtuins (SIRTs), with seven members in a family termed SIRT1 through SIRT7. They share a conserved central deacetylase domain but have different N- and C termini and display distinct subcellular localization, suggesting different biological functions.

The distant mammalian Sir2 homolog SIRT6 is a broadly expressed, predominantly nuclear protein like SIRT1. Inactivation of the Sirt6 gene in mice leads to dramatically shortened life span and a premature aging-like phenotype. It was shown that SIRT6 is a histone H3 lysine 9 deacetylase, and identified a role for SIRT6 activity at telomeric chromatin, where it prevents telomere dysfunction in human cells. In addition, SIRT6 also deacetylates histone H3 acetylated lysine 56 in vivo to promote genomic stability. In term of function, SIRT6 binds to the NF- κ B subunit RELA and attenuates NF- κ B signaling by modifying chromatin at NF- κ B target genes. Thus SIRT6-mediated control of NF- κ B prevents aging-associated, hyperactive NF- κ B-dependent gene expression, and inhibition of NF- κ B can rescue the early lethality of Sirt6 knockout

mice. Overexpression of wild-type Sirt6, but not the catalytically inactive form, consistently resulted in increased tumor necrosis factor protein production relative to its mRNA levels.

The conventional method for measuring SIRT6 activity is very complicated and laborious. In order to measure SIRT6 enzyme activity, it is necessary to prepare radioactive acetylated histone H3 as a substrate. First, cells have to be labeled metabolically with radioactivity by adding radioactive acetic acid to the culture medium. Second, radioactive acetylated histone has to be purified from the cells. Following the reaction, it is necessary to extract and separate the radioactive acetyl group, which has been released from acetylated histone, using ethyl acetate to measure the activity of the enzyme based on the radioactivity.

Although a method for measuring the activity of deacetylase without the use of radioactive substances was reported in recent years, owing to the use of fluorescent-labeled acetylated lysine as a substrate, the reaction product must be separated from the intact substrate and the fluorescent intensity measured by reverse phase HPLC. As mentioned above, these measurement systems are difficult to adapt for processing many samples under a variety of conditions, because of their complicated operation. Thus a simple system for biochemical analysis as well as for inhibitor screening without the use of radioactive substances is preferred.

2. Overview

Abcam's SIRT6 Activity Assay Kit (Fluorometric) (ab156068) detects deacetylase activity of recombinant SIRT6.

Primarily, the SIRT6 Activity Assay Kit (Fluorometric) is designed for the rapid and sensitive evaluation of SIRT6 inhibitors or activators using recombinant SIRT6 or purified SIRT6.

Applications for this kit include:

- 1) Screening inhibitors or activators of SIRT6.
- 2) Detecting the effects of pharmacological agents on SIRT6.

3. Principle of the Assay

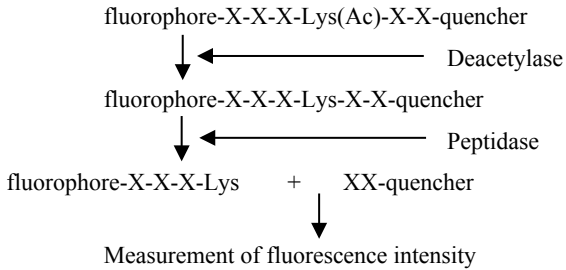
Abcam's SIRT6 Activity Assay Kit (Fluorometric) measures the activity of SIRT6 by the basic principle of changing a SIRT6 reaction into the activity of the peptidase. In order to measure the enzyme activity of SIRT6, which is the NAD dependent Histone deacetylase, and its homolog, this kit is designed so that the activity of NAD dependent Histone deacetylase can be measured under existence of Trichostatin A, which is the powerful inhibitor of HDACs.

In this kit, fluorophore and quencher are coupled to amino terminal and carboxyl terminal of substrate peptide, respectively, and before reaction of deacetylase, the fluorescence cannot be emitted. However, if SIRT6 performs deacetylation, substrate peptide will become cut by the action of peptidase added simultaneously, quencher will separate from fluorophore, and fluorescence will be emitted. Deacetylase enzyme activity is measured by measuring this fluorescence intensity.

