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CENTRE D'EXPERTISE ET DE CONTROLE
DES ANALYSES LAITIÈRES

2005

4th quarter

N°55

CECALAIT'S NEWSLETTER

BEST WISHES FOR 2006

from all the team at CECALAIT

ENTEROBACTER SAKAZAKII: PRESENTATION OF THE STUDY LED BY THE AFSSA

(EVALUATION OF THE ISO-IDF DRAFT STANDARD METHOD FOR THE DETECTION OF *ENTEROBACTER SAKAZAKII* IN MILK POWDER PRODUCTS AND POWDER INFANT FORMULA)

Summary of the talk presented by Mrs GNANOU-BESSE (AFSSA) at CECALAIT's AGM 2005

***Enterobacter sakazakii* is a Gram-negative bacillus, member of the *Enterobacteriaceae* family.**
It has been identified as a pathogenic agent in sporadic but serious neonatal infections, causing meningitis, septicaemia or enterocolitis. The disease frequency is very low (several tens of cases since the Sixties), but the mortality rate is 20 to 50%. There are few infections among adults suffering from serious underlying disease.
In the majority of cases, the consumption of infant powdered milk formula has been blamed. A rather recent example was the outbreak of neonatal infections in France in December 2004, due to the contamination of powder infant formula.
As with all the coliforms, this pathogen is widely found in the food and domestic environments, and it is especially sought in dried milk. A Canadian study shows that this bacterium is present in 6.7% of dried milks, but the rates of contamination are generally lower than 1 cfu per 100 g. The infectious dose is around 1000 bacteria, therefore a problem of bottle preparation and storage can be blamed in the cases of neonatal infections.
In 2004, a draft standard for the detection of *Enterobacter sakazakii* in milk powder and powder infant formula was proposed by the IDF (see figure). The AFSSA LERQAP, as the European Community reference laboratory for milk and milk products (European directive 92/46), has decided to test this method. The objectives of this study were to evaluate its performances and its applicability to powder infant formula, and to compare several available selective media.
The following criteria of performance were studied: (i) the inclusiveness and exclusivity; (ii) the detection limit ; (iii) the method performances for the analysis of naturally contaminated products.

Inclusiveness and exclusivity were studied using 28 pure strains of E. sakazakii and 16 non-E sakazakii Enterobacteriaceae strains. The whole protocol of analysis was followed by the isolation on 4 agars: 3 chromogenous media: ESIA™ (AES Laboratoires), DFI™ (Oxoid, Dardilly, France), and ESIA™ fabricated in our laboratory according to the formula described in the draft standard; and a medium for Enterobacteria: VRBG.
The results obtained are similar for all the chromogenous media and no difference was observed between ESIA™ ready-to-use and ESIA™ produced in the laboratory.
Concerning the aspect of the colonies obtained on these media, the specificity and the sensitivity are good, but the specificity for the medium VRBG is only 50%. Indeed, on this medium, all the colonies of Enterobacteriaceae appear as typical.
Therefore, the step of selection of the yellow-pigmented colonies after spreading on the non-selective medium TSA decreased the performances of the method. The sensitivity of the 4 media tested hardly decreases after this step. Indeed, some strains of E. sakazakii (about 20%) did not produce typical yellow-pigmented colonies on TSA.
On chromogenous media, mainly for DFI™, the definition of typical colony colour should be widened as it does not allow strains of E. sakazakii to be detected.
To evaluate the detection limit, samples of infant powder formula with four different levels of contamination (from 5 cfu/100 g to 50 cfu/25 g, and a blank) were tested. The analyses were repeated six times per level, except the blank which was repeated twice. Then, the detection limit was assessed for 3 E. sakazakii strains.
The results show positive detections at all the levels of contamination, except for the blanks, with similar results for the 4 selective media tested.
All the detection limits obtained are lower than 10 cfu/100 g, the lowest was 4 cfu/100 g.

The analyses of naturally contaminated samples were realised with 100 g of 3 powder infant products implicated in neonatal infections. The draft standard protocol was followed and 4 selective media were tested with incubation at 37 and 44°C, which are temperatures recommended for DFI™ and ESIA™. In all the cases, E. sakazakii was detected. However, yellow or white pigmented colonies were obtained on TSA medium. For the medium DFI™, an incubation at 44°C is less effective, and the temperature recommended by the manufacturer is best.

