

## Product Information

### HMG-CoA Reductase Assay Kit

Catalog Number **CS1090**

Storage Temperature  $-70\text{ }^{\circ}\text{C}$

## TECHNICAL BULLETIN

### Product Description

3-hydroxy-3-methylglutaryl-CoA reductase (HMGR) is a transmembrane glycoprotein, located on the endoplasmic reticulum.<sup>1</sup> This enzyme catalyzes the four-electron reduction of HMG-CoA to coenzyme A (CoA) and mevalonate, which is the rate-limiting step in sterol biosynthesis.<sup>2</sup> The activity of HMGR is controlled through synthesis, degradation, and phosphorylation in order to maintain the concentration of mevalonate derived products. In addition to the physiological regulation of HMGR, the human enzyme has been targeted successfully by drugs in the clinical treatment of high serum cholesterol levels.<sup>3,4</sup> Controlling serum cholesterol levels has an important therapeutic role as hypercholesterolemia often leads to the development of atherosclerosis and consequently to cardiovascular pathologies, which might result in myocardial infarction and stroke. Recent evidence suggests that a disturbance of cholesterol homeostasis contributes to the development of a chronic inflammatory state.<sup>5</sup>

Reaction scheme of HMGR:



The HMGR Assay Kit is an important tool for the basic research of cholesterol and other related metabolic pathways. The kit is designed for the detection of HMGR activity. A major function of this kit is to screen for different inhibitors/activators of the purified catalytic subunit of the enzyme, which may play a crucial role in therapeutics. The assay is based on the spectrophotometric measurement of the decrease in absorbance at 340 nm, which represents the oxidation of NADPH by the catalytic subunit of HMGR in the presence of the substrate HMG-CoA.

### Reagents

The kit is sufficient for 30 assays of 1 ml or 100 assays of 200  $\mu\text{l}$ .

Assay Buffer, 5 $\times$ Catalog Number A5981	10 ml
NADPH Catalog Number N6505	25 mg
Substrate Solution (HMG-CoA) Catalog Number S7447	2 ml
HMG-CoA Reductase (catalytic domain) 0.50–0.70 mg/ml Catalog Number H8789	200 $\mu\text{l}$
Inhibitor Solution (Pravastatin) Catalog Number I5909	200 $\mu\text{l}$

### Equipment Required but Not Provided

- 1 ml spectrophotometer cuvette (quartz, Catalog Number S10C) or UV 96 well plate (Catalog Number CLS3635)
- UV/Vis Spectrophotometer

### Precautions and Disclaimer

This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

### Preparation Instructions

Use ultrapure water (17 M $\Omega$ -cm or equivalent) for the preparation of reagents and throughout the procedure.

1 $\times$  Assay Buffer - Dilute the Assay buffer, 5 $\times$  (Catalog Number A5981) 5-fold with ultrapure water (e.g., dilute 0.2 ml of Assay buffer, 5 $\times$  with 0.8 ml of ultrapure water). 1 ml of 1 $\times$  Assay Buffer is sufficient for 1 sample in a 1 ml cuvette assay or 5 samples using a 96 well plate. Keep on ice or store at  $-20^{\circ}\text{C}$  for further use. Keep the concentrated Assay Buffer, 5 $\times$  in working aliquots at  $-20^{\circ}\text{C}$ .

NADPH Reconstitution - Reconstitute the NADPH (Catalog Number N6505) with 1.5 ml of 1 $\times$  Assay Buffer. Mix well and store in working aliquots at  $-20^{\circ}\text{C}$ .

### Storage/Stability

The kit is shipped on dry ice and storage at  $-70^{\circ}\text{C}$  is recommended. Upon first use, store the components in working aliquots.

### Procedure

The enzyme and the substrate are less stable when added to the assay buffer. Hence, it is very important to add the different components according to the order mentioned in this procedure in order to obtain best results.

Thaw an aliquot of the HMG-CoA Reductase (HMGR) on ice and keep it cold throughout the procedure. Try not to keep it on ice for more than 60 minutes, since longer storage can result in reduction of enzyme activity.

All the other kit components can be thawed at room temperature and once thawed, should be kept on ice.

- Before beginning, set the spectrophotometer at  $37^{\circ}\text{C}$  and 340 nm, with a kinetic program:
  - 1 ml sample: read every 15 seconds for up to 5 minutes.
  - 96 well plate sample: read every 20 seconds for up to 10 minutes.

- Add appropriate volumes of the reaction solutions according to Table 1 (1 ml assay) or 2 (96 well plate).

