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EXPERTISE ET CONTROLE DES ANALYSES LAITIERES

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EVALUATION OF THE BENTLEY FCM™ SOMATIC CELL COUNTER ON COW'S MILK

The Somacount FCM, manufactured and distributed by Bentley Instruments, is an apparatus for the enumeration of somatic cells in milk using a fluoro-opto-electronic method: firstly, the test sample is mixed with a dye (buffered detergent solution of ethydium bromide) in order to disperse fat globules and to stain the nuclei of the somatic cells. An aliquot is then injected into a laminar flow carrier fluid. The stained cells are separated by the flow and exposed to a laser beam. The fluorescent light emitted by the somatic cells is then detected and amplified by a photomultiplier tube. Intensities above a specific threshold are counted. This light intensity is then converted into a cell concentration using a calibration equation.

The instrument is composed of two separate counting units which work alternately (Blue/red channel). The signal is processed by a computer connected to the apparatus.

The tests:

The evaluation tests were carried out in Actilait-Cecalait's physico-chemistry laboratory (reference and instrumental analyses) from December 2009 to February 2010. The repeatability and the accuracy were evaluated.

The criteria for evaluating the estimated parameters were taken from ISO 13366-2/IDF 148: 2007, or from the CNIEL/IE handbook concerning the use of somatic cell counters within the context of milk payment and milk control in France.

The following instrumental parameters were used:
- Rate: 500 samples / hour;
- No contamination adjustment;
- Use in combined mode with the Bentley FTS infrared analyser (draining assistance).

1- Samples

The tests were carried on 100 milk samples from 4 farms in Jura. Bronopol was added to the samples to give a final concentration of 0.02%.

2- Repeatability

2.1- Procedure

The repeatability of the instrument was evaluated using all the milk samples. The quantitative determination was carried out in automatic analysis mode, in duplicate for each set of 10 samples according to the following sequence: (Set 1 rep 1 – Set 1 rep 2 – Set 2 rep 1 – Set 2 rep 2…Set n rep 1 – Set n rep 2). A control milk was analysed every 30 samples to check the stability of the analyser.

2.2- Results

The results obtained are summarised in the table below.

	n	Min	Max	M	Sx	Sr	Sr (%)	r
RED CHANNEL	112	4	1225	105	175	7,1	6,7	20
BLUE CHANNEL	112	4	1280	111	180	5,9	5,3	16

Table 1: FCM repeatability criteria on cow's milk samples
n: number of results; min and max: minimum and maximum value; M and Sx: mean and standard deviation of the results; Sr and Sr%: absolute and relative standard deviation of repeatability; r: maximum deviation of repeatability in 95% of cases.

2.3- Conclusion

The standard deviations of repeatability Sr and Sr% observed are in agreement with the recommendations of the CNIEL/IE handbook which fixes a maximum limit of 15.10^3/ml and 10% (level 100.10^3/ml) and of the standard NF EN ISO 13366-2/FIL 148 which fixes a maximum limit of 6% (average level 150.10^3/ml).

3- Accuracy

3.1- Procedure

The accuracy of the analyser was evaluated using 110 samples. The quantitative analyses were carried out in accordance with the evaluation of the repeatability (cf 2.1). The evaluation concerned the values obtained after calibration of the instrument with commercial SRMs (cow's milk) produced by Actilait-Cecalait.

The reference method ISO 13366-1/IDF 148: 2007 (microscopic method) was used for the enumeration of the somatic cells.

The samples were also analysed using the Bentley Somacount 150 (SCC150), previously calibrated with the same SRMs (single test).