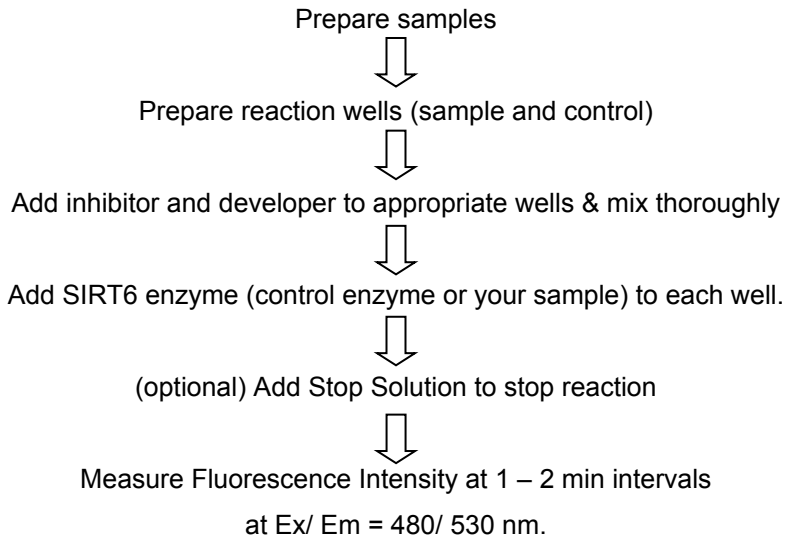
Since it is very simple to measure and it can be performed at a low price, the measurement of SIRT6 activity in most laboratories is possible if they are equipped with a fluorescent reader for microtiter plates. Considering that the use of fully automatic apparatus to measure fluorescence intensity has become widespread, SIRT6 activity measurement, which could not be made by the conventional method, is now possible with the SIRT6 Activity Assay Kit

(Fluorometric) using the same equipment. This new method of measurement should dramatically raise the efficiency of inhibitor screening and biochemical analysis of these enzymes.

Assay Principle:



4. Protocol Summary



5. Materials Supplied

Item	Identifier	Quantity	Storage
SIRT6 Assay Buffer	#1	2 x 1 mL	-20°C
Fluoro-Substrate Peptide (0.1 mM)	#2	1 x 500 µL	-20°C
Fluoro-Deacetylated Peptide (0.1 mM)	#3	1 x 100 µL	-20°C
NAD (8 mM)	#4	1 x 500 µL	-20°C
Developer	#5	1 x 500 µL	-80°C
Recombinant SIRT6	#6	1 x 500 µL	-80°C
Stop Solution	#7	2 x 1 mL	-20°C

6. Storage and Stability

All reagents included in this kit have been tested for stability. Reagents should not be used beyond the stated expiration date. Upon receipt, store the Developer and Recombinant SIRT6 at -80°C , all other kit reagents should be stored below -20°C .

- Thaw Fluoro-Substrate Peptide and Fluoro-Deacetylated Peptide at room temperature before use. Then, thaw the other reagents in ice and use after they are completely thawed.
- Avoid repeated freezing and thawing of Recombinant SIRT6. There is a possibility that the enzyme activity may be inactivated. Aliquot to 10-20 μL and store at -80°C .
- Avoid mixing of protease/peptidase inhibitors such as PMSF, or alkyl amine in samples that will be measured SIRT6 activity.

7. Materials Required, Not Supplied

- 96 well plate – black wells
- MilliQ water or other type of double distilled water (ddH₂O)
- Microcentrifuge
- Pipettes and pipette tips
- Microplate reader capable of measuring fluorescence at Ex/Em = 480-500/520-540 nm
- Orbital shaker

8. Assay Protocol

Abcam's SIRT6 Activity Assay Kit (Fluorometric) can measure the enzyme activity of SIRT6 with a homogeneous method. In this method, the reaction is initiated and the fluorescence intensity is measured by mixing simultaneously fluorescence-labeled acetylated peptide, which is a substrate, SIRT6, NAD and the developer. Since the reaction is not stopped, it is necessary to measure fluorescence intensity at regular intervals after the reaction is initiated, and to determine reaction velocity. Alternatively, within a time in which the reaction velocity is kept constant, it is also possible to stop the reaction by adding stop solution and to measure fluorescence intensity.