To conclude, the detection method of E. sakazakii, as described in the draft standard (ISO/IDF), appears to be sensitive and selective, but could be improved by some modifications:

- the widening of the definition of typical colonies on chromogenous media,
- the taking into consideration of the problem of the non-pigmented strains, which appears frequently in the study. One solution should be to re-isolate all the typical strains on chromogenous media, and perhaps to add an additional biochemical test before complete identification. (activity Tween 80 esterase)

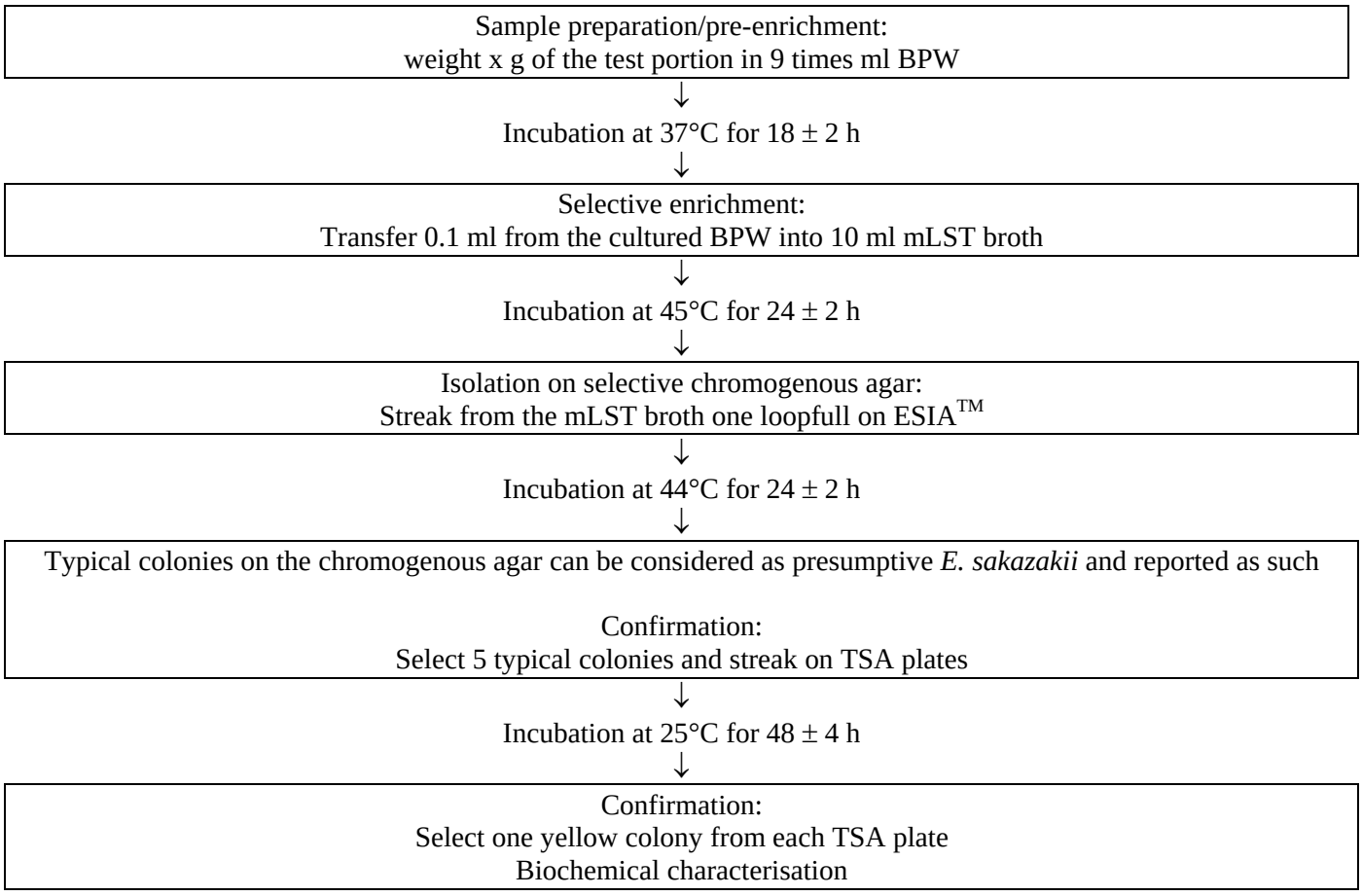
Due to their similar performances, the 2 agars DFI™ and ESIA™ could be used in this method. The medium VRBG shows relatively correct performances because of the selectivity of the liquid enrichment step. Consequently, it could be used as a complement to a chromogenous medium.