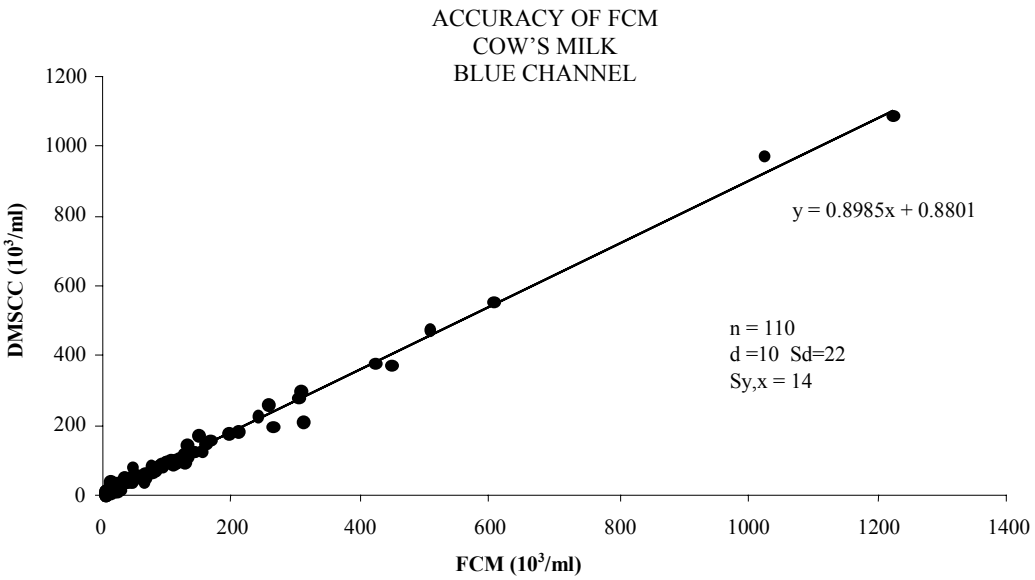
3.2- Results

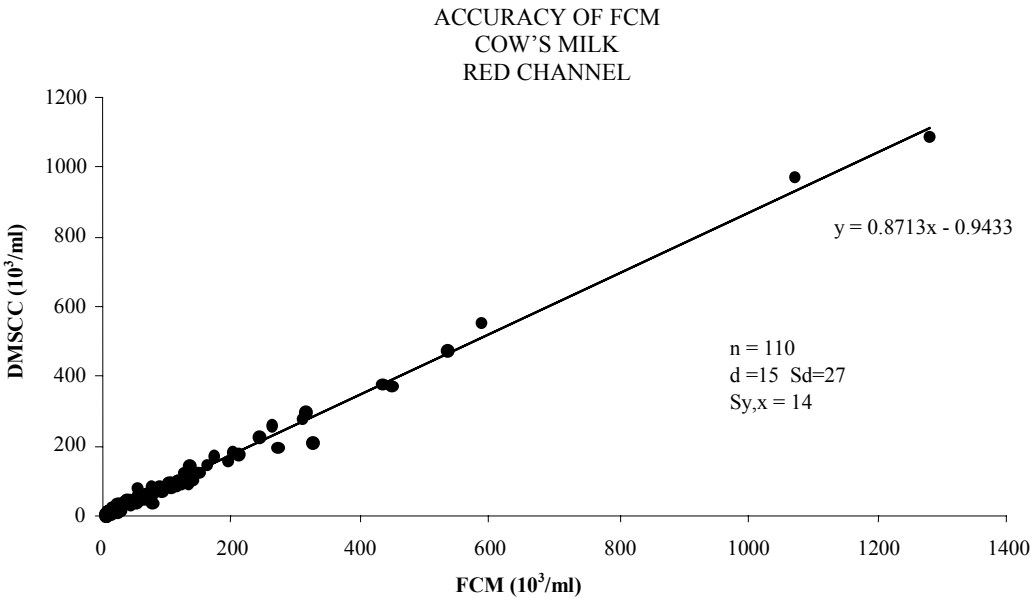
The results obtained are summarised in the table and figures below.

	BLUE CHANNEL	RED CHANNEL	SCC 150	Red channel /SCC 150
n	110			110
min	1			1
max	1087			1248
Y (10^3/ml)	96			109
X (10^3/ml)	106	111	109	106
Sy (10^3/ml)	159			184
d (10^3/ml)	10	15	13	-3
Sd (10^3/ml)	22	27	29	12
Sy,x	14	14	14	10
Sy,x (%)	14.8	14.7	14.2	9.2
b	0.899	0.871	0.859	1.045
a	1	-1	2	-2

Table: FCM accuracy criteria on cow's milk samples

n, min, max: number of results, minimum and maximum value; Y,X: mean of the results using the reference and instrumental methods; Sy: standard deviation of the results from the reference method; d, Sd: mean and standard deviation of deviations; Sy,x (Sy,x%): absolute and relative residual standard deviation; b, a: slope and intercept; Sy,x' (Sy,x'%): absolute and relative standard deviation forced through zero; b': slope forced through zero





