



Determination of **whey proteins** in milk

INTRODUCTION

The method developed by Lumex researchers is intended for determination of the mass concentration of whey proteins in **milk** by capillary electrophoresis (CE). 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.

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 from whey composition, the main components of which are the following:

- β -lactoglobulins,
- α -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, β -lactoglobulin is the least resistant to heating. It has been ascertained that its content in powdered milk is small and decreases during long storage.



MEASUREMENT METHOD

The method is based on preliminary preparation of whey, its subsequent separation, identification, and determination of analyzed components by capillary electrophoresis. The proteins are detected at a wavelength of 205 nm.

MEASUREMENT RANGE

The measurement ranges for the components are presented in the table below.

Component	Measurement range, mg/L
α -lactalbumin (α -LA)	0.01–100
β -lactoglobulin A (β -LG A)	0.02–10
β -lactoglobulin B (β -LG B)	0.02–10

ADVANTAGES OF THE CE METOD

As compared to chromatographic technique for whey proteins determination, the CE metod 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 used in measurements);
- capability of determination of various β -lactoglobulin isoforms.

EQUIPMENT AND REAGENTS

The following equipment and reagents are used in the measurements:

- Capel capillary electrophoresis system;
- α -lactalbumin, β -lactoglobulin A, β -lactoglobulin B;
- sodium hydroxide, ≥ 98 %;
- hydrochloric acid, 36.5-38 %;
- boric acid, ≥ 98 %;
- Tween® 20.

Data acquisition, collection, processing, and output are performed using a personal computer running under Windows® operating system with Elforun software installed.

EXAMPLES OF REAL ANALYSES

BGE: borate with Tween® 20

Capillary: $L_{\text{eff}}/L_{\text{tot}}$ 40/50 cm, ID 50 μm

Sample injection: 250 mbar \times s

Voltage: 25 kV

Detection: 205 nm

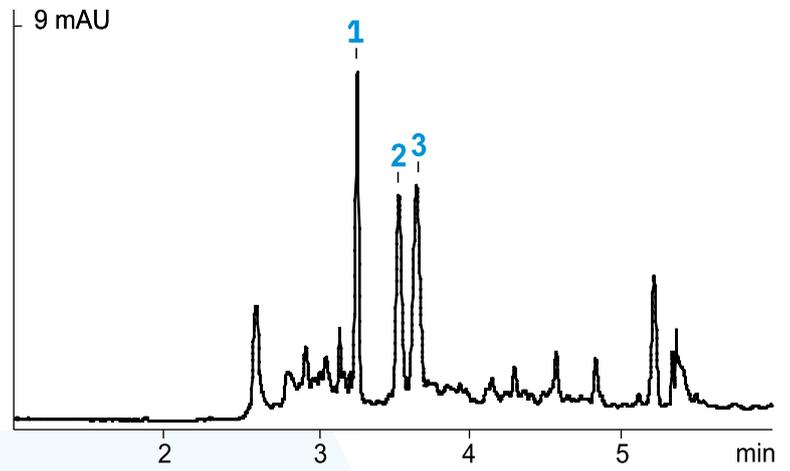
Sample: pasteurized milk

Found (g/L):

1 – α -LA (1.9)

2 – β -LG B (1.1)

3 – β -LG A (1.5)



Sample: dried milk