1. Assay for Quantification of SIRT6 Activity

- Following the table below and **in duplicate**, add ddH₂O, #1. SIRT6 Assay Buffer, #2. Fluoro-Substrate Peptide and #4. NAD to microtiter plate wells.
- Add #5. Developer to each well of the microtiter plate and mix well.

Assay reagents	Test sample	No enzyme control	No Test Sample control	No NAD control
ddH ₂ O	25 µL	25 µL	25 µL	30 µL
#1. SIRT6 Assay Buffer	5 µL	5 µL	5 µL	5 µL
#2. Fluoro-Substrate Peptide	5 µL	5 µL	5 µL	5 µL
#4. NAD	5 µL	5 µL	5 µL	-
#5. Developer	5 µL	5 µL	5 µL	5 µL
Enzyme Sample	5 µL	-	-	5 µL
Buffer of Enzyme Sample ⁽¹⁾	-	5 µL	-	-
#6. Recombinant SIRT6	-	-	5 µL	-
Total volume	50 µL	50 µL	50 µL	50 µL

(1) More information on Sample preparation in section 10

- Initiate reactions by adding 5 µL of your Enzyme Sample or Buffer of Enzyme Sample or #6. Recombinant SIRT6 to each well and mixing thoroughly at room temperature.

NOTE: Although the volume of addition of Enzyme Sample or Buffer of Enzyme Sample or #6. Recombinant SIRT6 is set to 5 μL in the previous table, it may be changed to a volume up to 20 μL at your discretion. In that case, please reduce the volume of Distilled water to set the final reaction volume of 50 μL .

4. Read fluorescence intensity for 30 to 60 minutes at 1 to 2 minute intervals using microtiter plate fluorometer with excitation at 480-500 nm and emission at 520-540 nm. Measure and calculate the rate of reaction while the reaction velocity remains constant.

Alternative procedure

1. Follow procedure described above till step 4.
2. While the reaction rate is kept constant, add 20 μL of #7. Stop Solution to each well at appropriate time to stop the reaction, and measure fluorescence intensity in a microplate fluorescence reader capable of excitation at a wavelength in the range 480-500 nm and detection of emitted light in the range 520-540 nm.

NOTE:

- During the time in which SIRT6 reaction rate is maintained, the difference in fluorescence intensity between Enzyme Sample Assay and No Enzyme Control Assay indicates the SIRT6 activity of your Enzyme Sample.
- If enzyme samples contain some protease/peptidase able to break down #2. Fluoro-Substrate Peptide, resulting in an increase of fluorescence intensity in No NAD Control Assay, the SIRT6 activity in the samples cannot be evaluated correctly.
- If enzyme samples contain inhibitors for protease/peptidase, precise SIRT6 enzyme activity cannot be measured. Since protease/peptidase inhibitors used in the usual protein purification process strongly inhibit the peptidase activity in the development reaction, please avoid using any protease/peptidase inhibitors during the process of protein purification.
- If enzyme samples have an inhibitory effect on the peptidase in the development reaction, the final fluorescence intensity will not increase. Please use #3. Fluoro-Deacetylated Peptide instead of #2. Fluoro-Substrate Peptide, and conduct a control experiment.

2. Assay for SIRT6 Inhibitor/Activator Screening

1. Following the table on the next page and **in duplicate**, add ddH₂O, #1. SIRT6 Assay Buffer, #2. Fluoro-Substrate Peptide or #3. Fluoro-Deacetylated Peptide and #4. NAD to microtiter plate wells.
2. Add Test Compound (inhibitor compound to test) or just the Solvent in which compound is dissolved (control) or Control Compound (not provided) to each well of the microtiter plate and mix.
3. Add #5. Developer to each well of the microtiter plate and mix well.
4. Initiate reactions by adding 5 μ L of your of #6. Recombinant SIRT6 or your Enzyme Sample to each well and mix thoroughly at RT.

