



## DETERMINATION OF **WHEY PROTEINS** IN MILK SAMPLES

### INTRODUCTION

One of the tests for authenticity of milk and dairy foods is the qualitative and quantitative composition of whey proteins and their ratio.

Caseins dominate in cow's milk before its processing (about 80% of total protein), whereas caseins are almost absent in the whey composition whose main components are the following:

- $\beta$ -lactoglobulins,
- $\alpha$ -lactalbumin,
- bovine serum albumin,
- immunoglobulins,
- lactoferrin and other minor proteins.

It is known that the protein composition in heat treated (pasteurized or sterilized) milk substantially differs from that in raw milk. Of the two basic whey proteins it is  $\beta$ -lactoglobulin that is least resistant to heating. It has been ascertained that its content in powdered milk is small and decreases during long storage.

The method developed by Lumex researchers is intended for measuring weight concentration of proteins in whey using capillary electrophoresis (CE) technique. The obtained measurement results provide solutions of the following application tasks:

- record the whey protein pattern of cow's milk;
- reveal the presence of reconstituted milk in whole pasteurized milk;
- identify milk origin from various dairy cattle.

### MEASUREMENT METHOD

The method is based on preliminary preparation of the whey, its subsequent separation and quantitative determination of proteins using the CE technique. The proteins are detected at a wavelength of 205 nm. Borate buffer with Tween 20® polymer additive is used as a background electrolyte.

### MEASUREMENT RANGE

The measurement ranges of the weight concentrations of proteins in whey are listed in table below.

Component	Measurement range, g/l
$\alpha$ -lactalbumin ( $\alpha$ -LA)	0.01–100
$\beta$ -lactoglobulin A ( $\beta$ -LG A)	0.02–10
$\beta$ -lactoglobulin B ( $\beta$ -LG B)	0.02–10

### ADVANTAGES OF THE CE TECHNIQUE

As compared to chromatographic technique for determination of whey proteins, the CE technique shows the following advantages:

- short time of analysis;
- no need for costly chromatography columns (fused silica capillaries tens of times less expensive than specific HPLC columns are used in measurements);
- capability of determination of various  $\beta$ -lactoglobulin isoforms.

### EQUIPMENT AND REAGENTS

The following equipment and reagents are used in the measurements:

- CAPEL®-105M capillary electrophoresis system;
- $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin A,  $\beta$ -lactoglobulin B, bovine serum albumin;
- sodium hydroxide, reagent grade;
- hydrochloric acid, high purity grade;
- boric acid, reagent grade;
- Tween® 20.

Data acquisition, processing and output are performed using a personal computer running under WINDOWS® XP/Vista/7 operating system with installed dedicated software for data acquisition and processing.



EXAMPLES OF REAL ANALYSES

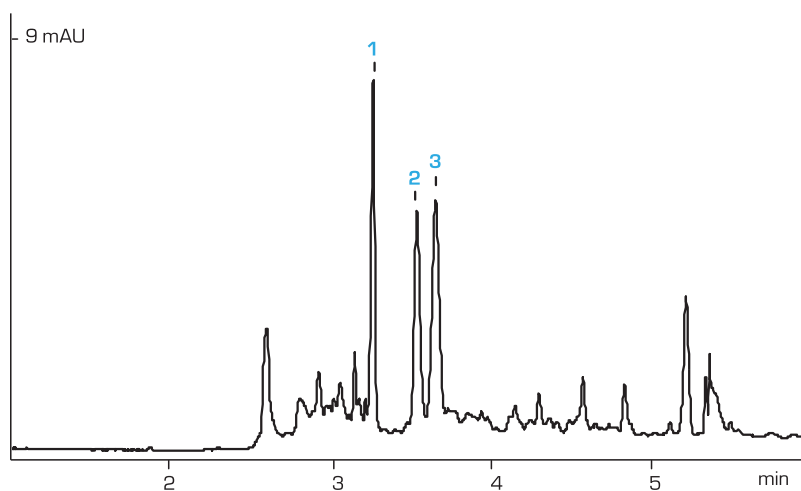
**SEPARATION CONDITIONS:**

**Buffer:** borate with Tween® 20 additive  
**Capillary:**  $L_{\text{eff}}/L_{\text{total}}$  40/50 cm, I.D. 50  $\mu\text{m}$   
**Sample injection:** 250 mbar\*s  
**Voltage:** +25 kV  
**Detection:** 205 nm

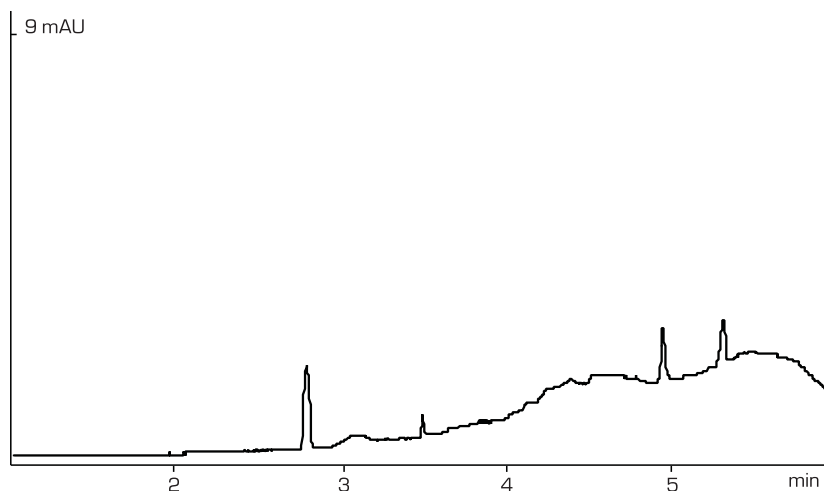
**Whey protein pattern of  
pasteurized milk**

**Measurement results (g/l):**

- 1 –  $\alpha$ -LA (1.9)
- 2 –  $\beta$ -LG B (1.1)
- 3 –  $\beta$ -LG A (1.5)



**Whey protein pattern of dried  
milk**



The contents of this paper are subject to change without notice.

The information in this leaflet is supplemental. To get more specific information on this method, please contact the developer of this method Lumex Instruments Ltd.

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