

## Protocol

# Protease Substrate Set

Ready-to-use peptide set for protease profiling

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Only qualified personnel should handle these chemicals.

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## 1 Introduction

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Proteolytic cleavage of proteins represents a key regulation event in biologically important processes like signal transduction and cell cycle regulation. To study these processes and the involved proteases, the identification of detailed substrate information is critical. One of the most efficient ways to study protease activities and substrate specificity is incubation of a collection of potential substrate peptides with the proteases of interest.

JPT Peptide Technologies' Protease Substrate Set is a selection of 360 peptides derived from cleavage sites for rapid screening of protease activity. These peptide derivatives contain the cleavage site sequences from P4- to P4'-position, which is flanked by DABCYL and Glu(EDANS)-amide moieties at the N-terminus and C-terminus, respectively. Upon incubation with your protease, cleavage of any peptide bond between the fluorophore and the quencher moiety can be detected using microtiter plate fluorescence readers.

## 2 List of components

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| Component              | Quantity | Format  |
|------------------------|----------|---|
| Protease Substrate Set | 1        | 384 well format (GreinerBioOne # 784076; F-form, small volume, medium binding, black) |
| Product Documentation  | 1        | Microsoft Excel   |

## 3 Storage and Handling

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### 3.1 Storage of Protease Substrate Set

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- Protease Substrate Set microtiter plates should be stored at -20°C.
- All other components may be stored at room temperature.

**PLEASE READ THE ENTIRE PROTOCOL BEFORE STARTING YOUR EXPERIMENTS! CAREFULLY NOTE THE HANDLING AND STORAGE CONDITIONS OF THE PROTEASE SUBSTRATE SET. PLEASE CONTACT JPT'S TECHNICAL SERVICES FOR ASSISTANCE IF NECESSARY.**

## 3.2 Product description

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JPT Peptide Technologies' ready-to-screen Protease Substrate Set is comprised of a total of 360 peptides derived from cleavage sites described in the scientific literature. The Protease Substrate Set comes in a 384-well microtiter plate (75pmol per well). Additionally, several empty wells are available for positive and negative controls (wells P1-P24). Subsequent to incubation with the target protease, evolving fluorescence can be detected using standard microtiter plate readers. The sensitivity of the assay is sufficient to detect low nanogramme levels of protease. The peptide derivatives are purified by HPLC (>95% at 220nm) and freeze-dried into the wells from a DMSO stock solution. There are no additional buffer salts inside the wells. The peptide derivatives are not immobilized onto the walls of the wells resulting in a homogeneous assay after dissolving of the peptides in assay buffer.

The product documentation provided with the set contains all information needed for the detailed analysis of your data including peptide sequences and Swiss-Prot accession numbers for the proteins containing these cleavage sites. If the individual human peptide sequence could be found in other organisms, too, all appropriate Swiss-Prot accession numbers are given.

## 4 Additional Materials Required

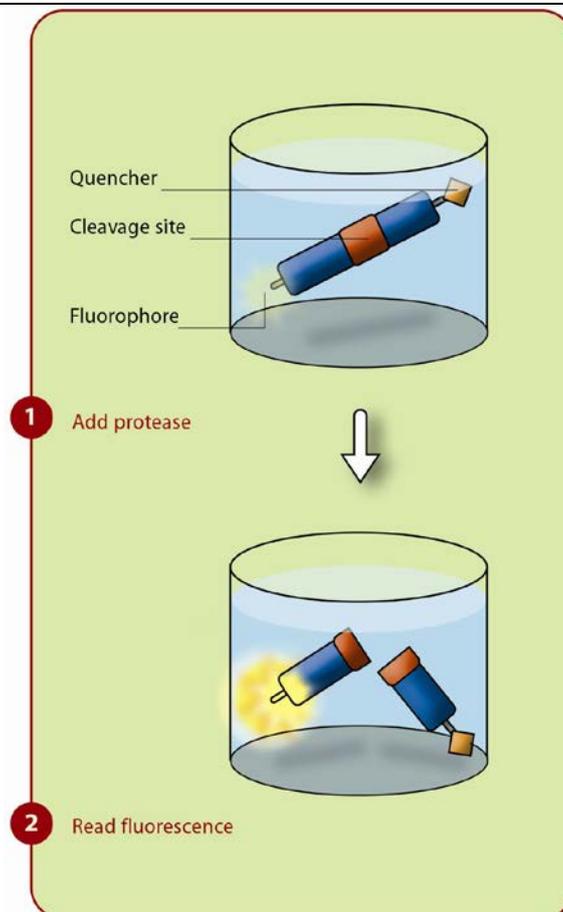
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- Protease of adequate activity (we recommend a final activity of 0.1U per well)
- Protease assay buffer
- Microtiter plate reader capable of measuring fluorescence at 490nm to at least 3-decimal accuracy. Wavelengths in the range of 450-520nm may be used and will result in similar sensitivities. The excitation wavelength should be in the range of 340-360nm. Excitation outside that range is possible but will reduce the total fluorescence intensity.