In this study, we demonstrated that the results obtained on medium ESIA™ produced in the laboratory or on ready-to-use medium ESIA™ are equivalent.

A complementary study, based on the analysis of a larger number of naturally contaminated samples, is in process at the AFSSA LERQAP.

Concerning the evolution of the standardisation of this method, a new draft was diffused, in August 2005, for comments. The main modification concerns an incubation of the broth at 44°C instead of 45°C in the previous version.

Figure: ISO/IDF draft standard method flow scheme



ROLE, FUNCTIONING AND PRINCIPAL WORK OF THE CODEX COMMITTEE ON ANALYSIS METHODS AND SAMPLING

Summary of the talk presented by Mrs Laurence LEONETTI (ALF) at CECALAIT's AGM 2005

Codex is a term which can refer to either the "Codex Alimentarius Commission" in charge of the elaboration and adoption of the Codex documents, or to the "Codex Alimentarius", or food code, constituted of 13 volumes.
Created in 1961 by FAO and WHO, the Codex Alimentarius commission is an inter-governmental authority which joins together 182 countries representing 5 continents. The IDF is member of this commission as a technical adviser for the milk and dairy products committee, and as an observer for the other committees. Codex is divided into general subject committees, commodity committees (e.g.: fats and oils, fish and fishery products, or milk and milk products), regional coordinating committees and intergovernmental task forces. Codex elaborates definitions, general principles, general standards, product standards, recommendations, codes of practice or code of hygienic practice, and guidelines, applicable to all foodstuffs. Its purpose is to facilitate world trade, to protect consumer health and to harmonise the national legislations. These documents, which are addressed to the Codex authorities, to the governments and to food professionals are periodically revised and are valid for 10 to 30 years. Their elaboration is long (5 to 8 years) within the work group context .

CODEX COMMITTEE ON ANALYSIS METHODS AND SAMPLING (CCMAS)

In the domain of dairy analysis, the role of the general subjects committee on analysis methods and sampling is to approve and to adopt reference analysis methods proposed by the commodity committee of milk and dairy products.
This committee, presided and vice-presided by Hungary, examines, defines and adopts the methods proposed by the sectorial committees and also, documents of a general order relating to work applying to all foodstuffs.
Several agents of the DGCCRF, the DGAL, the SGCI and the professional world participate in this committee which meets yearly in Budapest.
The methods to be approved are classified in 4 types (cf. table below). The official analysis methods elaborated by international organisations, the routine and the horizontal methods are studied in priority.

Classification of the methods:

	Definition
Type I	Method defining a value which it is only possible to obtain at the end of the method per se and which is the only one used to establish the accepted value of the measured element (e.g.: total acidity, expressed as lactic acid, in the fermented milks)
Type II	Reference method, when type I methods are not applicable. Chosen among type III methods . Its use is recommended in the case of a dispute and for calibration (e.g.: fat content in cheese by gravimetry)
Type III	Alternative method. Answers to the whole criteria defined by the CCMAS for the control, the inspection or the regulation (ex: vitamin A content in fat mixes by HPLC)
Type IV	Temporary method. Traditional method or of recent application, but for which the required criteria by the CCMAS have not yet been determined e.g.: no interlaboratory study (e.g.: enumeration of micro-organisms in the leaves of the fermented milks)

The documents adopted and the work in process, within the context of this committee, are presented below:

DOCUMENTS ADOPTED BY THE CCMAS

- **The "criteria" approach:** it is inspired by the European Commission decision 2002/657 relating to the performances of the analysis methods and the interpretation of results. Its principle is to have, for each specification of a Codex standard, performance criteria that the method can respect.

- **The validation by only one laboratory:** In certain specific cases, and when the validated interlaboratory methods are not available, it is possible to validate the method by only one laboratory.

- **Guidelines for food sampling :** this document proposes various sampling plans according to the type of foodstuffs and the health risk. It can be used by each product commodity to select the sampling plans judged to be adapted to its sector.

