MASTITIS
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REPORT OF THE IDF GROUP OF EXPERTS ON MASTITIS

Two well attended meetings of the Group were held during the year in Lelystad in May and in Brussels in November. The retirements of Professor Bassalik-Chabielska (PL), Dr H. Funke (SE) and Dr B. Havelka (CS) were noted with regret and their considerable contributions to the work of the Group were acknowledged. Dr K. Plym-Forsell (SE) was welcomed as a new member.

The Group continued its work in drawing up documents and standards for publication. New publications during the year were: The Enumeration of Somatic Cells (IDF Provisional International Standard 148:1991), on which comments are invited before December 1992, Mastitis Research Index No. 9 (January 1992), and Mastitis Newsletter No. 16 (July 1991). The Machine Milking and Mastitis Subgroup A2D (Chairman: Dr J. Hamann, DE) is preparing a document on the effect of machine milking on teat tissue. Chapter 1 on the physiological status of the bovine teat has been completed, Chapter 2 on machine-induced changes in the status of the bovine teat with respect to the new infection risk is at the editing stage, and work is about to be started on Chapter 3 on functional parameters of milking units with regard to teat tissue treatment. This Subgroup intends subsequently to prepare a protocol for the dynamic testing of milking machines and to address the subject of conductivity and milking machines.

Since the publication of the provisional cell count standard, the Cell Count Subgroup A2B (Chairman: Mr J. Booth, GB) has been discussing the precision of cell counting, standards for new cell count instruments, and the interpretation of individual cow cell counts. Professor W. Heeschen (DE) organized a further international ring trial (No. 19) on behalf of the Group and it was noted that, although there has been little overall improvement in the quality of cell counting, the trials are a valuable means for single laboratories to assess the quality of their cell count work. Laboratories are now also obtaining much more repeatable results with the standard milk samples. Laboratories wishing to participate in these trials, approximately annually, should contact Professor Heeschen via the IDF. Subgroup A2B has also drawn up a Cell Count Questionnaire (1792/A) which was issued to National Committees in February for replies by 31 May 1992. The intention is to publish a summary of the replies in the next Mastitis Newsletter.

A large number of topics on mastitis were discussed at the meetings of the groups. These included mastitis due to Nocardia and coagulase-negative staphylococci, updates on mastitis vaccination and genetic engineering, the use of pre-milking teat disinfection, and the continuing problem of summer mastitis. On therapy the efficacy of different routes of administration was discussed as were the subjects of non-antibiotic treatment, including homoeopathic remedies and the temporary cessation of milking of treated quarters. It was proposed that a third IDF Mastitis Symposium be held in 1995, along the lines of those held in Reading (GB) in 1975 and Kiel (DE) in 1985, and this is being investigated.

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(*) Current membership of Group A2

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Observers: B.G. Cané (AR), M. Laborde (UY), G. Kalatzopoulos (GR), Ch. Burvenich (BE).
ANTIBIOTICS AND SULFONAMIDES IN MILK: Risk evaluation of residues

1 INTRODUCTION

The concepts and strategies for the detection of antibiotics and sulfonamides («inhibitors») in milk comprise two different aspects:

1. Payment for milk on the basis of quality («technological safety»), and
2. Public health criteria governed by food laws («toxicological safety»).

The aspects mentioned are of different importance in the member countries of the IDF or the EEC. For milk payment the presence of inhibitors is frequently dealt with by price reduction or other arrangements disadvantageous to the producer. In the Federal Republic of Germany the price reduction reaches 30% of the milk price for the whole month where inhibitors are detected.

Viewing the problem from the standpoint of public health or food laws, milk containing antibiotics is generally banned. These apparently incompatible requirements operate side by side in many countries. To overcome legal problems involved in the detection of inhibitors within quality payment systems, «positive» findings for inhibitors are included in the quality parameter «bacteriological quality».

The only existing and widely accepted maximum residue limit (MRL) for antibiotics is that for penicillin G. In the EEC countries a MRL of 0.004 µg/ml (ppb) is given [1]. Concerning the other antibiotics (including sulfonamides), it is only stated that milk should be free of other antibiotics. The limits under consideration depend on the official tests used in the different countries.

With the exception of penicillin G, for most of the antibiotics and sulfa drugs under discussion a wide gap exists between the concentrations in milk regarded as toxicologically safe and those requirements which characterize the technological safety. Milk which is regarded to be free of «inhibitors» will not fulfill in all cases the toxicological requirements which form the basis for the fixation of the withholding periods for antibacterial compounds. During recent years new tests have been developed (antibody and receptor tests (Charm)), which are capable of closing the existing gap to a large extent. Nevertheless, a complete new concept and system has to be developed for an integrated antibiotic detection system that meets technological and toxicological requirements. The complex situation is illustrated by the figures given in Table 1.