## 5 General considerations

### 5.1 Experimental basics

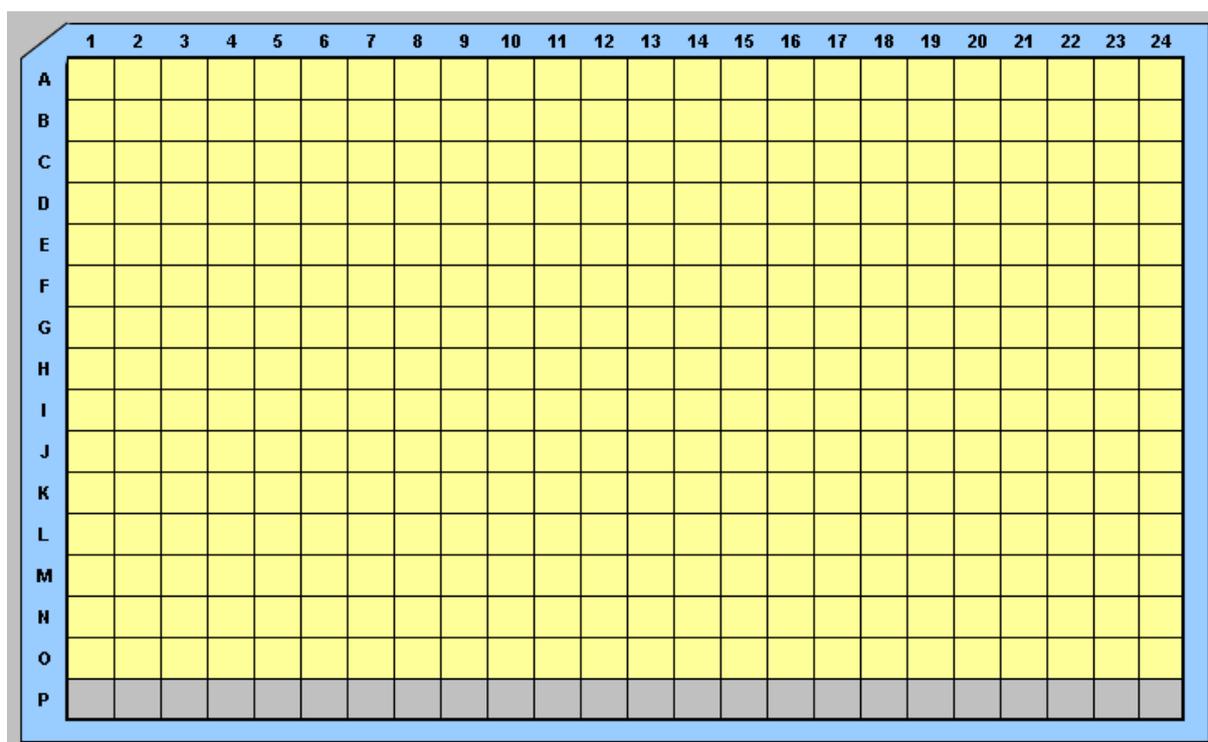
JPT Peptide Technologies' Protease Substrate Set includes one 384-well MTP containing 360 internally quenched (Dabcyl/EDANS) peptides derived from proteolytic cleavage sites (>95% purity, 0.075nmol per well). Since the Protease Substrate Set is provided in a standard 384 MTP format, it can be easily adapted to your automated protease assay or allows for hand-made assays within less than one day (see Figure I).