- **Directives on the uncertainty of measure:** This document, which applies to quantitative analysis, gives an international definition and the expression of the results of the measure of uncertainty. It can be estimated by different procedures, particularly, those described by the ISO (Guide for the expression of the measure of uncertainty) and EURACHEM (Guide EURACHEM / CITAC).

WORK IN PROCESS AND RESULTS OF THE 26th SESSION OF THE COMMITTEE (4-8th April 2005)

As the elaboration process of the document is long, the different work (at different stages) described below, is in process:

Use of the analytical results:
A document relating to the use of the analytical results was adopted and will be integrated, after its adoption by the general principle committee and the Codex commission, to the "Manual of the Codex procedures". As this type of document does not exist yet, it would permit interpretation of the analytical results at the Codex level and at the level of the various systems according to the countries. It recommends the products committee to integrate, for each specification mentioned in a Codex standard, the information concerning the sampling plans, the measure of uncertainty, the recuperation and the significant figures.

Settlement of disputes:
France must write a directive for the settlement of disputes concerning analytical methodology or laboratory performance. Its objective is to establish a settlement procedure of the dispute in the case of a disagreement on an analytical result between an importing and an exporting laboratory. It recommends settlement without new analyses or new sampling according to a 3 stage procedure .

Analytical terminology:
A third task on analytical terminology is in process. The objective is to revise the definitions for the Codex to ensure coherence with the analytical terminology used by other international authorities (standardisation organisations such as ISO). The French delegation leans on the terminology published by the AFNOR. 64 terms are under revision. The definitions, which can be quickly harmonised, will be amended and enclosed in the "Manual of procedures of Codex". These, which are in the process of revision, within the context of international organisations, will be integrated once they have been revised.

Evaluation methods:
The text concerning the directive for the evaluation of acceptable methods for Codex has progressed to stage 6. It supplies a framework for the countries and the Codex committees to evaluate the acceptability of a method. To be accepted, criteria such as accuracy, applicability, detection and determination limits, linearity, precision, intra-laboratory repeatability, inter-laboratory reproducibility, recuperation, selectivity and sensitivity, must be appreciated. For that, a definition of each term and an estimation procedure of these criteria are given.

As all this work is important for the food industry and for consumers, it is capital that the dairy interprofession contributes to them at a national level (via the government) and an international level (via the IDF and the IDF France – ALF). It is necessary to be implicated in this work because the orientations taken at an international level will have an impact at European and national levels.

REVIEW OF THE ACTIVITY OF THE « TBX MEDIUM » WORK GROUP OF THE AFNOR COMMISSION V08B « FOOD MICROBIOLOGY »

PART 2 : WORK GROUP ACTIVITIES

Tryptone-bile-glucuronide (TBX) and pepton-tergitol-glucuronide (PTX) agars are two chromogenous media, which allow the enumeration of *E. coli* by their positive character for β-D-glucuronidase, present in about 95% of *E. coli* found in food products. *E. coli* 0157:H7 for example, is deprived of this character.
Since 1993, the medium PTX is described in a routine standard at a national level (NF V 08-053). However, following the non-commercialisation of tergitol 7, a selective agent in this medium, it was replaced, at the end of 2002, by the medium TBX. This medium is standardised at an international level since 2001 (ISO 16649 parts 1 and 2). TBX had been selected following the ISO SC9 meeting in 1997, where comparisons had been presented on various matrices, with various methods and chromogenous media. However, taking into account these results, TBX did not seem to possess much higher performances than the other chromogenous media.

With the use of this new media, some laboratories met difficulties, particularly for the analysis of dairy products. These observations were described in a first article in "La Lettre de CECALAIT" n° 54. Following these reports, the AFNOR Commission V08B decided to create a work group, which must gather and study these observations and try to provide solutions. Organised by AFNOR, and animated by P. ROLLIER of CECALAIT, this work group is composed of about 10 suppliers and users. The group has met 3 times between 2004 and 2005. The activities and conclusions of this work group are presented in this second article.