In the following the principles for the risk evaluation of antibiotics and sulfa drugs in milk (public health aspects) will be covered.

2 RISK EVALUATION OF ANTIBIOTIC RESIDUES IN MILK AND OTHER FOODSTUFF

The toxicological evaluation of residues of antibiotics in food follows the same principles as have been elaborated during the last 30 years by WHO/FAO [2-5] within the framework of the Codex Alimentarius (Joint Expert Committee on Food Additives and Contaminants (JECFA)). The health risks which have to be taken into account are:

- pharmacological-toxicological risks,
- microbiological risks (favouring resistant or pathogenic microorganisms in the intestinal flora), and

<table>
<thead>
<tr>
<th>Sensitivity of microbiological methods for the detection of antibiotics and sulphonamides in milk (µg/kg)</th>
<th>Demand</th>
<th>State-of-the-art</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residue</td>
<td>Cut-off time</td>
<td>Toxicity</td>
</tr>
<tr>
<td>Penicillin</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tetracyclines</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>200</td>
<td>?</td>
</tr>
<tr>
<td>Sulfamidine</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>

1 = West-German Regulations
2 = Recommended maximum residue limit (JECFAC, 1989/1990)
3 = Confirmation required
- immunopathological risks (allergies).

For antibiotics and sulfonamides the fixation of an acceptable daily intake (ADI) which is based on the non-(observed)effect level or non-(observable)adverse effect level (NOEL or N(O)AEL) (Table 2) is undeniable.

The ADI is based on the possibility of demonstrating a non-observable effect level (NOEL) for the fixation of a MRL (Figure 1).

The calculation of the ADI is given in Table 3.

### Table 2

<table>
<thead>
<tr>
<th>Non-effect level (NEL) and Maximum residue limit (MRL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observable effect</strong></td>
</tr>
<tr>
<td><strong>Amount of compound</strong></td>
</tr>
<tr>
<td><strong>Concentrations with toxicological effects</strong></td>
</tr>
<tr>
<td><strong>Dose without observable effect (NOEL)</strong></td>
</tr>
<tr>
<td><strong>Safety factor</strong></td>
</tr>
<tr>
<td><strong>Maximum residue limit (MRL)</strong></td>
</tr>
</tbody>
</table>

### Figure 1

**Calculation of the Acceptable Daily Intake (ADI)**

\[
ADI = \frac{\text{NOEL} \times 70}{\text{SF}}
\]

<table>
<thead>
<tr>
<th>ADI</th>
<th>mg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOEL</td>
<td>mg/kg in animals</td>
</tr>
<tr>
<td>70</td>
<td>average body weight of consumers</td>
</tr>
<tr>
<td>SF</td>
<td>safety factor (e.g. 100, 1000)</td>
</tr>
</tbody>
</table>
The toxicologically tolerable concentration in a certain foodstuff can be calculated following the formula given in Table 4.

\[
TC = \frac{ADI \text{ (mg/kg BW\text{*})} \times BW \text{ (kg)}}{\text{Additional Safety Factor (ASF)}} \times \text{food consumed (kg)}
\]

Basis: 300 g meat, 1.5 kg milk or 1 egg

* Body weight

Table 4

The MRL should always be lower than the tolerable concentration, calculated on the basis of the formula in Table 4. The calculation of the waiting or withholding period (WP) is based on the time necessary to reach the tolerable concentration or a MRL (based on the ADI) in the milk (Table 5).

In the case of chemotherapeutics antimicrobial facts have to be regarded:
- Selection pressure on the intestinal flora (growth of resistant microorganisms)
- Development of resistances in pathogenic enterobacteriaceae

In the case of immunopathological significance:
- MRL has to be reduced (e.g. benzylpenicillin)

Table 5

During the last few years JEFCAC has evaluated a number of antibiotics and sulfa drugs in milk and other foodstuffs (Table 6).

