



**KF01002**

# **ABTS Antioxidant Capacity Assay Kit**

**96 well plate  
100/200/400 tests**

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## Table of contents

1.	General information	1
2.	Technical specifications	2
3.	Materials and storage	3
4.	Introduction	4
5.	Assay principle	5
6.	Assay preparation	6
7.	Sample preparation	9
8.	Assay protocol	10
9.	Data analysis	11
10.	Troubleshooting	13
11.	Additional information	15
12.	Related products	15
13.	Warranties and limitation of liability	16

## 1. General information

### PRECAUTIONS

Please read this manual carefully before beginning the assay.

This product is designed for **research use only**. It is not approved for human or animal use or clinical diagnosis. All chemicals should be handled with care and in accordance with laboratory safety practices. It is recommended to use basic Personal Protective Equipment.

Do not use after the expiration date stated on the packaging.

Do not mix or substitute reagents or materials from other kit batches or vendors.

For the **material safety data sheet** (MSDS) please contact us at [info@bioquochem.com](mailto:info@bioquochem.com)

### TECHNICAL RECOMMENDATIONS

Store reagents as indicated in **Materials and storage** section.

Be sure to keep the bottle capped when not in use.

Let the components reach room temperature (RT) before use.

Immediately before use, gently invert and rotate reagent bottles several times to mix the contents thoroughly.

Avoid foaming or bubbles when mixing or reconstituting components.

Avoid cross contamination of samples or reagents by changing pipette tips between sample, standard and reagent additions.

Be sure to use the optimal microplate for the assay. Transparent microplates for UV/VIS applications, and black microplates for fluorescence measurements.

## 2. Technical specifications

### **Available sizes**

100/200/400 tests

### **Required sample volume**

5 µL/test

### **Compatible samples**

Biological fluids (serum, plasma, urine, saliva), tissue homogenates, cell lysates, food and beverages

### **Type of detection**

Colorimetric (734 nm)

### 3. Materials and storage

#### MATERIALS SUPPLIED

Item	No. Tests	Units	Storage
Reagent A	100	1	-20 °C
	200	2	
	400	4	
Reagent B	100	1	RT
	200	2	
	400	4	
Trolox Standard	100	1	-20 °C
	200	2	
	400	4	
Vitamin C Standard	100	1	RT
	200	2	
	400	4	
Transparent 96-Well Microplate	100	1	RT
	200	2	
	400	4	

#### MATERIALS NEEDED BUT NOT SUPPLIED

- Double distilled water (ddH<sub>2</sub>O) as Milli-Q Ultrapure Water.
- Labware materials (micropipettes, tubes, stirring/mixing equipment).
- Colorimetric microplate reader – equipped with filter for OD 734 nm.

#### STORAGE CONDITIONS

On receipt, store kit components as indicated above. Under these conditions, the reagents are stable in the original packaging until the expiration date stated on the outside of the box. After reconstitution, standard solutions are unstable in the presence of oxygen. Prepare a fresh set of standards for every use.

## 4. Introduction

Antioxidants serve as a protection against the harmful effects of free radical damage. Antioxidant systems include both antioxidative enzymes (superoxide dismutase, catalase, glutathione peroxidase, etc.), and low-molecular weight non-enzymatic compounds (glutathione, uric acid, lipoic acid, bilirubin, coenzyme Q, vitamin C, vitamin A, vitamin E, flavonoids, carotenoids, etc.).

Total antioxidant capacity (TAC) is a global measure of the non-enzymatic antioxidant efficiency that integrates the individual effect of all antioxidants in a given matrix, and their additive, synergistic or antagonistic interactions.

TAC is considered as an important parameter to establish antioxidant status of biological samples. Alterations in the redox status of tissue/organs and body fluids have been linked to several health impairments such as infertility, obesity, cancer, and neurodegenerative diseases.

TAC is also an important tool for plant characterization and for food quality control since the antioxidant levels vary depending on environmental factors, harvesting, aging and storage conditions, among others.