1) COMPARISON STUDY OF THE METHODS LED BY THE AFSSA

Following remarks from the European Milk network, the AFSSA led a comparison study of different methods. Part of this study was presented to the TBX work group. The conclusions concerning the TBX medium are described below:

- The study dealt with the comparison of different parts of the IDF standard 16649:2001 (part 1: inoculation on membranes and on the surface ; part 2: inoculation in the mass ; part 3: MPN method). These tests were carried out with TBX media provided from only one supplier.
- Concerning the use of TBX (parts 1 and 2), on naturally contaminated cheeses, the results showed that part 1 is either equivalent to part 2, or allows recovery of more *E. coli*, particularly for samples containing stressed bacteria. However, part 1 requires an additional step of recuperation on a membrane, which is not convenient to set up. That is why almost no laboratories apply this method.

Then, the studies presented in paragraphs 2 and 3 have been realised following the protocol of part 2 or the quasi equivalent standard NF V 08-053:2002.

2) PROBLEMS POSED BY THE READY-TO-USE MEDIA

The work group has been particularly interested in the media to liquefied, which seem to pose more problems than the media reconstituted from powder. Indeed, some laboratories noticed that the ready-to-use TBX media in flasks seems to be more fragile and heat sensitive than the dehydrated media, with, in particular a more diffuse colony colour .

Then, the laboratory L2 compared, on naturally contaminated raw milk cheeses and on one of CECALAIT's proficiency tests in milk, ready-to-use or dehydrated TBX media from one supplier:

- In the raw milk cheese samples, this laboratory observed about the same or slightly lower numbers than with the dehydrated medium. Only one sample shows a very important underestimation (1.7 log).
- In the proficiency test samples, the differences are higher (between 0.6 and 0.8 log). They can be explained by the nature of the samples: they are artificially contaminated with a mix of 3 strains and contain a bacteriostatic preservative which can cause additional stress to the bacteria.

Another laboratory noticed that a medium prepared with a non pressure-sealed dehydrated medium is less effective than after pressure-sealing, but this practice is not advised by the suppliers.

CECALAIT also observed a decreasing performance in time on a dehydrated medium (see performance tests described below).

A compound contained in the medium TBX is probably sensitive to various factors, particularly to heat. It is perhaps necessary to sensitise the laboratories on the good practices of use of the ready-to-use media: for example, the storage temperature which can act on the stability of the chromogen, the limit of its heating time and its rapid use.

3) MEDIA PERFORMANCE TESTS

The work group therefore studied the performance tests to see if they were often implemented by the laboratories and if they could underline a defect of growth.

3.1 General principles of the performance tests

The protocol for the realisation of these performance tests and the strains to use are described generally in the ISO/TS 11133-2 standard. They must be realised by the laboratories which use dehydrated media. For the medium TBX, the strains to test are described in the routine standard NF V 08-053. If the media sterility and growth tests are successful, they are validated. For each growth test, the medium to evaluate is compared to a non-selective reference medium, generally TSA (Trypton-Soja-Agar).
3 growth tests are described:

- **Productivity**: concerns strains numbered or sought after by the tested medium and permits appreciation of the performance of the medium for the growth of these strains.
- **Selectivity**: on the contrary, concerns strains that are not numbered or sought after by the tested medium. The selectivity measures the capacity of the medium to totally inhibit these strains.
- **Specificity:** in the same category, allows evaluation of the culture of non characteristic strains.

Concerning the medium TBX, the protocol and the strains described in the standard to test the selectivity, seem to be suitable. However, there was a problem concerning the reference of a strain recommended for specificity in the NF V 08-053 standard. The work group studied this point and 2 strains have been proposed, as substitutes, to the Commission V 08B on 22nd March 2005 (point 4 – PV 165).
In the study described below, the work group particularly analysed the productivity tests in the user laboratories.

3.2 Productivity tests on TBX medium

3.2.1 Productivity tests realised by an analytical laboratory at the beginning of 2003:

The productivity tests were realised on a strain of *E. coli*, isolated from food products and inoculated in the mass with the media PTX and TBX, different from the strains described in the NF V 08-053 standard. These tests underlined the inhibition of *E. coli* on all the ready-to-use or dehydrated TBX media, provided by 4 different suppliers. These tests allowed the dehydrated PTX medium to be validated, but not the ready-to-use medium.

