MitoCheck® Complex II Activity Assay Kit

Item No. 700940

Customer Service 800.364.9897 * **Technical Support** 888.526.5351

www.caymanchem.com

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Materials Supplied

Kit will arrive packaged as a -80°C kit. For best results, remove components and store as stated below.

Item Number	Item	Quantity/Size	Storage
700941	Mitochondrial Complex II Activity Assay Buffer	2 vials/10 ml	-20°C
700018	Ubiquinone Assay Reagent	1 vial/100 µl	-80°C
700942	DCPIP Assay Reagent	1 vial/700 µg	-20°C
700019	Bovine Heart Mitochondria Assay Reagent	1 vial/100 µl	-80°C
700021	Succinate Assay Reagent	1 vial/100 µl	-20°C
700020	Half Volume 96-Well Clear Plate	1 plate	Room temperature

If any of the items listed above are damaged or missing, please contact our Customer Service department at (800) 364-9897 or (734) 971-3335. We cannot accept any returns without prior authorization.

WARNING: This product is for laboratory research use only: not for administration to humans. Not for human or veterinary diagnostic or therapeutic use.

Precautions

Please read these instructions carefully before beginning this assay.

For research use only. Not for human or diagnostic use.

NOTE: It is recommended that gloves be worn at all time when working with isolated mitochondria and mitochondrial inhibitors.

If You Have Problems

Technical Service Contact Information

Phone: 888-526-5351 (USA and Canada only) or 734-975-3888

Fax: 734-971-3641

Email: techserv@caymanchem.com

Hours: M-F 8:00 AM to 5:30 PM EST

In order for our staff to assist you quickly and efficiently, please be ready to supply the lot number of the kit (found on the outside of the box).

Storage and Stability

This kit will perform as specified if stored as directed in the **Materials Supplied** section on page 3 and used before the expiration date indicated on the outside of the box.

Materials Needed But Not Supplied

1. A plate reader capable of measuring absorbance a 600 nm at 30 second intervals
2. Adjustable and multichannel pipettes
3. A source of pure water; glass distilled water or HPLC-grade water is acceptable
4. Mitochondrial Inhibitors - Rotenone, TTFA, Potassium Cyanide, or Antimycin A
5. 0.1 M NaOH

INTRODUCTION

Background

Complex II (succinate dehydrogenase/co-enzyme Q reductase) is one of the major sites of electron entry into the mitochondrial electron transport chain (ETC). Complex II catalyzes the oxidation of succinate to fumarate, and in the process reduces ubiquinone (Q) to ubiquinol (QH_2).[1] Ultimately, oxidation of succinate will lead to reduction of O_2, the terminal step in mitochondrial respiration. In addition to the implied mitochondrial dysfunction, inhibition of complex II has also been linked to oncogenesis.[2-4] This assay is designed so that direct inhibitory effects on complex II can be observed. Activity of succinate dehydrogenase can be inhibited using atpenin A5, TTFA, and malonate.

About This Assay

Cayman's MitoCheck® Complex II Activity Assay allows for the activity of complex II to be determined without the need to isolate mitochondria or pre-incubate with antibodies. As complex II oxidizes succinate, electrons are passed to an analog of ubiquinone and then on to DCPIP, which, when oxidized, absorbs in the 600 nm range. The absorbance of DCPIP will decrease upon reduction. Complex II activity is measured as a decrease in absorbance at 600 nm over time. To prevent interference from other ETC complexes, rotenone (1 µM), antimycin A (10 µM), and potassium cyanide (2 mM) are present as inhibitors (not supplied). For the use of this kit with other types of tissue mitochondria, please see Cayman's MitoCheck® Mitochondrial (Tissue) Isolation Kit (Item No. 701010).

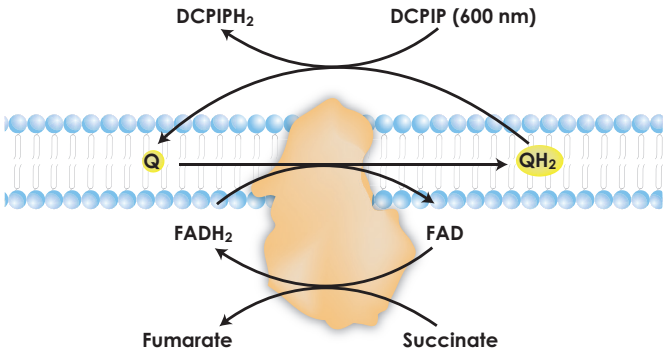


Figure 1. Reaction catalyzed by Complex II as measured by this assay kit.

PRE-ASSAY PREPARATION

Reagent Preparation

All assay reagents, unless listed below, are ready to use as supplied.

1. Mitochondrial Complex II Activity Assay Buffer - (Item No. 700941)

This buffer is ready to use as supplied. It is important that the buffer is warmed to room temperature prior to use. Additionally, vortex well to be sure that any crystals that may have precipitated have dissolved.

