Enzymatic Reduction of S-Sulfoglutathione in Rat Liver

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Since the discovery of S-sulfoglutathione (GSSO₂H) in calf lens, little work on its biochemistry has been reported. Its presence in rat intestine has been demonstrated, and an enzyme catalyzing its reduction by NADPH has been purified from pea tissues. This communication describes the enzymatic reduction of GSSO₂H by rat liver homogenates.

Table 1. Reduction of S-sulfoglutathione by rat liver homogenates.

The reaction mixture contained in a final volume of 2 ml: 0.5 ml of a 20% rat liver homogenate in 0.14 M KCl; phosphate buffer 50 mM, pH 7.5; GSSO₂H 2.9 mM; and (where indicated) 2.3 mM NADPH. After incubation at 30° for 60 min, the reaction was stopped by the addition of 1 ml of 10% metaphosphoric acid. An aliquot of the centrifuged sample was passed through a Dowex 50 (H⁺) column and reduced by an electrolytical procedure. After bubbling with nitrogen for 15 min, the formed GSH (equivalent to the GSSO₂H in the sample) was determined with 5,5'-dithiobis-(2-nitrobenzoate). Boiling completely abolished the activity.

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Remaining GSSO₂H (mM)</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>2.6</td>
</tr>
<tr>
<td>2. (not incubated)</td>
<td>2.5</td>
</tr>
<tr>
<td>3. (plus NADPH)</td>
<td>0.6</td>
</tr>
<tr>
<td>4. (minus GSSO₂H)</td>
<td>0.04</td>
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</table>

The assay used was based on the determination of the GSSO₂H consumption in the system. This was accomplished by removing formed GSH from the reaction mixture by ion-exchange chromatography, followed by reduction of the remaining GSSO₂H to GSH, which was then determined. This procedure would not generally differentiate between an oxidative degradation (to give, e.g., the sulfonic acid, GSO₃H) and the proposed reduction of GSSO₂H. However, it has been demonstrated that GSSO₂H consumption is paralleled by a concomitant formation of GSH (to be published).

Since glutathione reductase from yeast or porcine erythrocytes does not catalyze the reduction of GSSO₂H (B. Eriksson, unpublished experiments), it is probable that the reductive destruction of GSSO₂H shown in Table 1 is due to an enzymatic activity distinct from glutathione reductase.


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Preparation of Sodium Polysulfides by Solid and Molten State Reactions

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In connection with the recent interest in kraft pulping in the presence of sodium polysulfides, a number of different methods for the preparation of polysulfides have been considered. These are: dissolution of elemental sulfur in aqueous sodium sulfide,1 oxidation of aqueous sodium sulfide either electrolytically,2 or with air in the presence of alkaline lignin degradation products.3 The possibility of making polysulfides by processing at elevated temperatures the sodium-sulfur compounds available in the recovery system of a kraft pulp mill (Na₂S, Na₂SO₃, Na₂S₂O₃) has not previously been considered. It is, however, known that polysulfides can be obtained.

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