<table>
<thead>
<tr>
<th>No</th>
<th>Compound</th>
<th>ADI (JEFCAC) mg/person</th>
<th>MRL (mg/kg)</th>
<th>Step*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Benzylpenicillin</td>
<td>0.3</td>
<td>0.004</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Oxytetracycline</td>
<td>0 - 0.003 mg/kg</td>
<td>0.1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Sulfadimidine</td>
<td>0 - 0.004 mg/kg</td>
<td>0.025/0.050</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Chloramphenicol</td>
<td>no value</td>
<td>no value</td>
<td>-</td>
</tr>
</tbody>
</table>

Evaluation later: Chlortetracycline, streptomycin, neomycin, sulfa drugs etc.

1 = Codex procedure  
2 = Daily intake should be lower  
3 = Total residues  
4 = Residues not acceptable

Table 6
In the Federal Republic of Germany detection limits for antibiotics and sulfa drugs are available in terms of «evaluation figures» [6] (Table 7). The figures given in Table 7 are targets or marks which should be reached in the future and are the basis for the fixation of the withholding period.

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Detection limit (μg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chloramphenicol</td>
<td>1</td>
</tr>
<tr>
<td>2. Nitrofurans</td>
<td>1</td>
</tr>
<tr>
<td>3. Imidazole</td>
<td>10</td>
</tr>
<tr>
<td>4. Nitroimidazole</td>
<td>1</td>
</tr>
<tr>
<td>5. β-lactam antibiotics</td>
<td>10</td>
</tr>
<tr>
<td>Penicillin G</td>
<td>0.005 IU/g</td>
</tr>
<tr>
<td>6. Aminoglycoside antibiotics</td>
<td>200</td>
</tr>
<tr>
<td>7. Tetracyclines</td>
<td>10</td>
</tr>
<tr>
<td>8. Macrolide antibiotics</td>
<td></td>
</tr>
<tr>
<td>Erythromycin</td>
<td>15</td>
</tr>
<tr>
<td>Oleandomycin</td>
<td>200</td>
</tr>
<tr>
<td>9. Polypeptide antibiotics</td>
<td></td>
</tr>
<tr>
<td>Polymyxin B</td>
<td>100</td>
</tr>
<tr>
<td>Colistin</td>
<td>100</td>
</tr>
<tr>
<td>10. Spiramycin</td>
<td>30</td>
</tr>
<tr>
<td>11. Ansamycin</td>
<td></td>
</tr>
<tr>
<td>Rifamycin SV</td>
<td>10</td>
</tr>
<tr>
<td>12. Lincomycin</td>
<td>40</td>
</tr>
<tr>
<td>13. Tiamulin</td>
<td>100</td>
</tr>
<tr>
<td>14. Sulfonamides</td>
<td>100</td>
</tr>
<tr>
<td>Sulfadimidine, sulfathiazole,</td>
<td></td>
</tr>
<tr>
<td>sulfaguanidine, sulfaniamid</td>
<td></td>
</tr>
<tr>
<td>etc. (as sum including N-acetyl metabolites)</td>
<td></td>
</tr>
<tr>
<td>15. Trimethoprim</td>
<td>50</td>
</tr>
<tr>
<td>16. Dapsone</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7

Recently, the US Food and Drug Administration (FDA) has fixed «safe» levels which are given in Table 8.

<table>
<thead>
<tr>
<th>Residue</th>
<th>Safe Tolerance</th>
<th>Residue</th>
<th>Safe Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>10 0</td>
<td>Sulfamethazine</td>
<td>10</td>
</tr>
<tr>
<td>Cephapirin</td>
<td>20 0</td>
<td>Sulfadimethoxine</td>
<td>10 10</td>
</tr>
<tr>
<td>Cloxacinilin</td>
<td>10 0</td>
<td>Sulfamerazine</td>
<td>10</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>10 0</td>
<td>Sulfathiazole</td>
<td>10</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>10 0</td>
<td>Sulfadiazine</td>
<td>10</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>80 100</td>
<td>Novobiocin</td>
<td>100</td>
</tr>
<tr>
<td>Chlorotetracycline</td>
<td>30 30</td>
<td>Gentamicin</td>
<td>30</td>
</tr>
<tr>
<td>Oxytetracycline</td>
<td>30 150</td>
<td>Neomycin</td>
<td>150</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>50 125</td>
<td>Streptomycin</td>
<td>125</td>
</tr>
<tr>
<td>Tylosin</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From: BISHOP et al. (1991)
It is evident from Figure 2 that a lot of work is still required before "harmonization" with respect to aspects of technological and toxicological safety is reached for all the significant antibiotics and sulfa drugs.

Consequently in the EEC countries approval of an antibiotic or sulfa drug for treatment of farm animals will require:
1. fixation of NEL/ADI,
2. development of a suitable detection method, and
3. fixation of the withholding period on the basis of the residues detected (ADI/MRL).