**BQC ABTS Assay Kit is a quick, simple, and reproducible assay to determine TAC in a wide variety of samples.**

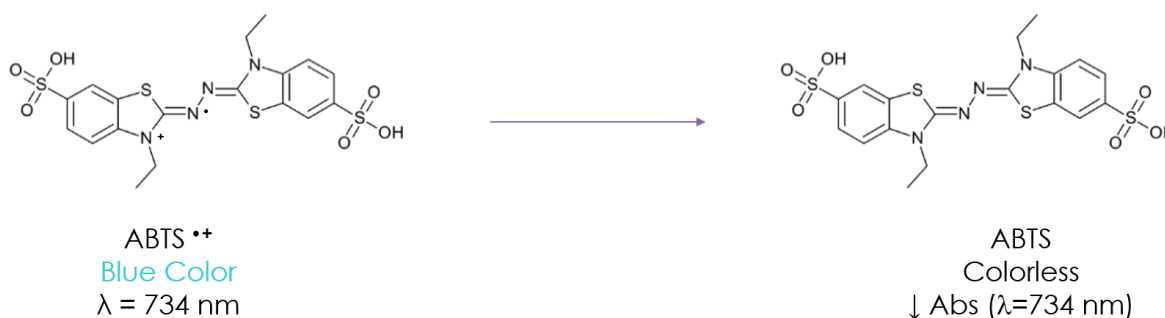
## 5. Assay principle

BQC Trolox Equivalent Antioxidant Capacity Assay Kit (**ABTS-TEAC**) and BQC Vitamin C Equivalent Antioxidant Capacity (**ABTS-CEAC**) can be used to measure TAC in a wide variety of samples.

This ABTS Assay Kit is based on the interaction between antioxidants and the pre-formed green-blue stable radical cationic chromophore, 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonate, ABTS<sup>•+</sup>). In the presence of antioxidants, the oxidized ABTS<sup>•+</sup> radical is reduced to ABTS resulting in a discoloration of the solution, measured by the decrease in absorbance at 734 nm.

Antioxidants scavenge ABTS<sup>•+</sup> radical cation in a concentration dependent manner.

In this assay, Trolox or Vitamin C can be used to standardize the sample TAC relative to Trolox (Trolox Equivalents Antioxidant Capacity, TEAC) or Vitamin C (Vitamin C Equivalents Antioxidant Capacity, CEAC).



*Principle of ABTS Assay Kit*

## 6. Assay preparation

### REAGENT PREPARATION

**All assay reagents not listed below are ready to use as supplied. Allow the reagents to reach room temperature before use.**

**R.A. Working Solution:** Dilute Reagent A with Reagent B in a 20 mL tube (not provided) to an absorbance of around  $0.8 \pm 0.1$  at 734 nm. This value is obtained with a dilution between 1:30 and 1:60 of Reagent A with Reagent B.

It is recommended to try first with the most concentrate solution and then dilute it until the absorbance reaches the desired value.

❗ **CAUTION:** R.A. Working Solution must be freshly prepared and used immediately

#### ABTS\_TEAC Assay

**Trolox Standard Solution:** Add 1 mL of Reagent B to the Trolox vial and mix well. Dilute the solution 1:10 with ddH<sub>2</sub>O (e.g. 100 µL of Trolox solution with 900 µL of ddH<sub>2</sub>O). Use ethanol instead of ddH<sub>2</sub>O when working with lipophilic samples. Use the 1:10 diluted Trolox solution to prepare the standard curve.

#### ABTS\_CEAC Assay

**Vitamin C Standard Solution:** Add 1 mL of ddH<sub>2</sub>O to the Standard vial and mix well. Dilute the solution 1:10 with ddH<sub>2</sub>O (e.g. 100 µL of Vitamin C solution with 900 µL of ddH<sub>2</sub>O). Use the 1:10 diluted Vitamin C solution to prepare the standard curve.



## STANDARD CALIBRATION

Prepare the standards for the calibration curve from the diluted Standard solution according to the following Table. Prepare the standards immediately prior to each assay. Vortex tubes thoroughly. Discard standard solutions after use.

Standard	Trolox solution 1:10 diluted (μL)	ddH <sub>2</sub> O (μL) <sup>1</sup>	TEAC (μM Trolox)
Std 1	0	200	0
Std 2	10	190	50
Std 3	20	180	100
Std 4	40	160	200
Std 5	80	120	400
Std 6	120	80	600

<sup>1</sup> **ABTS-TEAC.** Use EtOH instead of ddH<sub>2</sub>O when working with lipophilic sample.

