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HERD TYPES OF GROUP-B STREPTOCOCCI

THEIR PREVALENCE AMONG HERDS IN FOUR DANISH MASTITIS CONTROL AREAS AND THE RELATION OF TYPE TO THE SPREAD WITHIN HERDS

By

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JENSEN, N. E.: *Herd types of Group-B streptococci. Their prevalence among herds in four Danish mastitis control areas and the relation of type to the spread within herds.* Acta vet. scand. 1980, *21*, 633—639. — Herd types of B-str. were determined for 159 herds on the basis of serological typing of 336 quarter-milk isolates. The herds were selected at random within an area with some 25,000 herds, and assumably the results reflect the type distribution in that area. In contrast with previous findings in Zealand, no significant difference in the distribution of herd types was found between new-infected herds and herds with infections of known duration. However, compared to herds with infections of presumably long standing, new-infected herds had a relative deficit of Herd Type III.

Herd Types III and X showed a significantly higher tendency than the other types to spread among cows within a herd.

It is concluded that infections caused by Herd Types III, Ia/III and X require special attention in a control program, while in most cases supervision would seem to be adequate for infections caused by other types. Yet, such a program will leave a hygienic problem unsolved.

Group-B streptococci; serological types; herd-type distribution.

In studies on the epidemiology of bovine mastitis caused by Group-B streptococci (B-str) the adoption of "herd types" has proved expedient because of extensive type variations of B-str. within herds (*Jensen* 1980 a, b, c, *Jensen & Berg* 1980).

A herd type is characterized by a principal antigen and includes combinations of antigens which may shift among each other but do not shift to antigens outside the combination.

This point of view was arrived at on analysis of results of serological typing of B-str. in 129 herds (*Jensen* 1980 a). In addition it was found that the proper herd type could be established

in 80.6 % (104/129) of the herds by typing of 1 quarter-milk isolate,
in 91.5 % (118/129) of the herds by typing of 2 quarter-milk isolates,
in 94.6 % (122/129) of the herds by typing of 3 quarter-milk isolates,
in 96.1 % (124/129) of the herds by typing of 5 quarter-milk isolates.

In 1 of the 5 remaining herds typing of 8 quarter-milk isolates was necessary to establish the herd type (III). In another herd (Ib) 10 isolates had to be examined. In 2 herds (Ic and II) a second sampling and in 1 herd (III) 5 samplings were required for determination of the correct herd type.

So far the herd-type distribution has been elucidated for the eastern part of Denmark only, i.e. in the mastitis control area covered by the SVS, Ringsted (*Jensen* 1980 a). The present report deals with the herd-type distribution among herds in other parts of Denmark.

MATERIAL AND METHODS

From 159 herds in 4 mastitis control areas, viz. 3 in Jutland and 1 in Funen, 336 quarter-milk isolates of B-str. were collected during the 4th quarter of 1979. If available, isolates were requested from 3 cows from each herd. One isolate was received from each of 59 herds, 2 from each of 23 herds, and 3 from each of 77 herds. In 1979 the laboratories involved conducted mastitis control in 25,694 herds, 626 of which were B-str. infected (4th quarter of 1979). New infections with B-str. were recorded in 408 herds during 1979.

In the following, the term "new herd" designates herds in which, following demonstration of B-str. in bulk milk during the 3rd and 4th quarters of 1979, the presence of this infection was confirmed by examination of quarter-milk samples from all cows, and in which no B-str. infection had been diagnosed the year before. Sixty-nine herds with 2133 cows, 335 of which were B-str. infected (544 quarters) belonged to this category. Other infected herds are designated "old herds". For 62 such

herds, from which the necessary data were available, the mean duration of the B-str. herd infection was 30 months. Twenty-eight herds have been permanently infected since the first testing. Of a total of 3815 cows in old herds, 578 had B-str. infection (1005 quarters).

Isolates of B-str., preferably primary cultures on blood-aesculin agar plates, were forwarded to the SVS, Ringsted. A few of them had to be subcultivated to obtain pure cultures. Unnecessary subcultivations were avoided, however. Serological type determination was made by double diffusion in agarose gel (*Jensen* 1979).

RESULTS

The herd-type distribution

The distribution of herd types in the present material appears from Table 1. Besides, the distribution among old herds with B-str. infections of presumably long standing is presented.

For comparison the previously published herd-type distribution among 100 new-infected herds in the mastitis control area covered by the SVS, Ringsted (*Jensen* 1980 a) is shown.