3 CONCLUSION

In future the strategy for the control of antibiotics and sulfa drugs in milk and milk products should include a number of elements. Microbial screening tests should be maintained at the farm level. The testing for antibiotics and sulfa drugs which cannot be detected by commonly used microbiological screening tests should be performed by microbial receptor tests, antibody receptor tests or immuno assays. The testing for antibiotics and sulfa drugs in the silo milk and in the heat-treated milk should use tests with the sensitivity required under toxicological aspects (microbial penicillin screening tests and in addition receptor and antibody tests). Such an integrated system should be handled in a flexible way, using microbial testing methods and more sophisticated receptor and immuno tests in combination to ensure free and fair trade with milk and milk products in a worldwide market.

LITERATURE

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RESEARCH COMMUNICATIONS

TEAT DIPPING BEFORE MILKING
SUMMARY OF UK FIELD TRIALS

The increase in the number of dairy farmers in the USA who have adopted pre-milking teat disinfection to combat environmental mastitis prompted the initiation of field trials in the UK to assess the efficacy, safety, and acceptance of disinfectants used in this way.

An initial study was performed during the winter housing period of 1989/90, which involved 310 Friesian cows from three commercial dairy herds. Animals within each herd were paired according to lactation and known history of clinical mastitis, and members of each pair were randomly divided between control and pre-milking teat disinfection (PMTD) groups. Udder preparation of control animals consisted of dry wiping with individual paper towels. PMTD animals were prepared in the same way, after which their teats were dipped in an iodophor disinfectant (0.25% available iodine), allowed a contact time of 30 s, and then wiped with individual paper towels. New clinical and total new intramammary infections were recorded and taken as a measure of efficacy.

Residue studies were performed to determine the resulting effect on the iodine levels in the milk. An assessment of effect on milking times was also made.

Efficacy results proved inconclusive. On one farm, PMTD resulted in a reduction in new intramammary infections (IMI), but an increase in clinical cases. On the second farm, there was a reduction in both new IMI and clinical cases. On the third farm, there was an increase in new IMI, but a reduction in clinical cases. Iodine content of milk was not significantly affected by the additional procedure. Milking times were increased by 10-20 min per 100 cows.

In order to properly validate the procedure, it was clear that a larger scale study needed to be conducted.

During the winter housing period of 1990/91, a paired herd study was performed involving 18 herds. Herds were paired according to history of clinical mastitis, herd size, calving pattern, and type of housing. One herd in each pair acted as control, whilst the other incorporated PMTD into their routine. Efficacy was determined as the difference in number of clinical cases recorded during the trial period.

However, this trial failed to show any reduction in the incidence of clinical mastitis as a result of PMTD.

A subsequent in-house study in which teats were artificially inoculated and then dipped in various solutions showed that, following a contact time of 30 s, a pre-milking teat disinfectant was no better at removing environmental pathogens than distilled water.

Although PMTD may be a good method of teat preparation, it is likely to be as a result of attention to detail rather than bacterial kill.

The commercial benefit expected of PMTD is a reduction in clinical cases of mastitis. Studies involving more than 2000 cattle under commercial conditions in the UK were unable to show that such a benefit can be guaranteed.

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WHAT FUTURE FOR CONDUCTIVITY?

Since the late 1940s many researchers have proposed the use of conductivity as a means of diagnosis for mastitis, either as a cow-side test or in connection with the milking machine.

Mastitis causes variations in the electrolyte content in milk, reducing levels of lactose and K, increasing concentrations of Na and Cl, thus resulting in an increased conductivity of secretion.

Considering the literature between 1972 and 1990 alone, nearly 100 papers were published on this topic, with a peak during the early 1980s (40% of overall papers). Most of the papers dealt with the cow-side test (80%) and only 20% of them dealt with «on-line» application.

In spite of the great efforts made to introduce conductivity as a routine diagnostic test, many doubts still remain on its reliability, and at present there are very few field applications.

COW-SIDE TEST

Milk conductivity (MC) was compared with lactation, infection status, SCC, lactose, pH, protein and other minor parameters. The correlations between cow-side MC and all the factors considered were obtained using absolute, relative, differential, inter-quarter ratio, average of MC measurements, threshold values. However none of the proposed MC parameters (absolute or relative) could be considered in a more reliable than any of the remaining ones. Moreover some authors demonstrated that MC correlation with microbiological assay was worse than other «classical» diagnostic tests or indicators such as SCC or CMT.