Standard	Vitamin C solution 1:10 diluted (μL)	ddH <sub>2</sub> O (μL)	CEAC (μM Vitamin C)
Std 1	0	200	0
Std 2	10	190	50
Std 3	20	180	100
Std 4	40	160	200
Std 5	80	120	400
Std 6	120	80	600

## PLATE SET UP

**BQC recommends running the standards, samples, and blanks at least in duplicate (triplicate recommended).** There is no specific pattern for using the wells on the plate. A proposed layout of standards (Std), reagent blank (B) and samples (S) to be measured in duplicate is shown below

	1	2	3	4	5	6	7	8	9	10	11	12
A	Std 1	Std 1	S2	S2	S10	S10	S18	S18	S26	S26	S34	S34
B	Std 2	Std 2	S3	S3	S11	S11	S19	S19	S27	S27	S35	S35
C	Std 3	Std 3	S4	S4	S12	S12	S20	S20	S28	S28	S36	S36
D	Std 4	Std 4	S5	S5	S13	S13	S21	S21	S29	S29	S37	S37
E	Std 5	Std 5	S6	S6	S14	S14	S22	S22	S30	S30	S38	S38
F	Std 6	Std 6	S7	S7	S15	S15	S23	S23	S31	S31	S39	S39
G	B	B	S8	S8	S16	S16	S24	S24	S32	S32	S40	S40
H	S1	S1	S9	S9	S17	S17	S25	S25	S33	S33	S41	S41

*Example of plate layout for the ABTS Assay Kit*

## 7. Sample preparation

**The following sample preparation protocols are intended as a guide only. The optimal conditions for sample preparation must be determined by the end user.** It is recommended to use fresh samples. If it is not possible, aliquot and store samples appropriately with minimal freeze/thawing.

**ABTS Assay Kit can be used to determine TAC in a wide variety of samples like biological fluids, cell lysates, tissue homogenates, food, and beverages.**

**Biological samples.** Biological samples like serum, plasma, urine, or saliva can be directly measured with appropriate dilutions. Hemolyzed plasma or serum and EDTA plasma should be avoided.

**Tissue Homogenates.** Dissect the tissue of interest and place it on a homogenizer tube with an appropriate amount of an ice-cold buffer (e.g. 10 mg tissue per 1 mL PBS pH 7.4). Homogenize the tissue and then centrifuge the homogenate at 10000 x g for 15 minutes at 4 °C and collect the supernatant.

**Cell culture.** Wash cells with ice-cold buffer (e.g. PBS) before lysis. Lyse cells by sonication or freeze-thaw cycles. Centrifuge cell lysis suspension at 10000 x g for 15 minutes at 4 °C and collect the supernatant. It is recommended to use lysates from 10<sup>6</sup> cells.

**Food and beverages.** Fruit juices and other beverages can be directly measured with appropriate dilutions. If it is required, clarify the sample through filtration prior performing the assay.

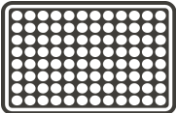





For the analysis of other samples like **plants, fruits, vegetables**, and other foods an extraction step is usually required. The extraction method varies based upon the sample type. The most common extraction solvents include acid/ethanol or acetone.

Reagents and materials required for sample preparation are not supplied with the kit. Before doing sample preparation, consider the volume of sample required per test; see **Technical specifications** section.

Make sure that interfering substances present in the sample do not give a significant background. Run proper blanks as necessary (e.g. sample blank should be always evaluated when working with highly colored samples). It is recommended to assay different sample dilutions to ensure the values fall within the standard curve.

## 8. Assay protocol

Prepare and mix all reagents thoroughly before use. Each standard, sample or blank should be assayed at least in duplicate.