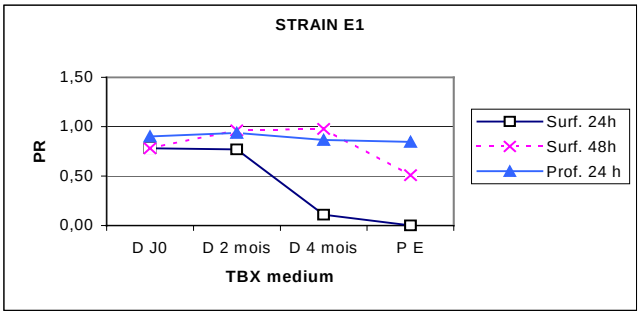
3.2.2 Productivity tests, realised in July 2004, on the strains used in CECALAIT's proficiency tests

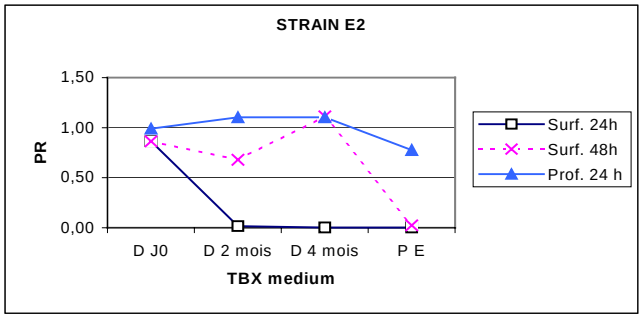
The objectives of this study, realised in the CECALAIT's laboratory, were to see:

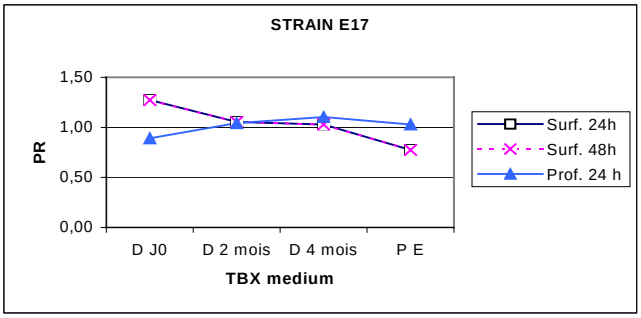
- if the strains used in the proficiency tests were sensitive to the medium effect,
- if productivity differences were obtained according to the media preparation mode, their time of storage and the inoculation, for the realisation of performance tests, on the surface or in the mass.

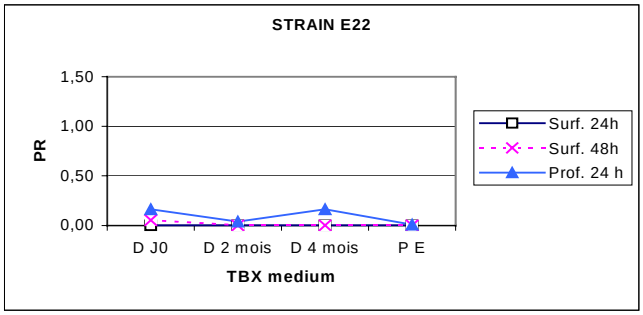
The 4 strains tested are usually used in CECALAIT's proficiency tests, and were isolated from samples of dairy products.
4 types of media, from a same supplier (A), were tested: a dehydrated TBX medium prepared the day of the study; the same medium used 2 and 4 months after preparation; ready-to-use TBX medium (PE); TSA-YE medium (Trypton-Soja-Agar and extract of yeast) used in the reference.
The dishes were inoculated on the surface (Spiral system) and in the mass, and incubated 24 and 48 hours at 44 ± 1°C. The productivity (PR) was calculated according to its different factors. The validation criteria of a batch was PR > 0.5.

The results presented in the figures below show the impact of different factors on the productivity of the medium TBX:









1- Strain effect: According to the strain tested, it can always be inhibited (E22), never inhibited (E17) or have a different response according to the media (E1 and E2). So, the strain E22 must be the same type as the strain, inhibited with all types of TBX, used in the study described below. The question is to know what is the frequency of this type of strain in naturally contaminated products. This could explain the problems met punctually in natural samples. Further to this study, the strain E22 is no longer used in CECALAIT's proficiency tests.