Even the use of threshold values is greatly affected by the sample population and by the statistical analysis adopted. Moreover MC measurement is influenced by many factors related to milk composition (fat, protein, lactose, pH), physiology (temperature, oestrus, lactation period, milk yield), sampling and milking interval, type of milk sample (stripping or foramilk), feeding and last, but not least, a strong herd effect.

«ON-LINE» MEASUREMENT

«On-line» measurement is very likely to represent the «future» milk conductivity as a diagnostic tool, since it allows some of those confounding factors (physiology, sampling, feeding) to be dealt with through appropriate algorithms.

Unfortunately the development of a conductivity cell for placing into the cluster is not an easy task. Different technologies and materials have been studied in order to solve problems mainly concerning cleaning of the device and improvement of measurements. The latter problem is related to the ability to avoid the presence of air bubbles in the tube or in the cells and to minimize the influences caused by other factors such as clots or temperature of milk.

The main advantage of «on-line» measurements is the feasibility of complete monitoring during milking time with data recorded on a personal computer.

In the case of «on-line» assessment, the cow proved to be the main confounding factor. It follows that it is necessary to analyse data with an appropriate algorithm taking into account the individual variability of measurements.

Few applications are commercialized or close to being so but, as for the cow-side test, its field of application seems to be restricted to the detection of clinical mastitis.
The possibility of detecting sub-clinical mastitis is very likely to be related to the detection of other parameters (pH, lactose, temperature, ions etc.) in addition to conductivity.

The development of appropriate cluster-probes and algorithms considering all those parameters could improve automatic monitoring during milking.

FUTURE DEVELOPMENT
The increasing interest in MC as a diagnostic tool led the IDF A2 Group to discuss this topic in the 1991 spring session at CDI in Lelystad. After the discussion there was general agreement on the difficulties in reaching any positive and realistic conclusion concerning both cow-side and on-line applications, because of a wide range of different experimental designs. MC evaluation methods, definitions of mastitis, parameters compared. While most of the members agreed on the small extent of cow-side MC tester and therefore the scarce interest in developing new tools for this kind of test, the members from Japan and New Zealand confirmed the large diffusion of those tools in field practice in their countries.

To avoid further «non-rational» approach to MC and to prevent the introduction of unreliable diagnostic tools, the members of A2 Group unanimously proposed to develop a standard protocol to test the instruments which are to be introduced onto the market.

The protocol on cow-side testing should include at least the following steps:

- **mastitis definition**: clinical and subclinical, based on bacteriology and cytology;
- **conductivity definition**: measure, type of elaboration (ratio, inter-quarter etc.), threshold values (if any);
- **control diagnostic test**: a control represented by a well-known and widespread indirect diagnostic test (that is, C.M.T.);
- **sample sizes and characteristics**: an appropriate sample size should be considered, preferably taken from different herds;
- **analysis of data**: data obtained from the two diagnostic tests (E.C. and control) should be correlated with a traditional diagnostic assay. The method of analysis must prove to be appropriate (sensitivity, specificity, agreement). A cost/benefit analysis may be helpful.

The different confounding factors should be considered through an appropriate experimental design.

The following points should be added to the previous ones concerning the «on-line» test:

- **cleaning and maintenance of the cells**: cleaning and management of the cell in the cluster should turn out to be fairly easy;
- **safety & reliability**: the application should be proved safe for both cows and man and have a relatively long life, taking into account the environment of the milking parlour.
- **conductivity together with other chemical parameters (pH, temperature, ions, milk constituents)** represent an interesting topic of investigation in connection with mastitis. The development of new computerized milking machines (robotic milking) increases the interest on every parameter that could be automated. However it is necessary to achieve a deeper and more objective knowledge about the relationship between MC (and other chemical parameters) assessment and mastitis.

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**MASTITIS NOTES FROM MEMBER COUNTRIES**

**SWITZERLAND**

**MASTITIS PATHOGENS IN SWITZERLAND (1988-1990)**

Samples taken by Veterinarians from Cows with Clinical Mastitis:

<table>
<thead>
<tr>
<th>Year</th>
<th>Bact. negative</th>
<th>Bact. positive</th>
<th>Streptococcus agalactiae</th>
<th><em>Other streptococci</em> (S. uberis, S. dysgalactiae, enterococci)</th>
<th>Staphylococcus aureus (Penicillinase-positive)</th>
<th>&quot;Other staphylococci&quot; (S. epidermidis, S. xylosus, S. hyicus, Micrococcus sp.)</th>
<th>Coliforms</th>
<th>Actinomyces pyogenes</th>
<th>Yeasts</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>22.3</td>
<td>77.7</td>
<td>2.9</td>
<td>32.0</td>
<td>30.9</td>
<td>11.4</td>
<td>12.7</td>
<td>2.6</td>
<td>1.3</td>
<td>6.2</td>
</tr>
<tr>
<td>1989</td>
<td>17.0</td>
<td>83.0</td>
<td>2.8</td>
<td>31.5</td>
<td>31.4</td>
<td>12.9</td>
<td>10.2</td>
<td>2.6</td>
<td>1.5</td>
<td>7.1</td>
</tr>
<tr>
<td>1990</td>
<td>22.2</td>
<td>77.8</td>
<td>2.8</td>
<td>32.9</td>
<td>26.4</td>
<td>17.5</td>
<td>9.2</td>
<td>2.7</td>
<td>1.6</td>
<td>6.9</td>
</tr>
</tbody>
</table>

Samples taken by Udder-Health-Service Extension Workers from Cows with Subclinical Mastitis:

<table>
<thead>
<tr>
<th>Year</th>
<th>Bact. negative</th>
<th>Bact. positive</th>
<th>Streptococcus agalactiae</th>
<th><em>Other streptococci</em> (S. uberis, S. dysgalactiae, enterococci)</th>
<th>Staphylococcus aureus (Penicillinase-positive)</th>
<th>&quot;Other staphylococci&quot; (S. epidermidis, S. xylosus, S. hyicus, Micrococcus sp.)</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>23.7</td>
<td>76.3</td>
<td>7.2</td>
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August 1991 MSch (MASTPATHO.GEM)

M. Schällibaum
Federal Dairy Research Institute, Milk Production Section Liebefeld-Berne August 1991
MAMMITES

des Vaches Laitières

Organisé par la Société Française de Buiatrie, en collaboration avec la Commission Mammites et Qualité du lait de la Section Nationale des Groupements Techniques Vétérinaires, l'Institut National Agronomique et le Nouvel Institut de l'Elevage

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  Société Française de Buiatrie: Ecole Nationale Vétérinaire, F-31076 Toulouse, France
MAMMARY GLAND PHYSIOLOGICAL AND PATHOLOGICAL SOCIETY: SEMINAR 1991

The first annual MPPS meeting 1991 was held at Ghent, Belgium on Friday 20 December 1991. It received as title: Role of cow and pathogen factors on the pathogenesis of mastitis, and was organized by Prof. Dr Christian Burvenich in the Faculty of Veterinary Medicine and assisted by the collaborators of the Laboratory of Veterinary Medicine in Ghent. The seminar was attended by 150 people (MPPS members, researchers from different companies and laboratories, dairy specialists, staff members of the University and students). The 4 invited speakers, coming from 3 countries, were international authorities on their subject, which made this seminar very successful.

The first two papers dealt with local defence mechanisms. Prof. Dr J. Hamann from the Institute of Hygiene, Dairy Research Centre, Kiel, Germany, presented: Tissue integrity and local defence mechanisms. Dr L.M. Sordillo from the Veterinary Infectious Disease Organization, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, dealt with the Role of cytokines in the pathophysiology and therapy of bovine mastitis.

After the break, which was sponsored by Jacky, Belgium, Dr N. Craven from Monsanto, Chineham Court, Chineham, Basingstoke, Hampshire, United Kingdom, dealt with the relationships between milk yield and mastitis: Milk production and mastitis control. Finally, Prof. Dr J. Schultz from the Veterinary Faculty of the University of Leipzig, Germany, discussed in his presentation the usefulness of the development of rapid cow-side mastitis tests for causative agents: Isolation of udder pathogens in milk of mastitic cows by a practising veterinarian and by a specialized laboratory. Comparison of results, consequences for diagnostics and therapy.

Local defence mechanisms in the teat tissue play an important role as a mastitis preventative system because the pathogens gain access to the udder mainly via the teat canal. In addition to a cow's individual characteristics (for example breed, lactation stage, age), the act of mechanical milking, in particular, can markedly reduce the efficiency of local defence mechanisms by inducing circulatory impairment due to congestion and oedema. This view was confirmed by results of experimental and field trials showing that marked changes in teat thickness (decrease or increase) induced by milking are resulting in significantly higher new infection rates with contagious and environmental pathogens. Prof. Dr J. Hamann discussed the importance of the integrity of the teat tissue, including aspects of the keratin lining of the teat canal, as a mastitis preventative factor.