- 1  Set up the plate design
- 2  Make sure that **R.A. Working Solution** has an **absorbance** of around  $0.8 \pm 0.1$  at 734 nm
- 3  Add **5 µL** of **standard (Trolox/Vitamin C)** or **sample** in each well. For **reagent blank** wells add **5 µL** of **ddH<sub>2</sub>O**
- 4 
  - **Standard (Trolox/Vitamin C)** and **sample** wells:  
Add **200 µL** of **R.A. Working Solution**
  - **Reagent blank** wells: Add **200 µL** of **Reagent B**
- 5  **Incubate** for **5 minutes** at **RT**
- 6  Read the **absorbance** of all wells at **734 nm** in end point mode at **RT**

If you need to **adapt this kit** for another form of the assay (for example cuvette), **contact us at** [info@bioquochem.com](mailto:info@bioquochem.com)

## 9. Data analysis

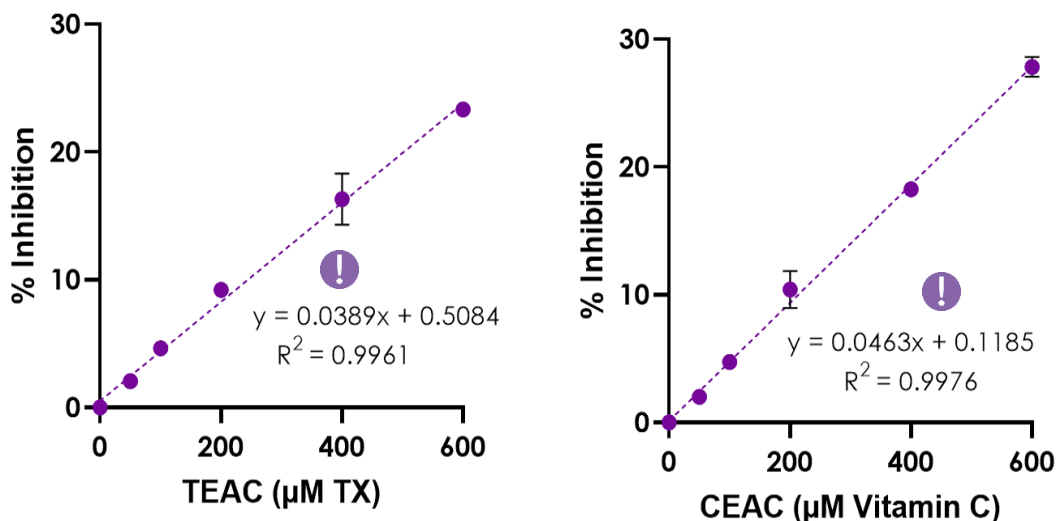
### ANALYSIS OF THE STANDARDS

- Calculate the average absorbance of the standards.
- Subtract the average absorbance of the reagent blank from the average absorbance of the standards to obtain the blank-corrected absorbance of the standards.
- Calculate the % inhibition for the standards according to the following equation:

$$\% \text{ Inhibition of Standard} = \left(1 - \frac{A_{\text{Std}}}{A_0}\right) \cdot 100$$

Where  $A_0$  is the blank-corrected absorbance of Std 1 (0  $\mu\text{M}$  Trolox/Vitamin C) and  $A_{\text{Std}}$  is the blank-corrected absorbance measured for the remaining antioxidant standards.

- Create a standard curve by plotting the % inhibition of standards as a function of the standard concentration (see **STANDARD CALIBRATION** section). A typical standard curve ( $y = \text{slope} \cdot x \pm \text{intercept}$ ) for this assay is shown below.



Standard curves with ABTS Assay Kit

- ⚠ These standard curves are an example of the data typically obtained with this kit. **DO NOT USE** these standard curves to calculate TAC of your samples. A new standard curve must be performed by the end user.

## ANALYSIS OF THE SAMPLES

- Calculate the average absorbance of the samples.
- Subtract the average absorbance of the reagent blank from the average absorbance of each sample to obtain the blank-corrected absorbance of the samples ( $A_s$ ).
- Calculate the % inhibition for the samples according to the following equation:

$$\% \text{ Inhibition of Sample} = \left(1 - \frac{A_s}{A_0}\right) \cdot 100$$

Where  $A_0$  is the blank-corrected absorbance of Std 1 (0  $\mu\text{M}$  Trolox/Vitamin C) and  $A_s$  is the blank-corrected absorbance measured for the sample.

