

## EnzyChrom™ Galactose Assay Kit (EGAL-100)

### Quantitative Colorimetric Galactose Determination

#### DESCRIPTION

**GALACTOSE** (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) is a monosaccharide that is found in dairy products, sugar beets, gums and mucilages. It is also synthesized in mammals, where it forms part of glycolipids and glycoproteins in several tissues. It forms the disaccharide lactose when combined with glucose. Simple, direct and high-throughput assays for galactose determination find wide applications. BioAssay Systems' assay uses specific enzyme-coupled reactions to form a colored product. The color intensity at 570nm or fluorescence intensity at 530nm/585nm is directly proportional to the galactose concentration in the sample.

#### KEY FEATURES

Use as little as 20  $\mu$ L samples. Linear detection range in 96-well plate: 10 to 1000  $\mu$ M galactose for colorimetric assays and 10 to 100  $\mu$ M for fluorimetric assays.

#### APPLICATIONS

**Direct Assays:** galactose in serum, plasma, urine, saliva, milk, culture medium and other biological samples.

**Drug Discovery/Pharmacology:** effects of drugs on galactose metabolism.

**Food and Beverages:** galactose in food and beverages products.

#### KIT CONTENTS

<b>Assay Buffer:</b> 10 mL	<b>Enzyme Mix:</b> Dried
<b>Dye Reagent:</b> 120 $\mu$ L	<b>Standard:</b> 1 mL

**Storage conditions.** The kit is shipped on dry ice. Store all components at -20°C. Shelf life of 12 months after receipt.

**Precautions:** reagents are for research use only. Normal precautions for laboratory reagents should be exercised while using the reagents. Please refer to Material Safety Data Sheet for detailed information.

#### COLORIMETRIC PROCEDURE

*Note: (1) glycerol and SH-containing reagents (e.g.  $\beta$ -mercaptoethanol, dithiothreitol) are known to interfere in this assay and should be avoided in sample preparation. (2) This assay is based on a kinetic reaction. To ensure identical incubation time, addition of Working Reagent to standard and samples should be quick and mixing should be brief but thorough. Use of a multi-channel pipettor is recommended.*

**Sample treatment:** serum and plasma samples can be assayed directly. Milk samples should be cleared by mixing 600  $\mu$ L milk with 100  $\mu$ L 6 N HCl. Centrifuge 5 min at 14,000 rpm. Transfer 300  $\mu$ L supernatant into a clean tube and neutralize with 50  $\mu$ L 6 N NaOH. The neutralized supernatant is ready for assay (dilution factor  $n = 1.36$ ).

1. Equilibrate all components to room temperature. Reconstitute the Enzyme mix with 120  $\mu$ L dH<sub>2</sub>O. Reconstituted Enzyme mix is stable for 3 months if stored at -20°C. During experiment, keep reconstituted Enzyme Mix in a refrigerator or on ice.

2. **Standards and samples:** prepare 400  $\mu$ L 1000  $\mu$ M Standard by mixing 40  $\mu$ L 10 mM standard with 360  $\mu$ L dH<sub>2</sub>O. Dilute standard in dH<sub>2</sub>O as follows.

No	1000 $\mu$ M STD + H <sub>2</sub> O	Vol ( $\mu$ L)	Galactose ( $\mu$ M)
1	100 $\mu$ L + 0 $\mu$ L	100	1000
2	80 $\mu$ L + 20 $\mu$ L	100	800
3	60 $\mu$ L + 40 $\mu$ L	100	600
4	40 $\mu$ L + 60 $\mu$ L	100	400
5	30 $\mu$ L + 70 $\mu$ L	100	300
6	20 $\mu$ L + 80 $\mu$ L	100	200
7	10 $\mu$ L + 90 $\mu$ L	100	100
8	0 $\mu$ L + 100 $\mu$ L	100	0

Transfer 20  $\mu$ L standards and 20  $\mu$ L samples into separate wells of a clear flat-bottom 96-well plate.

3. **Reaction.** For each reaction well, mix 85  $\mu$ L Assay Buffer, 1  $\mu$ L Enzyme Mix (*vortex briefly before pipetting*), and 1  $\mu$ L Dye Reagent in a clean tube. Transfer 80  $\mu$ L Working Reagent into each reaction well. Tap plate to mix. Incubate 20 min at room temperature.