**Figure 1:** demonstration of Protease Substrate Set

## 5.2 Protease Substrate Set microtiter plate Layout

The product documentation provided with the set contains all information needed for the detailed analysis of your data including peptide sequences, Swiss-Prot accession number, and names of the appropriate proteins. The layout of the microtiterplate is shown in Figure 2.



**Figure 2:** schematic layout of microtiter plate

## 6 Experimental protocols

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The following procedure is recommended for the Protease Substrate Set assay using a fluorescence reader which excites and reads fluorescence from the top of the plate. If your reader excites from the bottom and reads from the top or vice versa please contact JPT for Protease Substrate Sets delivered in appropriate microtiter plates. Please note that you will need to optimize buffer and reaction conditions for your specific target protease.

**Note: The following procedure is intended as a guideline only. The optimal experimental conditions will vary depending on the investigated parameters, and must be determined by the individual user. No warranty or guaranty of performance using that procedure is made or implied.**

The Protease Substrate Set is designed for assaying the enzyme activity directly in the 384-well microtiter plate. Protease reactions are performed in a final volume of 15 $\mu$ L resulting in a final peptide concentration of 5 $\mu$ M, respectively.

**Before starting the experiment make sure that your enzyme preparation, water and buffer components do not contain contaminations or components which may interfere with the fluorescence signal.**

### 6.1 Assay Procedure

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1. Let the Protease Substrate Set adjust to room temperature.
2. Carefully remove the foil covering the microtiter plate.
3. Add 10 $\mu$ L of assay buffer (without enzyme) to each well and allow the peptide derivatives to dissolve for 3 hours at room temperature.

**Avoid bubbles during the addition of the solution! Bubbles in the wells of the plate will adversely affect the fluorescence readings. If there are some**

**bubbles inside use a centrifuge (at a maximum speed of 800 x g) to remove the bubbles!**

4. Measure fluorescence at about 490nm (excitation in the range of 340-360nm). Store these data as starting set and use the lowest value of the wells filled with peptide solution as blank.
5. Transfer an adequate volume of assay buffer including the protease (we recommend 5 $\mu$ L/well resulting in a total volume of 15 $\mu$ L peptide solution per well) into each peptide-containing well (A1-O24). Add background controls to the wells P1-P24 (enzyme without substrate; assay buffer, components of the assay buffer like metal ions or reducing agents).

**Avoid bubbles during the addition of the enzyme solution! Bubbles in the wells of the plate will adversely affect the fluorescence readings. If there are some bubbles inside use a centrifuge (at a maximum speed of 800 x g) to remove the bubbles!**

**Use at least the protease solution itself without any peptide as a control! We strongly recommend the use of all assay buffer components as single controls. Make sure that the final volume in all wells is similar!**

6. Incubate the microtiter plate with the protease solution for 20min to 2 hours (45min recommended) at 37°C. Please note that reaction conditions might need to be optimized for your protease regarding incubation temperatures and reaction time.
7. Measure fluorescence at about 490nm (excitation in the range of 340-360nm). We recommend blanking against the lowest fluorescence value of the wells filled with peptide solution from the measurement before the reaction was started (see point 4).

## 7 Notes

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- The fluorescent readout is a highly sensitive detection principle. Each fluorescent component in your final assay solution will greatly increase the background signal. Make sure that your assay components are free from small dust particles. Use filtrated solutions only (at least 0.45µm pore size)!
- Proteases possess diverse optimal assay conditions. Therefore, a universal buffer system cannot be provided.
- Do not store the dissolved peptide solutions longer than one day! Depending on the peptide sequence aqueous peptide solutions are unstable. Use freshly prepared peptide solutions only for the protease experiment.
- Each cleavage event between the fluorophore and the quencher moiety will result in evolving fluorescence. Therefore this set can be used for the analysis of orphan proteases, too. In total 7 times 360 = 2520 potential cleavage sites = peptide bonds will be presented to the protease.

## 8 Related products

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For further information visit our homepage ([www.jpt.com](http://www.jpt.com)) or contact our customer support.

- Caspase Substrate Set
- Protease peptide microarray
- ProteaseSpots
- Protease Profiling Service