

# Protease Activity Assay Kit

(Catalog #K781-100; 100 assays; Store kit at -20°C)

## I. Introduction:

Proteases are naturally present in all organisms. These enzymes are involved in a multitude of physiological reactions from simple digestion of food proteins to highly regulated cascades. Proteases can either break specific peptide bonds (*limited proteolysis*), depending on the amino acid sequence of a protein, or break down a complete peptide to amino acids (*unlimited proteolysis*). The activity can be a destructive change (abolishing a protein's function), an activation of a function (preform to mature form) or it can be a signal in a signaling pathway. BioVision's Protease Activity Assay Kit is designed for the quantitative determination of proteases present in the protein sample. The assay uses fluorescein isothiocyanate (FITC)-labeled casein as a general protease substrate. The fluorescein label on the FITC-Casein is highly quenched. Upon digestion by proteases present in the sample the FITC-Casein substrate is cleaved into smaller peptides which abolish the quenching of the fluorescence label. The fluorescence of the FITC-labeled peptide fragments is measured at Ex/Em=485/530 nm. The kit is supplied with our Mass Spectrometry Grade (MSG), chemically stabilized Trypsin for use as a general protease control. However, other protease standard controls can also be used. This kit is easy to use and can detect <500 pg/well Trypsin present in the sample.

## II. Kit Contents:

Components	100 assays	Cap Color	Part Number
Protease Assay Buffer	25 ml	WM	K781-100-1
Protease Substrate (lyophilized)	1 vial	Red	K781-100-2
FITC Standard (25 µM)	200 µl	Yellow	K781-100-3
Positive Control (lyophilized)	1 vial	Green	K781-100-4

## III. Reagent Preparation and Storage Conditions:

**Substrate:** Reconstitute with 220 µl dH<sub>2</sub>O. Pipette up and down to completely dissolve. Store at -20°C. Use within two months.

**Positive Control:** Reconstitute with 100 µl Assay Buffer. Pipette up and down to completely dissolve. Aliquot and store at -20°C. Use within two months. Avoid freeze/thaw cycles.

## IV. Protease Assay Protocol:

### 1. Standard Curve Preparations:

Add 0, 2, 4, 6, 8, 10 µl FITC Standard into a series of standards wells. Adjust the final volume to 100 µl/well with Assay Buffer to generate 0, 0.05, 0.1, 0.15 0.2, and 0.25 nmol/well of the FITC Standard.

### 2. Sample and Positive Control Preparations:

Tissues or cells can be extracted with 4 volumes of the Assay Buffer, centrifuge to remove insoluble material and get a clear extract. Prepare test samples at 50 µl/well with Assay Buffer in a 96-well plate. Serum can be directly added into sample wells, and the volume adjusted to 50 µl/well with Assay Buffer. We suggest using several doses of your sample to ensure the readings are within the linear range. For Positive Control, add 5 µl Positive Control solution to wells and adjust volume to 50 µl/well with Assay Buffer. Include a reagent background control which only contains 50 µl of Assay Buffer.

### 3. Reaction Mix:

Mix enough reagents for the number of assays to be performed. For each well, prepare 50 µl of Reaction Mix containing:

Assay Buffer 48 µl  
Substrate 2 µl

Add 50 µl of the Reaction Mix to each well containing Positive Controls, reagent background control and test samples. Mix well. **(DO NOT ADD TO STANDARDS)**

**4. Measurement:** Read Ex/Em=485/530 nm R<sub>1</sub> at T<sub>1</sub> then read R<sub>2</sub> at T<sub>2</sub> after incubating the reaction at 25°C for 60 min, protected from light (or incubate longer if the sample activity is low). The fluorescence of the unquenched FITC generated by proteolytic digestion of the substrate is  $\Delta RFU = R_2 - R_1$ .

**Note: A.** It is essential to read R<sub>1</sub> and R<sub>2</sub> in the reaction linear range. It will be more accurate if you read the reaction kinetics, then choose R<sub>1</sub> and R<sub>2</sub> in the reaction linear range. **B.** Since the assay is a fluorescence quenching assay, the background reading is high, but sample reading are consistent.

**5. Calculation:** Subtract 0 Standard from all Standard readings. Plot the FITC Standard Curve. Apply the  $\Delta RFU$  to the FITC Standard Curve to get B nmol of FITC (amount of unquenched FITC generated between T<sub>1</sub> and T<sub>2</sub> in the reaction wells).

$$\text{Protease Activity} = \frac{B}{(T_2 - T_1) \times V} \times \text{Sample Dilution Factor} = \text{nmol/min/ml} = \text{mU/ml}$$

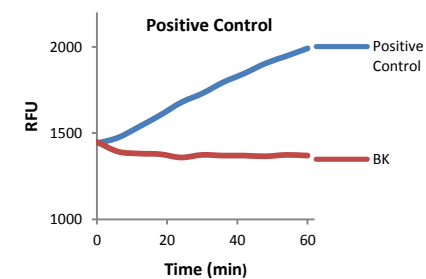
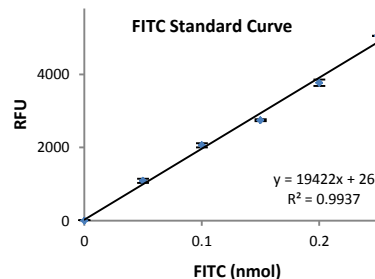
**Where:** B is the FITC amount from FITC Standard Curve (in nmol).