Figures 1 and 2: Relationship between the FCM and reference results on cow's milk samples

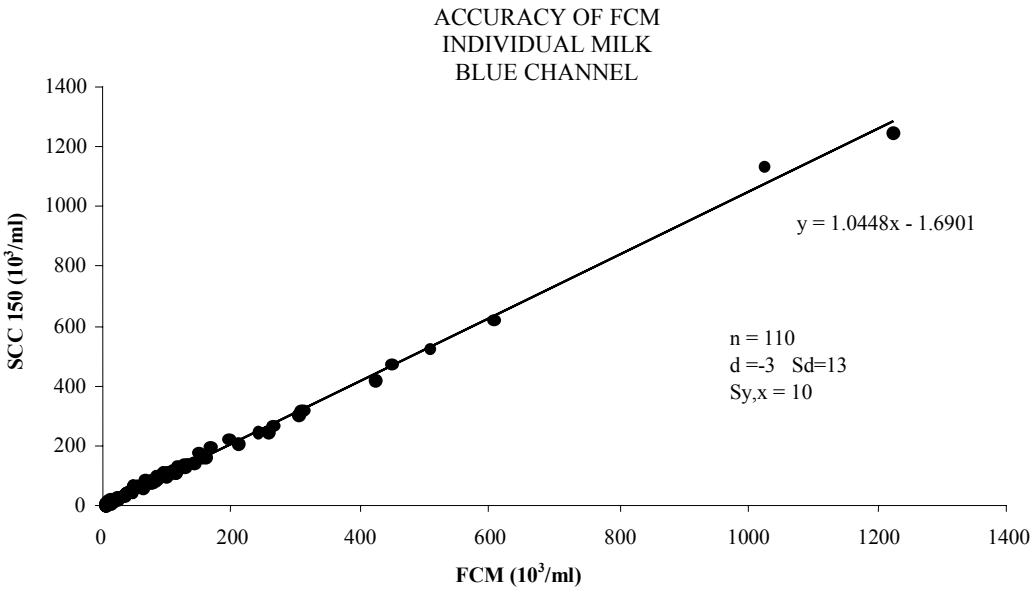


Figure 3: Relationship between the results of the FCM and the SCC 150 on cow's milk samples (regression forced through zero)

It can be noted that the means and standard deviations of deviations are similar between the two channels and are respectively around 13.10^3/ml and 25.10^3/ml. The regression lines are significantly different from 1.00 (P = 1%). The residual standard deviations (about 14.10^3/ml, relative 15%) are equivalent. The FCM results are very close to the values obtained with the SCC 150 analyser (a = 1.04 ; b = - 1.7 ; Sy,x =10, d = -3).

3.3- Conclusion

With no regulations for milk payment or standards, it can however be noted that the slope obtained is significantly different from 1.00 for the FCM and the Somacount 150. The origin of this deviation could be due to the relatively low cell count of the samples used in this study (average 96.10^3/ml). In comparison with the reference values, the absolute deviations remain low, approximately 10.10^3/ml.

The comparison of the FCM with another instrument (Bentley Somacount 150) calibrated in the same conditions produced satisfactory results with a slope and an intercept not significantly different from 1.00 and 0.00 respectively.

Phase I of the evaluation of the FCM within the context of milk payment and control (cow, goat, ewe) was validated by the Scientific and Technical Committee of the French Ministry of Agriculture.

According to the evaluation report of the Bentley FCM™ somatic cell counter on cow's milk – X. QUERVEL et Ph. TROSSAT – Actilait / Cecalait – April 2010

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STANDARDS, DRAFT STANDARDS

Classification in alphabetical order of theme

ISO standards under development

SENSORY ANALYSIS		
METHODOLOGY	ISO/DIS 3972 July 2010	SENSORY ANALYSIS Methodology – Method of investigating sensitivity of taste