NOTE: Although the volume of addition of Recombinant SIRT6 or your Enzyme Sample is set to 5 μ L in above tables, it may be changed to a volume up to 20 μ L at your discretion. In that case, please reduce the volume of ddH₂O to set the final reaction volume of 50 μ L.

5. Read fluorescence intensity for 30 to 60 minutes at 1 to 2 minute intervals using microtiter plate fluorometer with excitation at 480-500 nm and emission at 520-540 nm. Measure and calculate the rate of reaction while the reaction velocity remains constant.

Assay reagents	Test Compound Assay	Solvent Control Assay	Control Compound Assay	No Enzyme Control Assay	Development Control Assay
ddH₂O	20 µL	20 µL	20 µL	25 µL	30 µL
#1. SIRT6 Assay Buffer	5 µL	5 µL	5 µL	5 µL	5 µL
#2. Fluoro-Substrate Peptide	5 µL	5 µL	5 µL	5 µL	-
#3. Fluoro-Deacetylated Peptide	-	-	-	-	5 µL
#4. NAD	5 µL	5 µL	5 µL	5 µL	-
Test Compound	5 µL	-	-	-	5 µL
Solvent of Test Compound	-	5 µL	-	5 µL	-
Control Compound (not provided)	-	-	5 µL	-	-
#5. Developer	5 µL	5 µL	5 µL	5 µL	5 µL
#6. Recombinant SIRT6 (or Enzyme Sample)	5 µL	5 µL	5 µL	-	-
Total volume	50 µL	50 µL	50 µL	50 µL	50 µL

(1)More information on Sample preparation in section 10

Alternative procedure

1. Follow procedure described above till step 4.
2. While the reaction rate is kept constant, add 20 μL of #7. Stop Solution to each well at appropriate time to stop the reaction, and measure fluorescence intensity in a microplate fluorescence reader capable of excitation at a wavelength in the range 480-500 nm and detection of emitted light in the range 520-540 nm.

NOTE:

- Although the above tables indicate the volume of addition of Test Compound or Solvent of Test Compound or Control Compound (not provided) as 5 μL , the concentration and the volume of the reagents to add can be changed so that the concentration of test compounds becomes the setting concentration. For example, since the final volume of reaction is 50 μL here, it is also possible to add 10 μL of Test Compound or Solvent of Test Compound or Control Compound (not provided). In this case, please reduce the volume of Distilled water to set the final reaction volume of 50 μL .
- During the time in which SIRT6 reaction rate is maintained, the difference in fluorescence intensity between Solvent Control Assay and No Enzyme Control Assay indicates the SIRT6 activity.

- In order to estimate the active or inhibitory effect on SIRT6 activity by the test compounds correctly, it is necessary to conduct the control experiment of Solvent Control Assay at least once for every experiment and Control Compound Assay at least once for the first experiment, in addition to Test Compound Assay as indicated in the Table.2. When test compounds cause an active or inhibitory effect on SIRT6 activity, the level of increase of fluorescence intensity is strengthened or weakened as compared with Solvent Control Assay.
- The efficacy of the test compounds on the SIRT6 activity is the difference in fluorescence intensity between Test Compound Assay minus No Enzyme Control Assay and Solvent Control Assay minus No Enzyme Control Assay.
- If test compounds have an inhibitory effect on protease/peptidase, resulting that the increase in fluorescence intensity is not or a little observed in Development Control Assay, the effect on SIRT6 activity cannot be evaluated correctly.