2. Mitochondrial Inhibitors - *(Not Supplied)*

1. **Potassium Cyanide (KCN)** - KCN should be present to inhibit the ETC (complex IV) and prevent the oxidation of Q. It is important **that extreme care is taken when preparing and using KCN**. Protocol: In a **ventilated hood**, weigh out 6.5 mg of KCN and dissolve in 1 ml of 0.1 M NaOH to yield a 100 mM stock solution of KCN. **Do not use water or any acidic solvents to make up KCN.** Store stock solution on ice and make fresh less than three hours prior to running this assay. Use appropriate personal protective equipment (PPE).
2. **Rotenone (Item No. 13995)** - to ensure inhibition of complex I, use concentrations ≥1 µM. Rotenone can be made up in DMSO or ethanol. If making up in DMSO, avoid freeze/thaws. Use appropriate PPE.
3. **Antimycin A** - to ensure inhibition of complex III, use concentrations ≥10 µM. Can be made up in DMSO or ethanol. Use appropriate PPE.
4. **2-Thenoyltrifluoroacetone (TTFA)** - to ensure inhibition of complex II, use concentrations ≥1 mM. TTFA can be made up in DMSO or ethanol. Use appropriate PPE.

ASSAY PROTOCOL

Pipetting Hints

- Use different tips to pipette each reagent.
- Avoid introducing bubbles into the well.
- Do not expose the pipette tip to the reagent(s) already in the well.

General Information

- The final volume of the assay is 100 µl in all wells.
- It is not necessary to use all the wells on the plate at one time.
- It is recommended that the samples be assayed at least in duplicate (triplicates preferred).
- The assay is performed in the kinetic read mode at 25°C.
- Monitor the absorbance at 600 nm every 30 seconds for 15 minutes.

Performing the Assay

Label two polystyrene tubes as A and B and add the following reagents. *Isolated mitochondria can settle over time, so make sure contents of each tube are well mixed. Store tubes on ice until ready to use. Volumes indicated below are suitable for 20 reactions (or wells). Customer may scale volumes as needed.*

Tube A (1 ml)	Tube B (675 µl)
956 µl of Complex II Assay Buffer	487 µl of Complex II Assay Buffer
20 µl Bovine Heart Mitochondria Assay Regent	8 µl of Succinate Assay Regent
2 µl of 1 mM Rotenone *not supplied*	20 µl of Ubiquinone Assay Reagent
20 µl of 100 mM KCN (1 mM) *not supplied*	160 µl of DCPIP Assay Reagent
2 µl of 10 mM Antimycin A *not supplied*	

Table 1. Assay preparation

All assays are carried out at 25°C.

1. Add 50 µl of the contents of tube A to each well.
2. Add 20 µl of test compound, positive control, or vehicle to each well. Allow for pre-incubation if required.
3. Add 30 µl of the contents of tube B to each well.
4. Incubate five minutes at 25°C, then place plate in plate reader and measure absorbance at 600 nm (30 second intervals for 15 minutes at 25°C).

ANALYSIS

Calculations

1. Plot data as absorbance (y-axis) *versus* time (x-axis).
2. To determine the reaction rate, calculate the slope for the linear portion of the curve.
3. Determine % activity relative to the vehicle control using the equation indicated below.
4. To determine an IC_{50} value for each compound, plot the slope as a function of test compound concentration.

$$\text{Complex II Activity (\%)} = \left[\frac{\text{Rate of Sample wells}}{\text{Rate of Vehicle Control}}\right] \times 100$$

Performance Characteristics

The data shown below are an example of data obtained with this kit. Your results will not be identical to these.

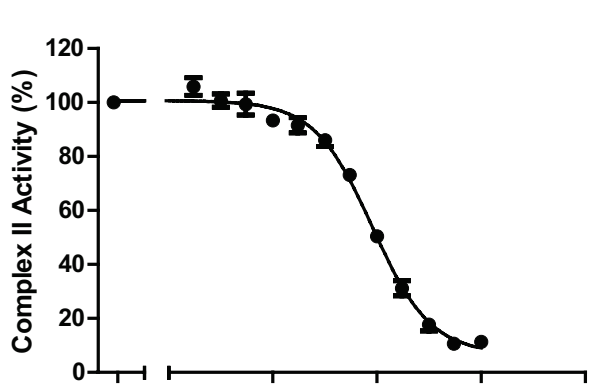


Figure 3. A typical concentration response curve for inhibition of complex II activity by TTFA (IC_{50} = 81 µM). "Veh." represents compound vehicle control.

RESOURCES

Troubleshooting

Problem	Possible Causes	Recommended Solutions
Erratic values; dispersion of duplicates/triplicates	A. Poor pipetting/technique B. Bubble in the well(s) C. Poor test compound solubility	A. Be careful not to splash the contents of the wells B. Carefully tap the side of the plate with your finger to remove bubbles C. Test solubility with assay buffer
No activity was detected in test compound wells	Test compound is a potent inhibitor	Check vehicle controls to be sure complex II is active
Test compound absorbance is above saturating positive control (*i.e.*, TTFA) absorbance	Test compound absorbs at 600 nM	Determine absorbance of compounds in the absence of DCPIP; subtract this value from all wells containing test compound

