Enzymatic Assay of FK-BINDING PROTEIN
Peptidyl-Prolyl Isomerase Activity

PRINCIPLE:

\[
\text{Suc-Ala-Leu-cis-Pro-Phe-pNA} \overset{\text{FKBP}}{\rightleftharpoons} \text{Suc-Ala-Leu-trans-Pro-Phe-pNA}
\]

\[
\text{Suc-Ala-Leu-trans-Pro-Phe-pNA + H}_2\text{O} \overset{\text{Chymotrypsin}}{\rightarrow} \text{Suc-Ala-Leu-trans-Pro-Phe} + \text{p-Nitroaniline}
\]

Abbreviations used:
pNA = p-Nitroanilide
FKBP = FK Binding Protein

CONDITIONS:  \( T = 1^\circ \text{C}, \ \text{pH} \ 8.0, \ A_{405nm}, \ \text{Light path} = 1 \ \text{cm} \)

METHOD:  Continuous Spectrophotometric Rate Determination

REAGENTS:

A. 50 mM HEPES Buffer with 100 mM Sodium Chloride, pH 8.0 at 1°C
   (Prepare 100 ml in deionized water using HEPES, Free Acid, Sigma Prod. No. H-3375 and Sodium Chloride. Adjust to pH 8.0 at 1°C with 1 M NaOH.)

B. 2,2,2-Trifluoroethanol (TFE)
   (Use 2,2,2-Trifluoroethanol. Before use, dry overnight with Calcium Chloride, Anhydrous, and Molecular Sieves, 3Å. Filter through a Whatman #5 filter paper in a dry room.)

C. 470 mM Lithium Chloride Solution (LiCl/TFE)
   (Prepare 10 ml in Reagent B using Lithium Chloride, Anhydrous. Dry the Lithium Chloride before use in a vacuum oven at 150°C for 24 hours. The Lithium Chloride Solution is at or near saturation at 460 mM in Reagent B. If the solution is turbid or not all of the Lithium Chloride goes into solution with stirring (1 hour) then filter through a Whatman #1 filter paper before use. PREPARE FRESH.)
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REAGENTS:

D. 6.0 mM Suc-Ala-Leu-Pro-Phe-pNA Solution (Substrate)
   (Immediately before use, prepare 0.5 ml in Reagent C
   using Suc-Ala-Leu-Pro-Phe-pNA, Bachem Biosciences Inc.
   Keep on ice.)

E. 1 mM Hydrochloric Acid Solution (HCl)
   (Prepare 10 ml in deionized water using Hydrochloric
   Acid.)

F. Chymotrypsin Enzyme Solution (Chym)
   (Immediately before use, prepare a solution containing
   60 mg/ml of a-Chymotrypsin, in cold Reagent E.)

G. FK Binding Protein Solution (FKBP)
   (Immediately before use, prepare a solution containing
   1 unit/ml of FK Binding Protein in cold Reagent A.)

PROCEDURE:

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

<table>
<thead>
<tr>
<th></th>
<th>Test</th>
<th>Blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reagent A (Buffer)</td>
<td>0.865</td>
<td>0.875</td>
</tr>
<tr>
<td>Reagent G (FKBP)</td>
<td>0.01</td>
<td>-------</td>
</tr>
<tr>
<td>Reagent F (Chym)</td>
<td>0.10</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Mix by inversion and equilibrate to 1°C. Monitor the A$_{405\text{nm}}$
until constant, using a suitably thermostatted
spectrophotometer. Then add:

<p>| | |</p>
<table>
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</thead>
<tbody>
<tr>
<td>Reagent D (Substrate)</td>
<td>0.025 0.025</td>
</tr>
</tbody>
</table>

Immediately mix by inversion and record the increase in
A$_{405\text{nm}}$ for approximately 1 minute. Obtain the r A$_{405\text{nm}}$/minute
using the maximum linear rate for both the Test and Blank.
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CALCULATIONS:

\[
\text{Units/ml enzyme} = \frac{(r_{A_{405\text{nm}}/\text{min Test}} - r_{A_{405\text{nm}}/\text{min Blank}})(1)(df)}{(0.01)(9.3)}
\]

1 = Total volume (in milliliter) of assay
df = Dilution factor
0.01 = Volume (in milliliter) of FKBP used
9.3 = Millimolar extinction coefficient of p-Nitroaniline at 405 nm under the conditions of the assay

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

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

UNIT DEFINITION:

One unit will catalyze the isomerization of 1.0 micromole of Suc-Ala-Leu-cis-Pro-Phe-p-Nitroanilide to Suc-Ala-Leu-trans-Pro-Phe-p-Nitroanilide per minute at pH 8.0 at 1°C.

FINAL CONCENTRATION:

In a 1.00 ml reaction mix, the final concentrations are 44 mM HEPES, 88 mM sodium chloride, 0.15 mM Suc-Ala-Leu-Pro-Phe-p-nitroanilide, 12 mM lithium chloride, 2.5% (v/v) 2,2,2-trifluoroethanol, 0.1 mM hydrochloric acid, 6 mg chymotrypsin, and 0.01 unit FK-binding protein.

REFERENCE:


NOTES:

1. In order to dry Reagent B (TFE), add the calcium chloride and molecular sieves each, at a concentration of 10% (w/v).

2. The presence of Reagent C (LiCl/TFE) insures that the majority of the substrate is converted to the cis
isomer.
NOTES: (continued)

3. A sharp increase in absorbance ("burst phase") will occur almost instantly after addition of the substrate as the chymotrypsin hydrolyzes the excess trans isomer. The cis to trans conversion catalyzed by the FK Binding Protein is mostly linear within the first minute of the reaction after the "burst phase."

4. This assay is based on the cited reference.

This procedure is for informational purposes.