- Calculate the TEAC ( $\mu\text{M}$  Trolox) or CEAC ( $\mu\text{M}$  Vitamin C) of the samples using the following equation. Slope and intercept values are obtained from the standard curve.

$$\text{TEAC or CEAC} = \left( \frac{\% \text{ Inhibition of Sample} - \text{intercept}}{\text{slope}} \right)$$

When working with diluted samples the concentration values obtained must be multiplied by the dilution factor to obtain the TEAC ( $\mu\text{M}$  TX) or CEAC ( $\mu\text{M}$  Vitamin C) value of the undiluted sample.

## 10. Troubleshooting

This troubleshooting table provides potential sources and solutions for common problems observed with BQC Assay Kits. **The problems listed below could occur when using any BQC Assay Kit.** They are not specific for this assay kit.

Problem	Possible Cause	Recommended Solution
Wells have color but there is no reading	Plate read at incorrect wavelength	Check the wavelength used in the assay
	Incorrect microplate	Use the correct microplate for your application UV/Vis: transparent Fluorescence: black wells/transparent bottom
Standard readings do not follow a linear pattern	Pipetting errors in preparation of standards	Avoid pipetting small volumes (<5 µL) Be careful not to splash from well to well
	Air bubbles formed in well(s)	Use reverse pipetting technique
	Standard stock is at incorrect concentration	Always refer to dilutions described in <b>Assay preparation</b>
	Improperly thawed reagents	Thaw all components completely and mix well before use
	Use of improperly stored reagents	Store the components appropriately Use fresh components from the standard curve
	Incorrect incubation times or temperatures	Refer to <b>Assay protocol</b>
Dispersion of standard and sample readings	Pipetting errors	Avoid pipetting small volumes (<5 µL) Be careful not to splash from well to well
	Air bubbles formed in well(s)	Use reverse pipetting technique

Problem	Possible Cause	Recommended Solution
Sample erratic values	Samples contain interfering substances	Dilute sample further (if possible)
	Inappropriately stored samples or samples used after multiple freeze-thaw cycles	Use fresh samples or store appropriately until use
	Samples not deproteinized	Use an appropriate deproteinization protocol
	Cells/Tissue samples not homogenized completely	Repeat the sample homogenization
	Inappropriate sample dilution buffer	Refer to <b>Assay preparation</b>
Sample reading fall outside the detection range	Samples are too diluted/concentrated No analyte/activity is observed in the sample	Re-assay using different sample dilutions

## STILL HAVING PROBLEMS?

Contact BQC if you have any further questions, our team will be pleased to help you:



Phone

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E-mail

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Business hours

Monday-Thursday: 8.30 to 17.00 (CEST)  
Friday: 8.00 to 15.00 (CEST)



## 11. Additional information

**BQC ABTS Assay Kit** is a quick (< 30 minutes) for determining TAC in a wide variety of samples.

Acetone, DMSO, Glycerol, Methanol, Dithiothreitol, 2-Mercaptoethanol, EDTA, SDS, Tween-20 and Tris pH 7.4 have been reported to interfere with the assay.

If unexpected results are obtained running your samples, please contact us at [info@bioquochem.com](mailto:info@bioquochem.com)

## 12. Related products

More products available on [bioquochem.com](http://bioquochem.com)

Reference	Product
KB03006	Polyphenol Quantification Assay Kit
KB03015	Anthocyanins Assay Kit
KB03033	NAD/NADH quantification Assay kit

## 13. Warranties and limitation of liability

BQC shall not in any event be liable for incidental, consequential or special damages of any kind resulting from any use or failure of the products, even if BQC has been advised of the possibility of such damage including, without limitation, liability for loss of use, loss of work in progress, downtime, loss of revenue or profits, failure to realize savings, loss of products of buyer or other use or any liability of buyer to a third party on account of such loss, or for any labor or any other expense, damage or loss occasioned by such product including personal injury or property damage is caused by BQC's gross negligence. Any and all liability of BQC hereunder shall be limited to the amounts paid by the buyer for the product.

Buyer's exclusive remedy and BQC's sole liability hereunder shall be limited to a refund of the purchase price, or the replacement of all material that does not meet our specifications.

Said refund or replacement is conditioned on buyer giving written notice to BQC within 30 days of shipment.

**Expiration date:** 1 year from the date of fabrication. Expiration date is indicated on the outside of the box.

For further details, please refer to our website [bioquochem.com](http://bioquochem.com)



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