The use of recombinant cytokines in the prophylaxis and treatment of mastitis is currently under investigation. The studies of Dr L. Sordillo have shown that in vitro treatment of mammary gland leukocytes with recombinant cytokines (IFN, IL, CSF) increased their phagocytic and bactericidal activities. On the other hand, intramammary infusion of periparturient cows with IFN-gamma prior to infection reduced the rate, duration and severity of experimental E. coli mastitis. The immunotherapeutic potential of other cytokines (IL-2 and CSF) in mastitis control was somewhat successful in reducing infection with S. aureus. Her experiments further clearly indicated the ability of recombinant cytokines to modify the outcome of mastitis during instances when the immune system has been compromised. Recombinant cytokines were capable of modifying the outcome of mastitis through a combined effect of recruitment of effector cells to the mammary gland, enhanced bacterial clearance by phagocytic cell populations, and regulation of acute inflammatory reactions.

Dr N. Craven demonstrated the positive genetic relationships between milk yield and mastitis, indicating that selection for increased milk yield is associated with an increased susceptibility to mastitis. These relationships were confirmed in analyses of data pooled for 14 full-lactation trials with BST. Regardless of BST treatment, high yielders experienced a higher incidence of clinical mastitis than low yielders. At equivalent milk production levels, incidences of clinical mastitis in control and BST-treated cows were similar. An overall higher incidence of clinical mastitis in treated cows than in controls reflected their higher average yields.

The seminar stressed the necessity for the development of rapid cow-side mastitis tests for causative agents based on immunological or enzymatic principles. The application of simple culturing and bacterioscopical methods as well as sensitivity tests by practitioners should be encouraged.

Prof. Dr Christian Burvenich
Dept of Veterinary Physiology, Faculty of Veterinary Medicine
Casinoplein 24, B-9000, Gent Belgium

BRITISH MASTITIS CONFERENCE
1992

The fifth annual British Mastitis Conference will be held at the National Agricultural Centre, Stoneleigh, near Coventry, Warwickshire, England, on Wednesday 14 October 1992.

The programme includes sessions on natural resistance to mastitis, the use of cell counts, problem solving, and an update on current research. Full details are available from Mr S. Towers, Oiba-Gaigy Animal Health, Whitleywood, Cambridge, CB2 4QT, England.

The proceedings of the 1991 British Mastitis Conference are also available from Mr Towers, address as above, price £15 ($30) including postage. The conference included papers on the cell count payment scheme, milking machine testing to prevent mastitis problems, whether treatment is necessary, teat dipping before milking, and the effects of milking frequency on mastitis.

J.M. Booth
Genus Animal Health, Veterinary Laboratory
Cleeve House, Lower Wick, Worcester, WR2 4NS, England
March 1992
MASTITIS CONTROL
by a Group of Experts
Results of Questionnaire 1889/A of 16 pages with results from 23 countries: data for cow population, mastitis control schemes, monitoring procedures, antibiotic sensitivity, mastitis control measures, milk payment, progress in mastitis control.
It is part of a three-part Bulletin which also covers payment systems for ex-farm milk and the alkaline phosphatase test as a measure of correct pasteurization.
Bulletin N°262/1991 - 1400 BEF

DESIGN OF CLINICAL TRIALS FOR MASTITIS THERAPY
by Margaret A. Thorburn, Dept. of Population Medicine, Ontario Veterinary College
This 8-page report covers clinical trials of therapeutic treatments; causes of mastitis and its consequences.
It is part of a five-part bulletin which also covers: radionuclides in dairy products; distribution systems for fresh dairy products; enzymes in cheesemaking; and teat & udder cleaning.
Bulletin N°247/1990 - 1500 BEF

ENVIRONMENTAL INFLUENCES ON BOVINE MASTITIS
by a Group of Experts
Covers mastitis as a multifactorial disease, pathogenesis, sources & transmission of pathogens, environmental influences on animal health, external environment, internal environment, conclusions and recommendations.
Bulletin N°217/1987 -1000 BEF

MACHINE MILKING & MASTITIS
by a Group of Experts
Comprises a) recommendations concerning the use of milking machines and the incidence of mastitis; b) review of literature on milking machine factors affecting the rate of new infections; c) review on the effect of machine milking on teat end condition.
Bulletin N°215/1987 - 1000 BEF