2- Medium effect: A medium effect is observed on strains E1 and E2. It appears that the media, classified in order of decreasing performance, are: - the dehydrated medium prepared the day of the study, - prepared 2 months before, - prepared 4 months before, - and the ready-to-use medium. Normally, the storage time of the prepared media must not exceed 3 months in the fridge (ISO/TS 11133-1). The performance of the medium TBX prepared in flasks decreases during storage and it must undergo additional heating before use. This could partially explain the deficiency of performance of the ready-to-use medium tested here.

3- Effect of inoculation type: The inhibition is more important on the surface than in the mass and allows obtention of more important medium effects. In the case of an inoculation on the surface, a longer incubation of 24 hours permits obtention of countable colonies, which, no doubt, did not develop or did not express the blue colour within 24 hours. This effect has already been observed in proficiency tests or in freeze-dried samples. Actually, the ISO/TS 11133-2 standard allows the choice concerning the type of inoculation. Chapter 5.3.1.2 note 2 indicates: "The pour plate method may also be used for culture media normally used for enumeration in this way". Therefore, the work group decided to propose a new, more direct wording for quantitative tests: the inoculation can be made on the surface or in the mass, but the protocol described in the standard corresponding to the tested medium must be used. This proposition was transmitted for approval to the work group in charge of the revision of the ISO/TS 11133-2 standard.

3.3 Inquiry on the realisation of performance tests in the laboratories:

- **Objectives of the inquiry:** The question was to know if these tests would be able to detect a batch which could cause problems during its use. Then, in September 2004, an inquiry was sent to the members of the Commission AFNOR V 08B. The purposes were to know if some problems were often met during the use of the medium TBX and if performance tests were realised often. In this case, do they permit to set aside batches for which problems were reported.

- **Results of the inquiry:** Only 6 laboratories on 95 answered. The problem most often met (3 laboratories) is the growth of other non-target bacteria. But, the use of ready-to-use media does not seem to be the cause of this problem. Only one laboratory carries out performance tests, but it does not use the protocol and strains described in the standards. These tests could not underline the non-specificity problem observed by this laboratory in its routine analyses.

A priori, the standardised performance tests are not or rarely implemented in the laboratories using TBX. Only the suppliers realised them. At the end of these tests, which can not underline the problems described above, all the commercialised media comply.

4) CONCLUSION

Since the first usage of the medium TBX in substitution of the medium PTX for the enumeration of *E. coli* in food, several laboratories, analysing naturally contaminated samples or CECALAIT's proficiency test samples, punctually noticed inhibition problems on this medium. The bacteriostatic preservative in the proficiency test samples can produce an additional stress to the strains in relation to a natural sample, and so can accentuate the problems observed with certain batches.

The work group showed that effects due to various factors exist:
- the sample (type of strain, physiological condition of the strain, matrix),
- the media (batch, mode of preparation and storage),
- the method (diluent, mode of inoculation)…,
- and perhaps, other factors not yet identified.

No doubt, these effects added together can generate important differences in the enumeration.

Thanks to the work on the performance tests of media, the work group showed that these tests do not seem to be able to underline this type of inhibition and only a few user laboratories applied them.
However, this work group could not underline the origin of this problem, bound more to a variability of batches than to a particular supplier. The difference between the media PTX and TBX is essentially the result of their composition, which is different in peptones (meat peptone for PTX and casein peptone for TBX) and in selective agents (tergitol 7 for PTX and biliary salts n° 3 for TBX). The use of biological ingredients, such as peptones and biliary salts, can involve non negligible variations in culture. However, the ISO/TS 11133-2 (4.1.2) standard is tolerant in the quantity of ingredients implemented in the production of a batch of media. Therefore, the media suppliers optimise their formula. A bibliographical study (1) realised by a member of the work group shows that biliary salts can have, according to their nature, an inhibiting effect on *E. coli*. However, the biliary salts n°3, which compose the medium TBX are better defined chemically than classical biliary salts. They are also well purified and stable.

To solve this problem, the only conceivable issue was to work again on the composition and to propose a new media for standardisation. This proposition has been rejected for the moment by the work group, knowing that the problems on the medium TBX seem to be less frequently met. Moreover, this study will require a very important and long technical work supported by the member laboratories of the standardisation organisms.

As the work group "TBX" did not find the origin of this variability, its activity has been suspended, but we are staying tuned to users and, if need be, we will present another review in "La Lettre de CECALAIT" to inform you about new elements.

(1) If you want this bibliographical study, please contact us.

