

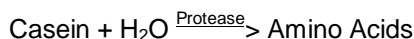


## SIGMA QUALITY CONTROL TEST PROCEDURE

## Product Information

### Enzymatic Assay of PROTEASE<sup>1</sup> Casein as a Substrate

#### PRINCIPLE:



**CONDITIONS:** T = 37°C, pH = 7.5, A<sub>660nm</sub>, Light path = 1 cm

**METHOD:** Colorimetric

#### REAGENTS:

- A. 50 mM Potassium Phosphate buffer, pH 7.5 at 37°C.  
(Prepare 200 ml in deionized water using Potassium Phosphate, Dibasic, Trihydrate, Sigma Prod. No. P-5504. Adjust to pH 7.5 at 37°C with 1 M HCl.)
- B. 0.65% (w/v) Casein Solution (Casein)  
(Prepare 125 ml in Reagent A using Casein, Sigma Prod. No. C-7078. Heat gently (do not boil) to 80-90°C for 10 minutes with stirring. Adjust the pH to 7.5 at 37°C, if necessary, with either 1 M NaOH or 1 M HCl.)
- C. 110 mM Trichloroacetic Acid Reagent (TCA)  
(Dilute 9 ml of Trichloroacetic Acid, 6.1 N, approximately 100% (w/v), Sigma Stock No. 490-10, to 500 ml with deionized water.)
- D. Folin & Ciocalteu's Phenol Reagent (F-C)  
(Dilute 10 ml of Folin & Ciocalteu's Phenol Reagent, Sigma Prod. No. F-9252, to 40 ml with deionized water.)
- E. 500 mM Sodium Carbonate Solution (Na<sub>2</sub>CO<sub>3</sub>)  
(Prepare 500 ml in deionized water using Sodium Carbonate Anhydrous, Sigma Prod. No. S-2127.)
- F. 10 mM Sodium Acetate Buffer with 5 mM Calcium Acetate, pH 7.5 at 37°C (Enzyme Diluent)  
(Prepare 100 ml in deionized water using Sodium Acetate, Trihydrate, Sigma Prod. No. S-8625, and Calcium Acetate, Sigma Prod. No. C-1000. Adjust the pH to 7.5 at 37°C with 0.1 M Acetic acid or 0.1 M NaOH.)

## Enzymatic Assay of PROTEASE<sup>1</sup> Casein as a Substrate

### REAGENTS: (continued)

- G. 1.1 mM L-Tyrosine Standard (Std Soln)  
(Prepare 100 ml in deionized water using L-Tyrosine, Free Base, Sigma Prod. No. T-3754. Heat gently (do not boil) until tyrosine dissolves and cool to room temperature.)
- H. Protease Enzyme Solution  
(Immediately before use, prepare a solution containing 0.1 - 0.2 unit/ml of Protease in cold Reagent F.)

### PROCEDURE:

Pipette the following reagents into suitable vials (in milliliters):

|                    | <u>Test</u> | <u>Blank</u> |
|--------------------|-------------|--------------|
| Reagent B (Casein) | 5.00        | 5.00         |

Equilibrate to 37°C. Then add:

|                             |      |       |
|-----------------------------|------|-------|
| Reagent H (Enzyme Solution) | 1.00 | ----- |
|-----------------------------|------|-------|

Mix by swirling and incubate at 37°C for exactly 10 minutes. Then add:

|                             |       |      |
|-----------------------------|-------|------|
| Reagent C (TCA)             | 5.00  | 5.00 |
| Reagent H (Enzyme Solution) | ----- | 1.00 |

Mix by swirling and incubate at 37°C for about 30 minutes. Filter through Whatman #50 filter paper or a 0.45 µm filter and use the filtrate in color development.

