EVALUATION OF THE BACTOSCAN FC : SUMMARY

Bactoscan FC by Foss Electric is a bacterial counter in raw milk. It is based upon flow cytometry and detects bacteria by epifluorescent microscopy. Its characteristics were evaluated by CECALAIT from February to April 1998. Tests were made on unheated samples and checked following points : stability, carry over, linearity, detection limits, repeatability, accuracy, according to standards IDF 100B:1991, IDF 128:1985, IDF 135B:1991, IDF 161A:1995 and AFNOR V03-110.

- Stability during one day was good, even better than previous counters like Bactoscan 8000. Stability during a few days was also good.

- Carry-over between samples was less than 0,4 %. The linearity of the counter was good in the whole tested range, that means from 0.6 to 6000 10^3 CFU/ml. Detection limits were in the range 940 to 1900 CFU/ml.

- Repeatability was tested by analyzing automatically 51 samples of herd milk twice each. Results were given in tables 1 and 2 (see your La Lettre de CECALAIT, n° 26).

Both tables showed Sr ≈ 0.054 log, which is significantly lower than the values recommanded in the French milk payment system for bacterial enumeration.

Here is the translation of the legends

Table 1 : repeatability according to IDF 128

Table 2 : repeatability with another presentation of the classes in order to allow comparison with previous results on Bactoscan 8000

First column in tables 1 and 2 : classes in CFU/ml or (Log transformed)

CFU : colony forming unit

Second column in tables 1 and 2 : n : number of samples

Third column in tables 1 and 2 : mean value in Log

Fourth column in tables 1 and 2 : Sr in Log, repeatability standard deviation (r = 2.77 Sr, with r : repeatability)

Fifth column table 1 : GRSDr in % : geometric relative standard deviation, with GRSDr given by the formula GRSDr = $(10^{Sr} - 1) \times 100$

For example, if Sr = 0.07, then GRSDr = $(10^{0.07} - 1) \times 100 = 17.5$ % so the range of variation of the original results about the geometric mean will be "mean" x (100 + 17.5) = "mean" x 1.175 and "mean" / (100 + 17.5) / 100 = "mean" / 1.175

Sixth column of table 1 : RD95 in % : critical relative difference between two measurements, with RD95 given by the formula RD95 = $(10^{2.8Sr} - 1) \times 100$

RD95 indicates that between two measurements under conditions of repeatability, the highest result should not exceed the lowest by more than RD95 in 95 % of cases. For example, if Sr = 0.07, then RD95 = $(10\ 2^{8x0.07} – 1)$ = 57 %. So if the lowest result is 100000 CFU/ml, the highest should be lower than 157000 CFU/ml in 95 % of cases

Fifth column in table 2 : Sr in Log, repeatability standard deviation in the reference method

Sixth column in table 2 : Sr in Log, repeatability standard deviation, concerning BSC 8000, given in the article written by Dasen and al. in 1991. (see the bibliography at the end of the article in La Lettre de CECALAIT n° 26)

◆ Accuracy was estimated by using 450 samples of herd milk. They were analyzed twice with the Bactoscan and just after, twice using reference method.

Values were log transformed. Simple linear regression gave the following equation

Log (reference) = 0.757 x Log (Bactoscan FC) + 0.656

with Sy,x = 0.301, the residual regression standard deviation.

The slope, the ordinate at the 0 abscissis and mean of the standard deviations were all significantly different from 0. So calibration is necessary before using Bactoscan FC. However, as its linearity is fairly good, it can be calibrated by means of a simple linear regression.

Estimation precision was ± 1.963 x 0.301 = ± 0.590 Log CFU/ml

That means that if you have a value Y from the calibration equation, the confidence interval (P=0.95) will be Log Y + 0.590   Log Y – 0.590

After testing every parameter the evaluation study concluded that Bactoscan FC performed well for all parameters and can be used in a milk payment scheme.