T<sub>1</sub> is the time of the first reading (R<sub>1</sub>) (in min).

T<sub>2</sub> is the time of the second reading (R<sub>2</sub>) (in min).

V is the pretreated sample volume added into the reaction well (in ml).

**Unit Definition:** One unit is defined as the amount of protease that cleaves the substrate, to yield an amount of fluorescence equivalent to 1.0 nmol of unquenched FITC per minute at 25°C.



## RELATED PRODUCTS:

- Trypsin Activity Assay Kit
- Protease Inhibitor Cocktail
- EZBlock™ Protease Inhibitor Cocktail, EDTA-Free
- EZBlock™ Protease Inhibitor Cocktails II thru IV
- EZBlock™ Universal Protease and Phosphatase Inhibitor Cocktail, EDTA-Free
- EZBlock™ Universal Protease and Phosphatase Inhibitor Cocktail
- Protease Inhibitors
- Proteases
  - Caspase
  - Cathepsins
  - Calpain
  - MMPs
  - Granzyme B

**FOR RESEARCH USE ONLY! Not to be used on humans.**

## GENERAL TROUBLESHOOTING GUIDE:

Problems	Cause	Solution
Assay not working	<ul style="list-style-type: none"> <li>• Use of ice-cold assay buffer</li> <li>• Omission of a step in the protocol</li> <li>• Plate read at incorrect wavelength</li> <li>• Use of a different 96-well plate</li> </ul>	<ul style="list-style-type: none"> <li>• Assay buffer must be at room temperature</li> <li>• Refer and follow the data sheet precisely</li> <li>• Check the wavelength in the data sheet and the filter settings of the instrument</li> <li>• Fluorescence: Black plates (clear bottoms) ; Luminescence: White plates ; Colorimeters: Clear plates</li> </ul>
Samples with erratic readings	<ul style="list-style-type: none"> <li>• Use of an incompatible sample type</li> <li>• Samples prepared in a different buffer</li> <li>• Cell/ tissue samples were not completely homogenized</li> <li>• Samples used after multiple free-thaw cycles</li> <li>• Presence of interfering substance in the sample</li> <li>• Use of old or inappropriately stored samples</li> </ul>	<ul style="list-style-type: none"> <li>• Refer data sheet for details about incompatible samples</li> <li>• Use the assay buffer provided in the kit or refer data sheet for instructions</li> <li>• Use Dounce homogenizer (increase the number of strokes); observe for lysis under microscope</li> <li>• Aliquot and freeze samples if needed to use multiple times</li> <li>• Troubleshoot if needed</li> <li>• Use fresh samples or store at correct temperatures until use</li> </ul>
Lower/ Higher readings in Samples and Standards	<ul style="list-style-type: none"> <li>• Improperly thawed components</li> <li>• Use of expired kit or improperly stored reagents</li> <li>• Allowing the reagents to sit for extended times on ice</li> <li>• Incorrect incubation times or temperatures</li> <li>• Incorrect volumes used</li> </ul>	<ul style="list-style-type: none"> <li>• Thaw all components completely and mix gently before use</li> <li>• Always check the expiry date and store the components appropriately</li> <li>• Always thaw and prepare fresh reaction mix before use</li> <li>• Refer datasheet &amp; verify correct incubation times and temperatures</li> <li>• Use calibrated pipettes and aliquot correctly</li> </ul>
Readings do not follow a linear pattern for Standard curve	<ul style="list-style-type: none"> <li>• Use of partially thawed components</li> <li>• Pipetting errors in the standard</li> <li>• Pipetting errors in the reaction mix</li> <li>• Air bubbles formed in well</li> <li>• Standard stock is at an incorrect concentration</li> <li>• Calculation errors</li> <li>• Substituting reagents from older kits/ lots</li> </ul>	<ul style="list-style-type: none"> <li>• Thaw and resuspend all components before preparing the reaction mix</li> <li>• Avoid pipetting small volumes</li> <li>• Prepare a master reaction mix whenever possible</li> <li>• Pipette gently against the wall of the tubes</li> <li>• Always refer the dilutions in the data sheet</li> <li>• Recheck calculations after referring the data sheet</li> <li>• Use fresh components from the same kit</li> </ul>
Unanticipated results	<ul style="list-style-type: none"> <li>• Measured at incorrect wavelength</li> <li>• Samples contain interfering substances</li> <li>• Use of incompatible sample type</li> <li>• Sample readings above/below the linear range</li> </ul>	<ul style="list-style-type: none"> <li>• Check the equipment and the filter setting</li> <li>• Troubleshoot if it interferes with the kit</li> <li>• Refer data sheet to check if sample is compatible with the kit or optimization is needed</li> <li>• Concentrate/ Dilute sample so as to be in the linear range</li> </ul>
<p><b>Note:</b> The most probable list of causes is under each problem section. Causes/ Solutions may overlap with other problems.</p>		