### COLOR DEVELOPMENT:

Standard Curve:

Prepare a standard curve by pipetting the following reagents into suitable vials (in milliliters):

|   | <u>Std 1</u> | <u>Std 2</u> | <u>Std 3</u> | <u>Std 4</u> | <u>Std<br/>Blank</u> |
|---|--------------|--------------|--------------|--------------|----------------------|
| Reagent G(Std Soln)                         | 0.05         | 0.10         | 0.20         | 0.40         | 0.00                 |
| Deionized Water                             | 1.95         | 1.90         | 1.80         | 1.60         | 2.00                 |
| Reagent E(Na <sub>2</sub> CO <sub>3</sub> ) | 5.00         | 5.00         | 5.00         | 5.00         | 5.00                 |
| Reagent D (F-C)                             | 1.00         | 1.00         | 1.00         | 1.00         | 1.00                 |

## Enzymatic Assay of PROTEASE<sup>1</sup> Casein as a Substrate

### COLOR DEVELOPMENT: (continued)

Sample:

Pipette the following reagents into 4 dram vials (in milliliters):

|  | <u>Test</u> | <u>Blank</u> |
|--|-------------|--------------|
| Test Filtrate                                | 2.00        | -----        |
| Blank Filtrate                               | -----       | 2.00         |
| Reagent E (Na <sub>2</sub> CO <sub>3</sub> ) | 5.00        | 5.00         |
| Reagent D (F-C)                              | 1.00        | 1.00         |

Mix by swirling and incubate at 37°C for 30 minutes. Remove the vials and allow them to cool to room temperature. Filter through a 0.45 µm filter immediately prior to reading. Read the absorbance at 660nm for each of the vials in suitable cuvettes.

### CALCULATIONS:

Standard Curve:

$$\Delta A_{660\text{nm}} \text{ Standard} = A_{660\text{nm}} \text{ Standard} - A_{660\text{nm}} \text{ Standard Blank}$$

Plot the  $\Delta A_{660\text{nm}}$  Standard vs µmoles of Tyrosine.

Sample Determination:

$$\Delta A_{660\text{nm}} \text{ Sample} = A_{660\text{nm}} \text{ Test} - A_{660\text{nm}} \text{ Sample Blank}$$

Determine the µmoles of Tyrosine equivalents liberated using the Standard curve.

$$\text{Units/ml enzyme} = \frac{(\mu\text{mole Tyrosine equivalents released}) (11)}{(1) (10) (2)}$$

11 = Total volume (in milliliters) of assay

10 = Time of assay (in minutes) as per the Unit Definition

1 = Volume of enzyme (in milliliter) of enzyme used

2 = Volume (in milliliters) used in Colorimetric Determination

$$\text{Units/mg solid} = \frac{\text{units/ml enzyme}}{\text{mg solid/ml enzyme}}$$

## Enzymatic Assay of PROTEASE<sup>1</sup> Casein as a Substrate

### CALCULATIONS: (continued)

$$\text{Units/mg protein} = \frac{\text{units/ml enzyme}}{\text{mg protein/ml enzyme}}$$

### UNIT DEFINITION:

One unit will hydrolyze casein to produce color equivalent to 1.0  $\mu$ mole (181  $\mu$ g) of tyrosine per minute at pH 7.5 at 37°C (color by Folin & Ciocalteu's reagent).

### FINAL ASSAY CONCENTRATION:

In a 6.00 ml reaction mix, the final concentrations are 42 mM potassium phosphate, 0.54% (w/v) casein, 1.7 mM sodium acetate, 0.8 mM calcium acetate, and 0.1 - 0.2 unit protease.

### REFERENCES:

Anson, M.L., (1938) *J. Gen. Physiol.* **22**, 79-89

Folin, O., and Ciocalteu, V., (1929) *J. Biol. Chem.* **73**, 627

### NOTES:

1. This assay procedure is to be used to assay Protease, Sigma Prod. Nos.: P-4630, P-4755, P-0384, P-5380, P-7431, P-6141, P-1512, P-9040, P-5147, P-5647, P-8775, P-7026, P-4032, P-8038, P-8298, P-2789, P-4789, P-6670, P-3910, P 5459 and P-4806.
2. This assay is based on the cited references.
3. Where Sigma Product or Stock numbers are specified, equivalent reagents may be substituted.

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