9. Data Analysis

1. Typical Results

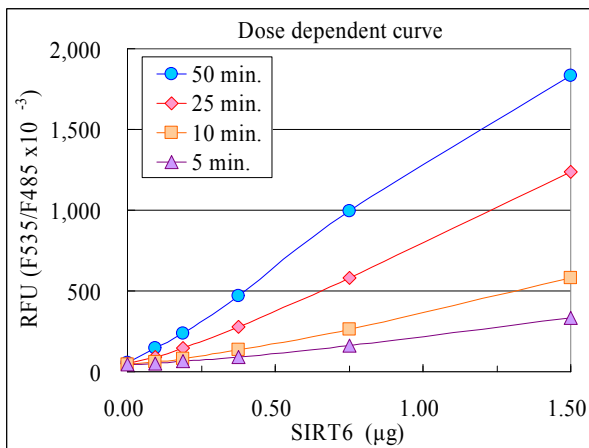


Figure 1: Dose dependency curve of recombinant SIRT6 activity

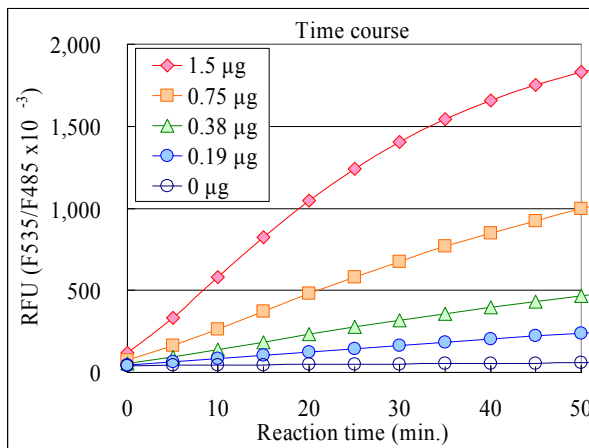


Figure 2: Time course of SIRT6-substrate deacetylation by recombinant SIRT6

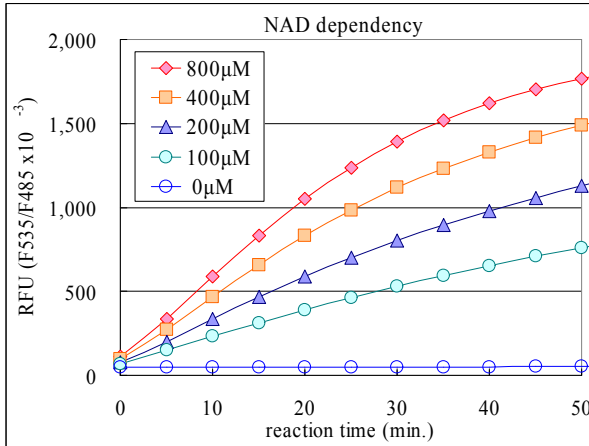


Figure 3: NAD dependency of recombinant SIRT6 activity

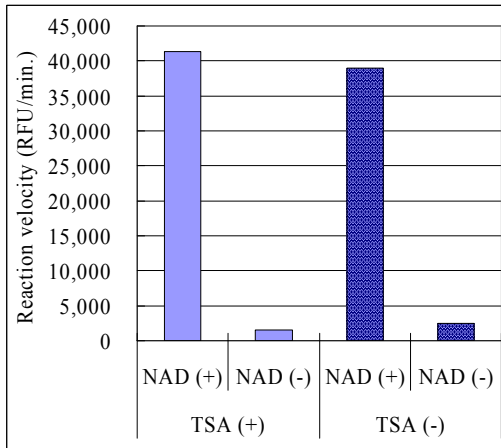


Figure 4: Effect of Trichostatin A and NAD on recombinant SIRT6 activity

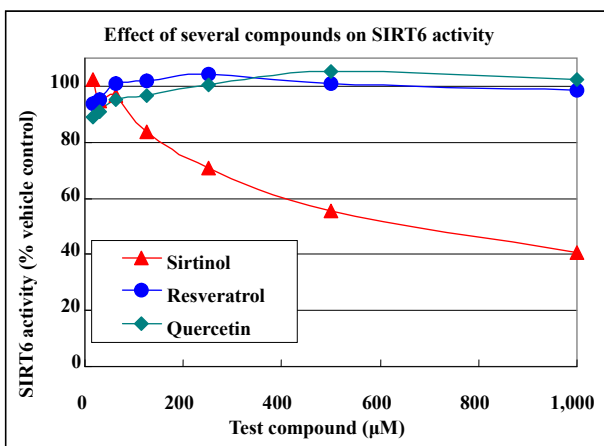


Figure 5: Effect of several compounds on recombinant SIRT6 activity

10. Sample Preparation

Numerous extraction and purification methods can be used to isolate SIRT6. The following protocols have been shown to work with a number of different cells and enzyme sources and are provided as examples of suitable methods. Crude samples can frequently be used without dilution while more concentrated or highly purified SIRT6 should be diluted.

