

**Glycogen Synthase**  
**Microplate Assay Kit**  
**Cat #: orb707344 (manual)**

Detection and Quantification of Glycogen Synthase (GCS) Activity in Serum, Plasma, Tissue extracts, Cell lysate, Cell culture media and Other biological fluids Samples.

*For research use only. Not for diagnostic or therapeutic procedures.*

## INTRODUCTION

Glycogen synthase (EC 2.4.1.11) is a key enzyme in glycogenesis, the conversion of glucose into glycogen. It is a glycosyltransferase that catalyzes the reaction of UDP-glucose and  $(1, 4\text{-}\alpha\text{-D-glucosyl})_n$  to yield UDP and  $(1, 4\text{-}\alpha\text{-D-glucosyl})_{n+1}$ . In other words, this enzyme combines excess glucose residues one by one into a polymeric chain for storage as glycogen. Glycogen synthase concentration is highest in the bloodstream 30 to 60 minutes following intense exercise.

Glycogen Synthase Microplate Assay Kit is a sensitive assay for determining Glycogen synthase activity in various samples. Glycogen synthase activity is determined by NADH decomposition rate. The reaction products can be measured at a colorimetric readout at 340 nm.

**KIT COMPONENTS**

Component	Volume	Storage
96-Well Microplate	1 plate	
Assay Buffer	30 ml x 4	4 °C
Reaction Buffer I	5 ml x 1	4 °C
Substrate	Powder x 1	-20 °C
Reaction Buffer II	15 ml x 1	4 °C
Enzyme	Powder x 1	-20 °C
Standard	Powder x 1	-20 °C
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**Note:**

**Substrate:** add 1 ml Reaction Buffer I to dissolve before use.

**Enzyme:** add 1 ml Reaction Buffer II to dissolve before use.

**Standard:** add 1 ml distilled water to dissolve before use; then add 0.2 ml into 0.8 ml distilled water, the concentration will be 400 µmol/L.

**MATERIALS REQUIRED BUT NOT PROVIDED**

1. Microplate reader to read absorbance at 340 nm
2. Distilled water
3. Pipettor, multi-channel pipettor
4. Pipette tips
5. Mortar
6. Centrifuge
7. Timer
8. Ice

## SAMPLE PREPARATION

### 1. For cell and bacteria samples

Collect cell or bacteria into centrifuge tube, discard the supernatant after centrifugation, add 1 ml Assay buffer for  $5 \times 10^6$  cell or bacteria, sonicate (with power 20%, sonicate 3s, interval 10s, repeat 30 times); centrifuged at 10,000g 4 °C for 15 minutes, take the supernatant into a new centrifuge tube and keep it on ice for detection.

### 2. For tissue samples

Weigh out 0.1 g tissue, homogenize with 1 ml Assay buffer on ice, centrifuged at 10,000g 4 °C for 10 minutes, take the supernatant into a new centrifuge tube and keep it on ice for detection.

### 3. For liquid samples

Detect directly.

**ASSAY PROCEDURE**

Warm all reagents to 37 °C before use.

Add following reagents into the microplate:

Reagent	Sample	Standard	Blank
Reaction Buffer I	40 µl	--	--
Substrate	10 µl	--	--
Sample	10 µl	--	--
Mix, incubate at 37 °C for 5 mins.			
Standard	--	200 µl	--
Distilled water	--	--	200 µl
Reaction Buffer II	130 µl	--	--
Enzyme	10 µl	--	--
Mix, measured at 340 nm and record the absorbance of 10th second and 70th second.			

**Note:**

- 1) Perform 2-fold serial dilutions of the top standards to make the standard curve.
- 2) For unknown samples, we recommend doing a pilot experiment & testing several doses to ensure the readings are within the standard curve range. If the enzyme activity is lower, please add more sample into the reaction system; or increase the reaction time; if the enzyme activity is higher, please dilute the sample, or decrease the reaction time.

