

Lactose Measurement in Cheese

FOOD & BEVERAGE SERIES



Introduction

Lactose concentrations in complex matrices such as cheese can be measured directly and quickly using the [YSI Model 2900 Series 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.



a xylem brand

I. Materials & Setup

- A. YSI Series Biochemistry Analyzer equipped with a 2702 Galactose Oxidase Membrane and 2705 Buffer.
- B. Lactose standards (5.00 g/L, 25.0 g/L).
- C. Connect the 2900 Series instrument to a suitable power source.
- D. Perform the instrument and membrane daily checks described in the Operations Manual (Section 5).
- E. Volumetric glassware (Class A recommended).
- F. The following instrument setup is recommended:
Sample size: 25 μ L

Probe A Parameters

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

Autocal Parameters

Temperature	1 $^{\circ}$ C
Time	30 Min
Sample	5 Samples
Cal Shift	2%

II. 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.

III. Method

- A. Determine an appropriate dilution factor. The sample injected should contain 1 to 10 g/L lactose.
- B. 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 (\sim 55 $^{\circ}$ 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.
- C. Calibrate the 2900 Series instrument with a 5.00 g/L lactose standard solution.
- D. 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 5) for specifications.
- E. Assay the sample prepared in B by aspiration into the 2900 series instrument. The linear range of the system is 0.05 to 25.0 g/L lactose. If the value reported exceeds this, further dilution is required.
- F. Calibration should be done frequently as described in the Operations Manual (Section 7).

IV. 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.

$$\begin{aligned} \text{\% Lactose:} &= 0.0217 \text{ g lactose/cheese} \\ 2.16 \text{ g/L} \times 0.100 &= 2.17\% \text{ (w/w)} \\ \text{L/9.96 mg} & \end{aligned}$$

Ordering Information

YSI Part Numbers:

- 2900 Series Biochemistry Analyzer
- 2935 Opaque Buffer Bottle
- 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)



APPLICATION NOTE 206LS



YSI Life Sciences develops and manufactures scientific instruments, sensors and systems that serve a variety of scientific and industrial markets worldwide. YSI has a long history in the life sciences and bioanalytical markets, most notably with our introduction of the world's first commercial whole blood glucose analyzer in 1975. Today there are over 10,000 YSI instruments installed around the world, trusted in critical situations to provide the most accurate data in the shortest time.

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