We would particularly like to thank:
- the user laboratories which give us their results
- the members of the work group

STANDARDS, DRAFT STANDARDS

Classification in alphabetic order by theme

ISO published standards

DAIRY PRODUCTS AND MILK-BASED FOODS		
DAIRY PRODUCTS / MILK BASED FOODS FAT CONTENT	ISO 8262-1:2005 ISO 8262-2:2005 ISO 8262-3:2005 (IDF 124-1, 124-2 and 124-3) September and November 2005	DAIRY PRODUCTS AND MILK-BASED FOODS Determination of fat content by the Weibull-Berntrop gravimetric method (Reference method) Part 1: Infant foods Part 2: Edible ices and ice-mixes Part 3: Special cases
DRIED MILK		
DRIED MILK / LACTIC ACID / LACTATES	ISO 8069:2005 (IDF 69) September 2005	DRIED MILK Determination of content of lactic acid and lactates
DRIED MILK AND DRIED MILK PRODUCTS		
DRIED MILK / DRIED MILK PRODUCTS INSOLUBILITY INDEX	ISO 8156:2005 October 2005	DRIED MILK AND DRIED MILK PRODUCTS Determination of insolubility index
MICROBIOLOGY OF FOOD AND ANIMAL FEEDING STUFFS		
ESCHERICHIA COLI / HORIZONTAL METHOD	ISO/TS 16649-3:2005 September 2005	MICROBIOLOGY OF FOOD AND ANIMAL FEEDING STUFFS Horizontal method for the enumeration of β-glucuronidase-positive *Escherichia coli* - Part 3: Most probable number technique using 5-bromo-4-chloro-3-indolyl-β-D-glucuronide
MILK		
MILK / PSYCHROTROPHIC MICROORGANISMS	ISO 6730:2005 (IDF 101) September 2005	MILK Enumeration of colony-forming units of psychrotrophic microorganisms - Colony-count technique at 6,5°C
STATISTICAL METHODS		
STATISTICAL METHODS / PROFICIENCY TEST	ISO 13528:2005 September 2005	Statistical methods for use in proficiency testing by interlaboratory comparisons

NEW EU STANDARDS AND REGULATIONS

Classification is established in alphabetical order of the first keyword

PESTICIDES / RESIDUE
O.J.E.U. L 276, 21st October 2005 - Commission Directive 2005/70/EC of 20 October 2005 amending Council Directives 76/895/EEC, 86/362/EEC, 86/363/EEC and 90/642/EEC as regards maximum residue levels for certain pesticides in and on cereals and certain products of animal and plant origin http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2005/l_276/l_27620051021en00350053.pdf

BOOKSHOP: LATEST PUBLICATIONS

The classification in alphabetic order of the first keyword allows you to consult the references according to your interests. The web site allows you to know more, or to order the book.

PATHOGENS

GRIFFITHS M. – **Understanding pathogen behaviour – Virulence, stress response and resistance** – CRC Press edition – ISBN 0849334268 – 611 p.

This book presents, in a first part, the analysis methods of the pathogens, and, then, in a second part, exams their virulence, their stress response et their resistance

FORTHCOMING EVENTS

Classified in chronological order

SALMONELLA

10 – 12 May 2006 Saint-Malo, France	4th International Symposium in "Salmonella and Salmonellosis"	http://www.zoopole.com/ispaia/i3s2006

STANDARDISATION

29 May – 2 June 2006 Vilnius, Lithuania	IDF / ISO Analytical Week	http://www.fil-idf.org

La Lettre de CECALAIT est éditée par CECALAIT, B.P. 70129, 39802 POLIGNY CEDEX
CECALAIT : association. Président : Marcel DENIEUL ; Vice-Président : Emmanuel MALLO;
Trésorier : Jacques DELACROIX; Secrétaire : Pascaline GARNOT ; Directeur : Hugues DAMOUR
Directeur de la publication : Marcel DENIEUL
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Rédaction achevée le 15 décembre 2005 – Traduction achevée le 19 décembre 2005
Impression : CECALAIT, B.P. 70129, 39802 POLIGNY CEDEX - Tél. : 03.84.73.63.20 - Télécopie : 03.84.73.63.29
4ème trimestre 2005
Dépôt légal : à parution
ISSN 1298-6976