

## Lactose Measurement in Cheese

### I. Introduction

Lactose concentrations in complex matrices such as cheese can be measured directly and quickly using the YSI Model 2700 Biochemistry Analyzer. Measurements are virtually unaffected by color, turbidity, density, pH, or the presence of reducing substances.

When a sample is injected into the sample chamber, the lactose diffuses into the membrane containing galactose oxidase. The lactose is immediately oxidized to hydrogen peroxide and a galactose dialdehyde derivative. The hydrogen peroxide is detected amperometrically at the platinum electrode surface. The current flow at the electrode is directly proportional to the hydrogen peroxide concentration, and hence to lactose concentration.

### II. Materials and Setup

- YSI Model 2700 Select Biochemistry Analyzer (single-channel or dual-channel) - equipped with a 2702 Galactose Oxidase Membrane and 2705 Buffer.
- Lactose standards (5.00 g/L, 25.0 g/L).
- Connect the Model 2700 to a suitable power source.
- Perform the instrument and membrane check described in the Operations Manual (Section 3).
- Volumetric glassware (Class A recommended).
- The following instrument setup is recommended:

Sample size:	25 µL
SamStation #	2
CalMethod	One Station

#### Black Probe Parameters

Chemistry	Lactose
Unit	g/L
Calibrator	5.00 g/L
End Point	30 Sec
CalStation#	1

#### White Probe Parameters

Single Channel	N/A
Dual Channel	None

#### Autocal Parameters

Sample Error	ON
Temperature:	1°C
Time	15 Min
Sample	5 Sam
Cal Shift	2%

### III. Limitations

Because galactose and other galactosides (raffinose, stachyose) are also substrates of galactose oxidase, the presence of these in the sample will interfere with this analysis.

### IV. Method

- Determine an appropriate dilution factor. The sample injected should contain 1 to 10 g/L lactose.
- Accurately weigh the cheese sample to be analyzed.  
Transfer the sample to a beaker and add approximately 50 mL deionized water.  
Stir the sample over low heat (~55°C) for 10 to 15 minutes.  
Transfer the sample to a 100 mL volumetric flask, using deionized water to aid in the complete transfer. Fill the flask to the mark with deionized water and invert to mix.
- Calibrate the 2700 Select with a 5.00 g/L lactose standard solution.
- Check the linearity of the membrane at least once a day by injection of a lactose linearity check solution (25.0 g/L). Refer to the Operations Manual (Section 3) for specifications.
- Assay the sample prepared in B by aspiration into the Model 2700. The linear range of the system is 0 to 25.0 g/L lactose. If the value reported exceeds this, further dilution is required.
- Calibration should be done frequently as described in the Operations Manual (Section 6).

### V. Calculations

To calculate % lactose, multiply the reported result by the appropriate dilution factor.

Example: 9.96 g of cheese was prepared as described. When assayed, the value reported was 2.16 g/L lactose.

% Lactose:

$$2.16 \text{ g/L} \times 0.100 \text{ L} / 9.96 \text{ g} = 0.0217 \text{ g lactose/g cheese}$$

$$= 2.17\% \text{ (w/w)}$$

### VI. Ordering Information

#### YSI No.

2700	Biochemistry Analyzer
2702	Galactose Oxidase Membrane Kit
2783	Lactose Standard Solution (5.00 g/L)
2784	Lactose Standard Solution (25.0 g/L)
2705	Buffer Kit
2392	NaCl Solution (for membrane installation)

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