ISO published standards

FOOD MICROBIOLOGY		
SAMPLE PREPARATION	ISO 6887-5:2010 August 2010	FOOD MICROBIOLOGY Preparation of test samples, initial suspension and decimal solutions for microbiological examination - Part 5: specific rules for the preparation of milk and milk products
MILK		
LACTOSE CONTENT	ISO 26462 (IDF 214) June 2010	MILK Determination of lactose content – Enzymatic method using difference in pH
MILK AND MILK PRODUCTS		
ANTIBIOTICS	ISO 10932 (IDF 223) June 2010	MILK AND MILK PRODUCTS Determination of the minimal inhibitory concentration (MIC) of antibiotics applicable to bifidobacteria

NEW EU REGULATIONS

Classification is established in alphabetical order of the first keyword

GEOGRAPHICAL INDICATIONS / DESIGNATIONS OF ORIGIN

O.J.E.U. C 188, 13th July 2010 – Publication of an application pursuant to Article 6 (2) of Council Regulation (EC) no 510/2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs [Oravsky Korbacik (PGI) (cheese)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:188:0015:0019:EN:PDF

O.J.E.U. C 188, 13th July 2010 – Publication of an application pursuant to Article 6 (2) of Council Regulation (EC) no 510/2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs [Zazrivsky Korbacik (PGI) (cheese)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:188:0020:0023:EN:PDF

O.J.E.U. L 186, 20th July 2010 – Commission Regulation (EU) no 634/2010 of 19 July 2010 entering a name in the register of protected designations of origin and protected geographical indications [Ricotta di Bufala Campana (PDO) (cheese)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:186:0014:0015:EN:PDF

O.J.E.U. C 202, 24th July 2010 – Publication of an application pursuant to Article 6 (2) of Council Regulation (EC) no 510/2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs [Tekovsky Salamovy Syr (PGI) (cheese)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:202:0008:0012:EN:PDF

O.J.E.U. L 203, 4th August 2010 – Commission Regulation (EU) no 698/2010 of 4 August 2010 entering a name in the register of protected designation of origin and protected geographical indications (Mâconnais (PDO)).
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:203:0003:0004:EN:PDF

STANDARDS - REGULATIONS

O.J.E.U. L 203, 4th August 2010 – Commission Regulation (EU) no 702/2010 of 4 August 2010 entering name in the register of protected designations of origin and protected geographical indications (Olomoucké tvarůžky (PGI))
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:203:0011:0013:EN:PDF

O.J.E.U. L 208, 6th August 2010 – Commission Regulation (EU) no 710/2010 of 6 August 2010 entering a name in the register of protected designation of origin and protected geographical indications (Podkarpacki miód spadziowy (PDO))
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:208:0001:0002:EN:PDF

O.J.E.U. C 212, 5th August 2010 – Publication of an amendment application pursuant to Article 6(2) of Council Regulation No 510/2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:212:0009:0015:FR:PDF

O.J.E.U. L234, 4th September 2010 – Commission regulation (EU) no 783/2010 of 3 September 2010 entering a name in the register of protected designation of origin and protected geographical indications [Queso de Flore Guía/Queso de Meia Flor de Guía/Queso de Guía (PDO)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:234:0003:0004:FR:PDF

O.J.E.U. L234, 4th September 2010 – Commission regulation (EU) no 783/2010 of 3 September 2010 entering a name in the register of protected designation of origin and protected geographical indications [Hessischer Handkäse ou Hessischer Handläs (PGI)]
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:234:0005:0006:FR:PDF

HYGIENE

O.J.E.U. L 175, 10th July 2010 – Commission Regulation (EU) no 605/2010 of 2 July 2010 laying down animal and public health and veterinary certification conditions for the introduction into the European Union of raw milk and dairy products intended for human consumption
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:175:0001:0024:EN:PDF

PESTICIDES

O.J.E.U. L 174, 9th July 2010 – Commission Regulation (EU) no 600/2010 of 8 July 2010 amending Annex I to Regulation (EC) n° 396/2005 of the European Parliament and of the Council as regards additions and modification of the examples of related varieties or other products to which the same MRL applies
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:174:0018:0039:EN:PDF

O.J.E.U. L 220, 21st August 2010 – Commission regulation (EU) no 750/2010 of 7 July 2010 amending Annexes II and III to Regulation (EC) n° 396/2005 of the European Parliament and of the Council as regards maximum residue levels for certain pesticides in or on certain foods
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:220:0001:0056:EN:PDF

O.J.E.U. L 226, 28th August 2010 – Commission regulation (EU) no 765/2010 of 25 August 2010 amending Annexes II and III to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum levels for chlorothalonil, clothianidin, difenconazole, fenhexamid, flubendiamide, nicotine, spirotetramat, thiacloprid and thiamethoxam in or on certain products.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:226:0001:0037:EN:PDF

BOOKSHOP: LATEST PUBLICATIONS

The classification in alphabetical order of the first keyword allows you to consult the references according to your interests. You can find out more or order the book via the website.

