ANALYTICAL METHODS FOR MILK RECORDING ANALYSIS

This document presents a summary of methods and instruments available for milk recording purposes. It is a part of the annexes of ICAR Guidelines for DHI analysis but for reason of convenience, it is aimed at presenting it separately so as to enable regular updates with the evolution of analytical method standardisation.

From the last version of 2001, the parts referring to reference methods and other chemical methods have been updated with the material of the international ISO|IDF standardisation whereas the information about the routine methods at first established from the replies to enquiries in ICAR countries has been complemented with new methods validated by national bodies of ICAR members and results published. Methods/instruments not produced or used any longer are given for information only and therefore printed in *Italic characters*.

Disclaimer : Part IV of the following list has only an informative objective by ICAR and in no case can constitute a kind of international approval by ICAR.

I - INTERNATIONAL REFERENCE METHODS

FAT

Gravimetric method (Röse-Gottlieb)	ISO 1211 | IDF 1 AOAC 905.02 (IDF-ISO-AOAC-Codex)
Gravimetric method (modified Mojonnier)	AOAC 989.05 (IDF-ISO-AOAC)

PROTEIN:

Titrimetric method (Kjeldahl)	ISO 8968 | IDF 20 AOAC 991:20 (IDF-ISO-AOAC) AOAC 991:21 AOAC 991:22 (IDF-ISO-AOAC) AOAC 991:23 (IDF-ISO-AOAC-Codex)

CASEIN:

Titrimetric method (Kjeldahl)	ISO 17997 | IDF 29 AOAC 927.03 AOAC 998.05 AOAC 998.06 AOAC 998.07

LACTOSE:

HPLC method is foreseen to provide the reference to routine methods by ISO | IDF and its international standardisation is underway (ISO CD 22662 | IDF 198). In the meantime, standardised methods as referred to in "Part II, Other methods" can be used.

UREA:

Differential pH-method (Reference method)	ISO 14637 | IDF 195

SOMATIC CELL COUNT:

Microscope method (Reference method)	ISO 13366-1 | IDF 148

II - OTHER METHODS (SECONDARY REFERENCE)

FAT:	
Butyrometric method (Gerber)	ISO 2446
	AOAC 2000.18
Babcock	AOAC 989.04
PROTEIN:	
Dye-binding (Amido Black)	ISO 5542 | IDF 98
	AOAC 975.17 (IDF-ISO-AOAC)
Dye-binding (Orange 12)	AOAC 967.12
Dumas method	ISO 14891
LACTOSE:	
Enzymatic	ISO 5765 | IDF 79
	AOAC 984.15
Gravimetric	AOAC 930.28
Polarimetric	AOAC 896.01

Under standardisation:

High Performance Liquid Chromatography	ISO CD 22662 | IDF 198
Differential pH-method	ISO WD | IDF (working draft)

III - STANDARDIZED ROUTINE METHODS

FAT:	
Automated turbidimetric I	AOAC 969.16
Automated turbidimetric II	AOAC 973.22
PROTEIN:	
Automated dye-binding (Amido Black)	AOAC 975.17 (FIL-ISO-AOAC)
FAT-PROTEIN-LACTOSE:	
Mid infra red (MIR) spectrometric	ISO 9622 | IDF 141 AOAC 972.16
UREA:	(taken into account with the underway revision of ISO 9622 | IDF 141)
SOMATIC CELL COUNT:	
Electronic particle counter (Coulter Counter)	(no longer taken into account with the underway revision of ISO 13366 | IDF 148)
Fluoro-opto-electronic method (Rotating disk)	ISO 13366-3 | IDF 148 AOAC 978.26
Fluoro-opto-electronic method (Flow cytometry)	(taken into account with the underway revision of ISO 13366 | IDF 148)

IV - INSTRUMENTAL ROUTINE METHODS USED IN ICAR COUNTRIES

(List drawn up with answers to ICAR questionnaires of 1994 and 1996, and supplemented with new validated analysers)

FAT:

Turbidimetric method:	*MilkoTester (Foss Electric, DK)*

FAT and PROTEIN:

Turbidimetric/Dye-binding:	*MTA-PMA (Foss Electric, DK)*

FAT, PROTEIN (and LACTOSE):

- Mid infra-red spectrometry:

* Milkoscan (Foss Electric,DK) :	*102, 103, 104, 104 (A/B)* 133 A, 133 B, 134 (A/B) *203 A, 203 B, 300* *255 (A or B),* 605 (A or B) Series 4000 (A or B) FT 120 (FTIR) FT 6000 (FTIR)
** Multispec (Multispec ,UK):*	*MK 1* *MK 2* *Micro-null*
* Bentley (Bentley, USA):	150 2000 (A or B)
* Lactoscope (Delta Instruments):	*300, 550, 750* Filter Automatic 200 Filter Automatic 400 FTIR Auto 400
** Aegys (Anadis Instruments, F):*	*MI 600 (FTIR)*

UREA:

- Colorimetric methods:
  * 1-4 paradimethylaminobenzaldehyde method (DMAB)
  * Diacetyl monoxime method (DAM)

- Automated enzymatic methods:

* Conductimetry :	Beckmann, BUN Analyser
* Differential pH-metry **:**	Eurochem, CL 10
	Hamilton, E.F.A.
* UV-photometry :	Flow injection analysis (FIA).
* Visible-photometry :	Chemspec 150 (Bentley, USA)
	Skalar Segmented flow analysis

- Mid Infra-Red Spectrometry :

* Milkoscan (Foss Electric,DK)	4000
	FT 120 (FTIR)
	FT 6000 (FTIR)
***** Lactoscope (Delta Instruments):	FTIR Auto 400

SOMATIC CELL COUNT:

- Particle counting : * *Coultronic (UK):* *Coulter Counter*

- Fluoro-opto-electronic :

>Disk cytometry :	* Foss Electric (DK):	Fossomatic	90, *180, 215,* 250, 360, 400
> Flow cytometry :	* *Anadis (F):*	*Somatic Cell Counter*	*300, 500*
	* Bentley (USA):	Somacount	150, 300, 500
	* *Chemunex (D):*	*Partec CA 11*	
	* Delta Instruments (NL):	Somascope	MKII Manual MKII Auto 200 MKII Auto 400
	* Foss Electric (DK):	Fossomatic	5000