References

1. Hederstedt, L. and Rutberg, L. Succinate dehydrogenase-A comparative review. *Microbiol. Rev.* **45(4)**, 542-555 (1981).
2. Selak, M.A., Armour, S.M., MacKenzie, E.D., *et al.* Succinate links TCA cycle dysfunction to oncogenesis by inhibiting HIF-α prolyl hydroxylase. *Cancer Cell.* **7(1)**, 77-85 (2005).
3. Pollard, P.J., Wortham, N.C., and Tomlinson, I.P. The TCA cycle and tumorigenesis: The examples of fumarate hydratase and succinate dehydrogenase. *Ann. Med.* **35(8)**, 632-639 (2003).
4. King, A., Selak, M.A., and Gottlieb, E. Succinate dehydrogenase and fumarate hydratase: Linking mitochondrial dysfunction and cancer. *Oncogene* **25(34)**, 4675-4682 (2006).

Related Products

Aconitase Assay Kit - Item No. 705502
JC-1 Mitochondrial Membrane Potential Assay Kit - Item No. 10009172
MitoCheck® Citrate Synthase Activity Assay Kit - Item No. 701040
MitoCheck® Complex I Activity Assay Kit - Item No. 700930
MitoCheck® Complex II/III Activity Assay Kit - Item No. 700950
MitoCheck® Complex IV Activity Assay Kit - Item No. 700990
MitoCheck® Complex V Activity Assay Kit - Item No. 701000
MitoCheck® Mitochondrial (Tissue) Isolation Kit - Item No. 701010
Oxygen Consumption Rate Assay Kit (MitoXpress®-Xtra HS Method) - Item No. 600800

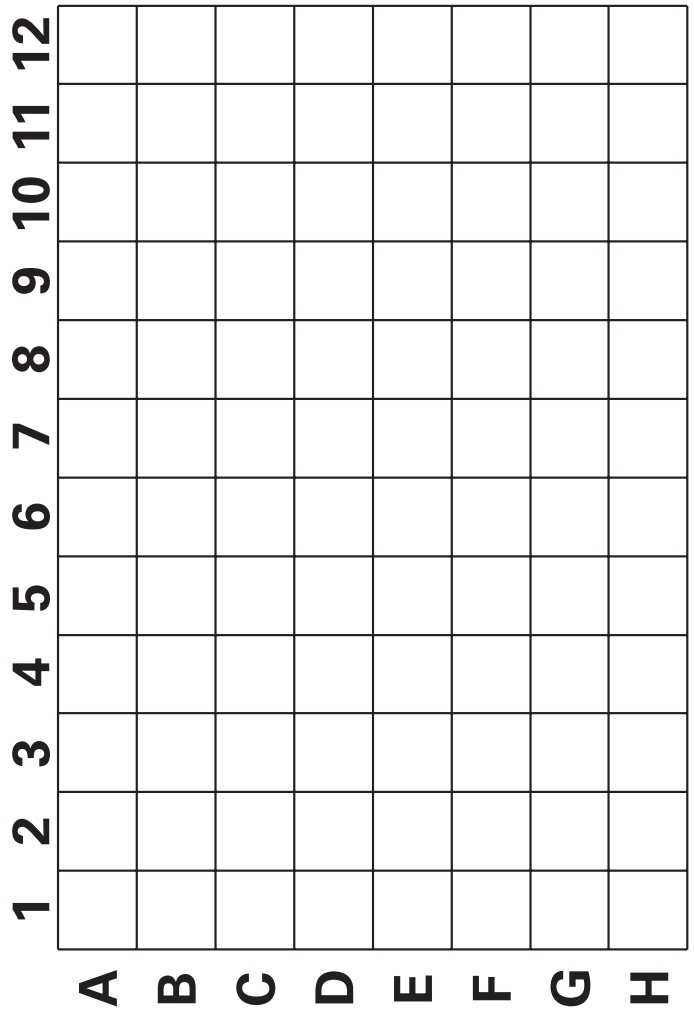
Warranty and Limitation of Remedy

Cayman Chemical Company makes **no warranty or guarantee** of any kind, whether written or oral, expressed or implied, including without limitation, any warranty of fitness for a particular purpose, suitability and merchantability, which extends beyond the description of the chemicals hereof. Cayman **warrants only** to the original customer that the material will meet our specifications at the time of delivery. Cayman will carry out its delivery obligations with due care and skill. Thus, in no event will Cayman have **any obligation or liability**, whether in tort (including negligence) or in contract, for any direct, indirect, incidental or consequential damages, even if Cayman is informed about their possible existence. This limitation of liability does not apply in the case of intentional acts or negligence of Cayman, its directors or its employees.

Buyer's **exclusive remedy** and Cayman's sole liability hereunder shall be limited to a refund of the purchase price, or at Cayman's option, the replacement, at no cost to Buyer, of all material that does not meet our specifications.

Said refund or replacement is conditioned on Buyer giving written notice to Cayman within thirty (30) days after arrival of the material at its destination. Failure of Buyer to give said notice within thirty (30) days shall constitute a waiver by Buyer of all claims hereunder with respect to said material.

For further details, please refer to our Warranty and Limitation of Remedy located on our website and in our catalog.



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