MILK AND DAIRY PRODUCTS

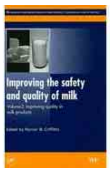
LAW B.L.; TAMIME A.– **Technology of Cheesemaking, 2nd Edition** – Edition Wiley Euorpe – July 2010 – ISBN 978-1-4051-8298-0 – 512 pages

http://eu.wiley.com/WileyCDA/

This fully revised version looks at the science and technology of cheesemaking with particular emphasis on the technology. Developments in terms of research are also covered including areas such as molecular genetics, enzymology and flavour chemistry as well as new issues concerning packaging and handling of milk before cheesemaking.

QUALITY

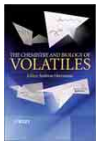
GRIFFITHS M. – **Improving the Safety and Quality of Milk: Volume Two, Improving Quality in Milk Products** – Edition CRCPress – May 2010 – ISBN 978-1-439-83639-2



This second volume covers the sensory and nutritional quality of cow's milk. The first section deals with the health aspects of milk. In the second section, aspects concerning milk quality such as microbial and chemical spoilage, sensory evaluation and factors influencing the vitamin and mineral content are reviewed. And finally, the third part deals with the improvement of particular products.

HERRMANN A. – **The chemistry and Biology of Volatiles** – Edition Wiley Europe – August 2010 - ISBN 978-0-470-77778-7 – 428 pages

http://eu.wiley.com/WileyCDA/



This book looks at volatile molecules from an interdisciplinary point of view. Several topics are reviewed including the bio-generation and analysis of volatiles and the generation of flavours and food aroma compounds.

IN THE PRESS – ON THE WEB

Classification in alphabetical order of keywords

MELAMINE

Codex sets limits for melamine and aflatoxin in food

http://www.foodproductiondaily.com/content/view/print/311166

► At the World Health Organisation annual food safety summit in Switzerland, the 130 members of the Codex Alimentarius Commission agreed to set the threshold for melamine in food at 2.5 mg/kg, while the permitted level for infant formula milk was set at 1 mg/kg.

New test detects melamine in milk products

http://www.foodsafety.com/2010/08new-test-detects-melamine-in-milk-products/

► Chinese scientists have developed a quick and simple colour change test to detect melamine in milk products.

METALS

Concern over aluminium levels in infant formula

http://www.foodproductiondaily.com/Quality-Safety/Study-raises-concerns-over-aluminium-levels-in-infant-formula

► A study from Keele University on powdered infant formula has brought to light significantly higher levels of aluminium in infant formula compared to breast milk.

MILK QUALITY

New milk quality biomarker

http://www.scientistlive.com/European-Food-Scientist/Food_Safety/

► Much attention has been drawn to milk quality tests in China following problems concerning the contamination of baby formula milk powder. Findings by researchers published in *Cell Research* could lead to a new standard for milk quality control.

STANDARDISATION

Codex Alimentarius Commission

http://www.codexalimentarius.net/web/archives.jsp?lang=en

► Report from the 33rd session of the Codex Alimentarius commission held from 5-9 July in Geneva, Switzerland.

STAPHYLOCOCCUS AUREUS

New version of ChromID MRSA

http://www.laboratorytalk.com/news/byx/byx138.html

► Biomérieux has launched a new version of ChromID MRSA with a maximum read time of 24 hours in comparison with 48 hours for the previous version.

FORTHCOMING EVENTS

Classified in chronological order

17-21 October 2010 Paris Nord Villepinte, France	World food process exhibition 2010	http://www.ipa-web.com
8-11 November, Auckland, New Zealand	2010 IDF World Dairy Summit	www.wds2010.com
22-25 novembre Paris Nord Villepinte, France	Packaging Exhibition 2010	http://www.emballageweb.com

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