4. Read optical density at 570nm (550-585nm).

#### FLUORIMETRIC PROCEDURE

For fluorimetric assays, the linear detection range is 10 to 100  $\mu$ M galactose. Prepare 100  $\mu$ M galactose standard by mixing 10  $\mu$ L 10 mM standard with 990  $\mu$ L H<sub>2</sub>O. Then dilute standards in H<sub>2</sub>O (see *Colorimetric Procedure*) to 100, 80, 60, 40, 30, 20, 10 and 0  $\mu$ M.

1. Transfer 20  $\mu$ L standards and 20  $\mu$ L samples into separate wells of a black 96-well plate.

2. Add 80  $\mu$ L Working Reagent, tap plate to mix. Incubate 20 min.

3. Read fluorescence at  $\lambda_{ex} = 530$ nm and  $\lambda_{em} = 585$ nm.

**Notes:** If the calculated galactose concentration of a sample is higher than 1000  $\mu$ M in colorimetric assay or 100  $\mu$ M in fluorimetric assay, dilute sample in water and repeat the assay. Multiply result by the dilution factor  $n$ .

#### CALCULATION

Subtract blank value (water, #8) from the standard values and plot the  $\Delta$ OD or  $\Delta$ RFU against standard concentrations. Determine the slope and calculate the galactose concentration of Sample,

$$\text{Colorimetry: } [\text{Galactose}] = \frac{\text{OD}_{\text{SAMPLE}} - \text{OD}_{\text{H}_2\text{O}}}{\text{Slope}} \times n \quad (\mu\text{M})$$

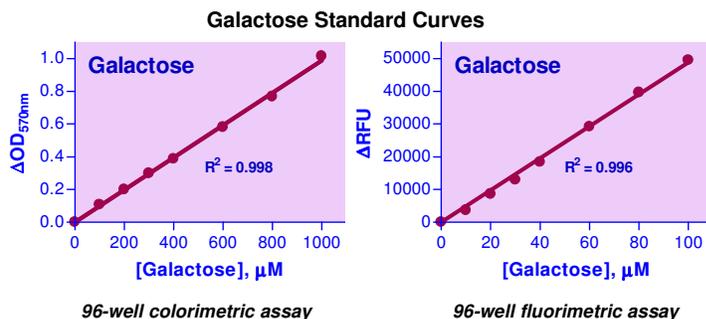
$$\text{Fluorimetry: } [\text{Galactose}] = \frac{\text{RFU}_{\text{SAMPLE}} - \text{RFU}_{\text{H}_2\text{O}}}{\text{Slope}} \times n \quad (\mu\text{M})$$

OD<sub>SAMPLE</sub>, OD<sub>H<sub>2</sub>O</sub> are optical density values of the sample and water. RFU<sub>SAMPLE</sub>, RFU<sub>H<sub>2</sub>O</sub> are fluorescence intensity values of the sample and water.  $n$  is the dilution factor.

**Conversions:** 1 mM galactose equals 18 mg/dL, 0.018% or 180 ppm.

#### MATERIALS REQUIRED, BUT NOT PROVIDED

Pipetting devices, centrifuge tubes, clear flat-bottom 96-well plates, optical density plate reader; black 96-well plates and fluorescence plate reader.



#### PUBLICATIONS

1. Ya-ting, S et al (2013). Development of a fed-batch cultivation for antibody-producing cells based on combined feeding strategy of glucose and galactose. *Biochemical Engineering Journal* 81: 126-135.

2. Shi, Jia, Yu Fu, and Xin-Huai Zhao (2018). Effects of Maillard-type caseinate glycation on the preventive action of caseinate digests in acrylamide-induced intestinal barrier dysfunction in IEC-6 cells. *RSC advances* 8.66: 38036-38046.

3. Xue, H. et al (2020). Lactose-Induced Chronic Diarrhea Results From Abnormal Luminal Microbial Fermentation and Disorder of Ion Transport in the Colon. *Frontiers in Physiology*, 11.