BOVINE MASTITIS: DEFINITION & GUIDELINES FOR DIAGNOSIS
by a Group of Experts
This bulletin gives new (compared to 1987) proposals for mastitis definitions, diagnosis & the results of an IDF trial on the interpretation of diagnostic data.
Bulletin N°211/1987 - 800 BEF

PROGRESS IN MASTITIS CONTROL
by a Group of Experts
This survey describes in tabular form the progress made in 23 countries, on the basis of an enquiry conducted in September 1983. In a previous survey, of 1977 (see Bulletin 121), many countries reported little progress; this time, 7 countries reported definite improvement to 1983.
Bulletin N°187/1985 - 500 BEF

MASTITIS RESEARCH INDEX (9TH EDITION, 1992)
Three sections: projects, worker index, subject index; 25 countries are covered.
Free

MASTITIS RESEARCH INDEX (8TH EDITION, 1991)
Three sections: projects, worker index, subject index; 20 countries are covered.
Free

MASTITIS NEWSLETTER N°16
Somatic cell counting, individual cow somatic cell counts, mastitis cell count data, efficacy of on-line measurement of quarter electrical conductivity, mastitis notes from Iceland, Japan, Norway, Switzerland, mastitis events, IDF and other mastitis publications.

MASTITIS NEWSLETTER N°15:
EEC Cell count requirements - Use of Cowside Tests for Mastitis Research Communications - Some Reflections on Application of DNA probes in Mastitis Diagnosis - Predipping in Perspective - Mastitis notes from Member Countries.
Available on request - May 1990 - Ref N° 112

MASTITIS NEWSLETTER N°14:
March 1989 - Ref N°106

MASTITIS NEWSLETTER N°13:
Questionnaire on National Herd Milk Mastitis Cell Counts - Mastitis Notes from Member Countries.
March 1988 - Ref N° 102

MILK - ENUMERATION OF SOMATIC CELLS
TO BE PUBLISHED SHORTLY

MACHINE MILKING MASTITIS

The IDF Subgroup of Experts on Machine Milking and Mastitis (A2D) is working on a monograph "Machine milking induced teat tissue reactions and new infection risk" which is grouped into the following chapters:

I GENERAL ASPECTS

1 Physiological status of the bovine teat
   1.1 Introduction
   1.2 Description of the physiological status of the teat
   1.2.1 Parameters and methods
   1.2.2 Factors of influence
   1.2.2.1 Anatomical and physiological aspects of the teat
   1.2.2.2 Individual cow factors
   1.2.2.3 External factors
   1.3 Reference system
   1.4 Guidelines on evaluation of physiological teat reactions to milking

2 Machine induced changes in the status of the bovine teat with respect to the new infection risk
   2.1 Introduction
   2.2 Description of machine induced changes in the bovine teat
   2.2.1 Parameters and methods
   2.2.2 Milking machine induced teat tissue reactions
   2.2.2.1 After a single milking
   2.2.2.1.1 Appearance and teat condition
   2.2.2.1.2 Anatomic structure and tissue composition
   2.2.2.1.3 Status of physiological activity
   2.2.2.2 After repeated use of machine milking
   2.2.2.2.1 Appearance and teat condition
   2.2.2.2.2 Anatomic structure and tissue composition
   2.2.2.2.3 Status of physiological activity
   2.3 Teat tissue status and new infection risk
   2.3.1 External lesions
   2.3.2 Internal lesions
   2.4 Guidelines on evaluation of machine induced teat reactions with respect to new infections

3 Functional parameters of milking units with regard to teat tissue treatment
   3.1 Introduction
   3.2 Description of influence of functional parameters on teat tissue treatment
   3.2.1 Linear design
   3.2.2 Vacuum level
   3.2.3 Pulsator rate
   3.2.4 Pulsator ratio
   3.2.5 The a, b, c, d-values of pulsation
   3.2.6 Positive pressure pulsation
   3.2.7 Vibration pulsation
   3.2.8 Pulsationless milking
   3.2.9 Hydraulic milking
   3.2.10 Other milking factors
   3.3 Guidelines on evaluation of influence of functional parameters on teat tissue treatment

II SPECIAL ASPECTS

1 Teat tissue status and environmental mastitis
2 Teat tissue status and new infection risk during dry off period and during early lactation stage
3 Machine milking and teat tissue reaction with respect to robot milking

III APPENDIX: TERMINOLOGY AND DEFINITIONS

The monograph is expected to be finished in the coming year.

Dir Prof. Dr habil. J. Hamann
Bundesanstalt für Milchforschung
postfach 6069, 2300 Kiel 14, Germany
January 1992