**Table 1.**

Reaction volumes for 1 ml samples

Sample	1 $\times$ Assay buffer	Pravastatin	NADPH	HMG-CoA	HMGR
Blank	920 $\mu\text{l}$	–	20 $\mu\text{l}$	60 $\mu\text{l}$	–
Activity	915 $\mu\text{l}$	–	20 $\mu\text{l}$	60 $\mu\text{l}$	5 $\mu\text{l}$
Inhibition	910 $\mu\text{l}$	5 $\mu\text{l}$	20 $\mu\text{l}$	60 $\mu\text{l}$	5 $\mu\text{l}$

**Table 2.**

Reaction volumes for 96 well plate samples

Sample	1 $\times$ Assay buffer	Pravastatin	NADPH	HMG-CoA	HMGR
Blank	184 $\mu\text{l}$	–	4 $\mu\text{l}$	12 $\mu\text{l}$	–
Activity	182 $\mu\text{l}$	–	4 $\mu\text{l}$	12 $\mu\text{l}$	2 $\mu\text{l}$
Inhibition	181 $\mu\text{l}$	1 $\mu\text{l}$	4 $\mu\text{l}$	12 $\mu\text{l}$	2 $\mu\text{l}$

Add the reagents to the reaction (wells or cuvette) in the following order:

- Add the 1 $\times$  Assay buffer to all samples.
- Add the inhibitor (Pravastatin) to the inhibition sample.
- Add the reconstituted NADPH to all samples.
- Add Substrate Solution (HMG-CoA) to all samples.
- Add HMG-CoA Reductase (HMGR) to the Activity and Inhibition samples.
- Mix the samples thoroughly.

**Note:** When using a plate reader, shake the plate vigorously for at least 10 seconds before the first absorbance measurement.

- Start the kinetics program immediately. The  $A_{340}$  will decrease due to the decrease in NADPH concentration.

## Results

### Specific activity calculation

For an accurate calculation it is recommended to perform the assay in 1 ml samples.

Calculate the activity of the product according to the following equation:

$$\text{Units /mgP} = \frac{(\Delta A_{340}/\text{min}_{\text{sample}} - \Delta A_{340}/\text{min}_{\text{blank}}) \times \text{TV}}{12.44 \times V \times 0.6 \times \text{LP}}$$

Where:

**12.44** =  $\epsilon^{\text{mM}}$  - the extinction coefficient for NADPH at 340 nm is  $6.22 \text{ mM}^{-1}\text{cm}^{-1}$ . 12.44 represents the 2 NADPH consumed in the reaction.

**TV** = Total volume of the reaction in ml (1 ml for cuvettes and 0.2 ml for plates)

**V** = volume of enzyme used in the assay (ml)

**0.6** = Enzyme concentration in mg-protein (mgP)/ml (0.50–0.70 mgP/ml)

**LP** = Light path in cm (1 for cuvettes and 0.55 for plates)

Unit definition: One unit will convert 1.0  $\mu\text{mole}$  of NADPH to  $\text{NADP}^+$  per 1 minute at 37 °C. The unit specific activity is defined as  $\mu\text{mol}/\text{min}/\text{mg-protein}$  (Units/mgP).

## References

1. Koning, A.J., et al., Different subcellular localization of *Saccharomyces cerevisiae* HMG-CoA reductase isozymes at elevated levels corresponds to distinct endoplasmic reticulum membrane proliferations. *Mol. Biol. Cell*, **7**, 769-789 (1996).
2. Holdgate, G.A., et al., Molecular mechanism for inhibition of 3-hydroxy-3-methylglutaryl CoA (HMG-CoA) reductase by rosuvastatin. *Biochem. Soc. Trans.*, **31**, 528-531 (2003).
3. Istvan, E.S., et al., Crystal structure of the catalytic portion of human HMG-CoA reductase: insights into regulation of activity and catalysis. *EMBO J.*, **19**, 819-830 (2000).
4. Istvan, E.S., and Deisenhofer, J., The structure of the catalytic portion of human HMG-CoA reductase. *Biochim. Biophys. Acta*, **1529**, 9-18 (2000).
5. Kleemann, R., and Kooistra, T., HMG-CoA reductase inhibitors: effects on chronic subacute inflammation and onset of atherosclerosis induced by dietary cholesterol. *Curr. Drug Targets Cardiovas. Haemat. Disord.*, **5**, 441-453 (2005).

CAA,EB,MAM 01/11-1

Sigma brand products are sold through Sigma-Aldrich, Inc.

Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.