## CALCULATION

**Unit Definition:** One Unit of Glycogen Synthase activity is defined as the enzyme reduces 1 nmol of NADH per minute.

1. According to the protein concentration of sample

$$\begin{aligned} \text{GCS (U/mg)} &= (C_{\text{Standard}} \times V_{\text{Standard}}) \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / (V_{\text{Sample}} \times C_{\text{Protein}}) \\ & / T \\ & = 1600 \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / C_{\text{Protein}} \end{aligned}$$

2. According to the weight of sample

$$\begin{aligned} \text{GCS (U/g)} &= (C_{\text{Standard}} \times V_{\text{Standard}}) \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / (V_{\text{Sample}} \times W / \\ & V_{\text{Assay}}) / T \\ & = 1600 \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / W \end{aligned}$$

3. According to the quantity of cells or bacteria

$$\begin{aligned} \text{GCS (U/10}^4\text{)} &= (C_{\text{Standard}} \times V_{\text{Standard}}) \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / (V_{\text{Sample}} \times N / \\ & V_{\text{Assay}}) / T \\ & = 1600 \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / N \end{aligned}$$

4. According to the volume of sample

$$\begin{aligned} \text{GCS (U/ml)} &= (C_{\text{Standard}} \times V_{\text{Standard}}) \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) / V_{\text{Sample}} / T \\ & = 1600 \times (\text{OD}_{\text{Sample (10S)}} - \text{OD}_{\text{Sample (70S)}}) / (\text{OD}_{\text{Standard}} - \text{OD}_{\text{Blank}}) \end{aligned}$$

$C_{\text{Standard}}$ : the standard concentration, 400  $\mu\text{mol/L}$  = 400 nmol/ml;

$V_{\text{Standard}}$ : the volume of standard, 200  $\mu\text{l}$  = 0.2 ml;

$C_{\text{Protein}}$ : the protein concentration, mg/ml;

W: the weight of sample, g;

N: the quantity of cell or bacteria,  $N \times 10^4$ ;

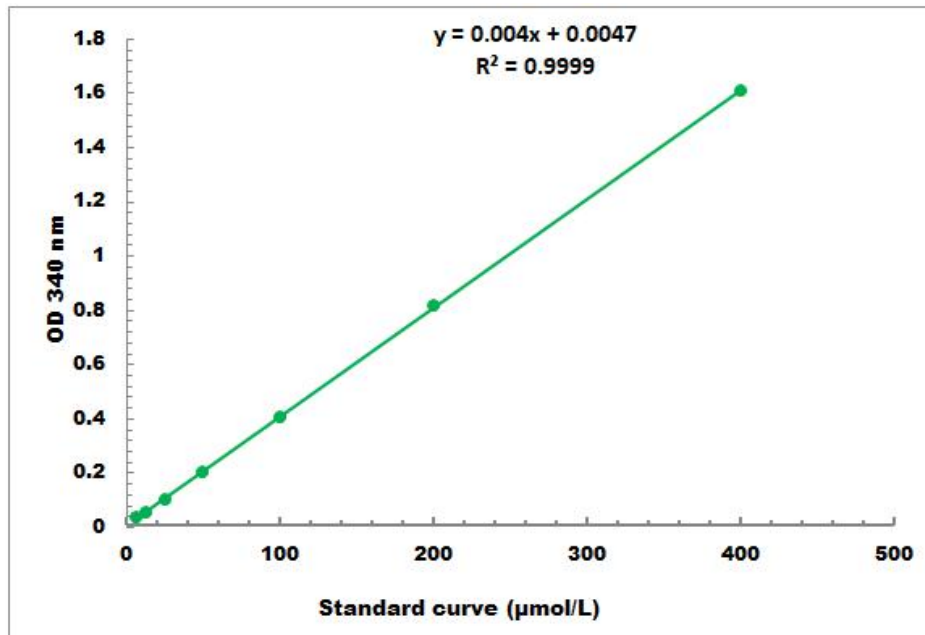
$V_{\text{Sample}}$ : the volume of sample, 0.01 ml;

$V_{\text{Assay}}$ : the volume of Assay buffer, 1 ml;

T: the reaction time in step 1, 5 minutes.

## TYPICAL DATA

The standard curve is for demonstration only. A standard curve must be run with each assay.



Detection Range: 4 µmol/L - 400 µmol/L