It is strongly advised that the user always perform an initial experiment to determine the proper dilution to be used in subsequent experiments. This need not be any more than a single time point assay using serial dilutions of the crude extract, cell lysate or sample fraction taken prior to a purification step. All sample preparation should be performed at 4°C and recovered fractions should be kept at -80°C to prevent loss of enzymatic activity.

A. Buffer Preparation

Lysis Buffer	Sucrose Cushion	Extraction Buffer
10 mM Tris HCl (pH 7.5) 10 mM NaCl 15 mM MgCl ₂ 250 mM Sucrose 0.5 % NP-40 0.1 mM EGTA	30 % Sucrose 10 mM Tris HCl (pH 7.5) 10 mM NaCl 3 mM MgCl ₂	50 mM Hepes KOH (pH 7.5) 420 mM NaCl 0.5 mM EDTA Na ₂ 0.1 mM EGTA 10 % glycerol

B. Isolation of Nuclei

1. Resuspend 1×10^7 cells into 1 mL of lysis buffer.
2. Vortex for 10 second.
3. Keep on ice for 15 min.
4. Spin the cells through 4 ml of sucrose cushion at $1,300 \times g$ for 10 min at $+4^\circ\text{C}$.
5. Discard the supernatant.
6. Wash the nuclei pellet once with cold 10 mM Tris HCl (pH7.5), 10 mM NaCl.

C. Extraction of Nuclei

1. Resuspend the isolated nuclei in 50-100 μL of extraction buffer.
2. Sonicate for 30 seconds.
3. Stand on ice for 30 min.
4. Centrifuge at $20,000 \times g$ for 10 min.
5. Take supernatant (the crude nuclear extract).
6. Determine protein concentration by Bradford method or equivalent.
7. Store the crude nuclear extract at -80°C until use.

11. Troubleshooting

- When chemicals that have an inhibitory effect on the peptidase are mixed in a crude SIRT6 fraction purified from various cells or the immunoprecipitate using a specific antibody against SIRT6 or other proteins, precise SIRT6 enzyme activity cannot be measured. Since the protease/peptidase inhibitors used in the usual protein purification process inhibit the peptidase activity strongly, please avoid the use of any protease/peptidase inhibitors during the protein purification process.
- Final fluorescence intensity will not increase, both when test chemicals have an inhibitory effect on SIRT6, and also when there is an inhibitory effect on the peptidase.
- If the test reagents themselves emit fluorescence at excitation wavelength: 480-500 nm and fluorescence wavelength: 520-540 nm, the inhibitory effect of the test assay cannot be evaluated correctly.
- The recombinant SIRT6 should be run in duplicate, using the protocol described in the Assay Protocol. Incubation times or temperatures significantly different from those specified may give erroneous results.

- The reaction curve is nearly a straight line if the kinetics of the assay is of the first order. Variations in the protocol can lead to non-linearity of the curve, as can assay kinetics that are other than first order. For a non-linear curve, point to point or quadratic curve fit methods should be used.
- Poor duplicates indicate inaccurate dispensing. If all instructions in the Assay Protocol were followed accurately, such results indicate a need for multi-channel pipettor maintenance.

Technical Support

Copyright © 2021 Abcam. All Rights Reserved. The Abcam logo is a registered trademark. All information / detail is correct at time of going to print.

For all technical or commercial enquiries please go to:

www.abcam.com/contactus

www.abcam.cn/contactus (China)

www.abcam.co.jp/contactus (Japan)