Table 1. Distribution of B-str. herd types in 3 materials.

Herd type	159 herds				28 herds with infection of long standing		100 new-infected herds Zealand April 1976-April 1979
	old 90		new 69				
	number	%	number	%	number	%	number (= %)
Ia	5	6	3	4	2	7	5
Ib							6
Ic			2	3			14
II	3	3	4	6	1	4	15
III	54	60	40	58	20	71	38
Ia III	2	2	2	3			2
Ibc	10	11	6	9	1	4	13
X	14	16	9	13	3	11	4
NT	2	2	3	4	1	4	3

Based on the experiences previously mentioned it may be stated that the reliability of the herd-type determination was 94.6 % for 77 (48 %) of the herds, 91.5 % for 23 (14 %) of the herds, and 80.6 % for the remaining 59 (37 %) of the herds.

The relation of herd type to the spread of B-str.

Data on the 69 new-infected herds are given in Table 2. When the herds are considered in total the number of infected cows and quarters per herd is 4.9 and 6.4, respectively. However, for 2 categories of herds, namely Type III- and Type X-herds the corresponding figures are somewhat higher. In fact, there is a significant difference both in numbers of infected cows ($\chi^2 = 31.7$, $P < 0.001$) and in numbers of infected quarters ($\chi^2 = 58.4$, $P < 0.001$) when data from Type III- and Type X-herds are compared with data from the rest of the herds.

Table 2. Number of infected cows and quarters in 69 new-infected herds grouped according to herd type.

Herd type	Number of herds	Total number of cows	Infected cows			Infected quarters		
			number	%	per herd	number	%	per cow
Ia	3	66	6	9.1	2.0	11	4.2	1.8
Ib	0							
Ic	2	33	5	15.2	2.5	8	6.1	1.6
II	4	100	10	10.0	2.5	14	3.5	1.4
III	40	1203	217	18.0	5.4	345	7.2	1.6
Ia III	2	131	8	6.1	4.0	11	2.1	1.4
Ibc	6	190	20	10.5	3.3	28	3.7	1.4
X	9	291	61	21.0	6.8	115	9.9	1.9
NT	3	119	8	6.7	2.7	12	2.5	1.5
Total	69	2133	335	15.7	4.9	544	6.4	1.6

DISCUSSION

Owing to extensive type variations, an exact B-str. herd-type diagnosis in all herds can be attained only by examination of multiple isolates from all infected quarters. However, an acceptable accuracy may be reached by examination of a few quarter-milk isolates (*Jensen* 1980 a). In the present study, for instance, 159 herds with 913 infected cows (1549 infected quarters) were herd-type classified by examination of just 336 isolates.

At the end of the period covered by the investigation, 626 herds were known to be infected with B-str. in the areas concerned. Of these herds, 159 (25 %), randomly selected, were included in the investigation. The results obtained should thus

reflect the true herd-type distribution in the cattle population in question.

The distribution of herd types was slightly different in the 4 areas. Since the number of isolates from each area was rather limited, however, the differences should probably be ascribed to chance (Table 1).

A surprising finding was the insignificant difference in herd-type distribution between new and old herds. However, compared to herds with infections of presumably long standing, new-infected herds had a relative deficit of Herd Type III-infections. Thus, in the course of time, similar changes in type distribution as observed in Zealand (*Jensen* 1980 a) may take place in these areas.

The relation between new and old herds with respect to herd-type distribution may, in the present material, have been significantly influenced by the fact that in some 60 % of the new-infected herds the infection had been introduced by purchase of infected cows (*Anon.* 1978—79) as compared to 9 % (9/100) in the Zealand material (unpublished data).

The rate at which B-str. infection spreads among cows within herds seems to be influenced by the type of B-str. involved. In this respect Herd Types III and X differed significantly from the other types. Previously *Jensen* (1980 a) found this to be the case with Herd Types III and Ia/III. A comparison between the 2 materials based upon the numbers of infected cows per herd for each of the Types III, Ia/III and X (figures from the Zealand material (*Jensen* 1980 a) given in brackets) shows the following: 5.4 (3.0), 4.0 (4.0) and 6.8 (2.8). The corresponding figures for the other types were Ia: 2.0 (1.2), Ib: not found (2.7), Ic: 2.5 (1.8), II: 2.5 (1.8), Ibc: 3.3 (1.8) and NT (non-typeable): 2.7 (1.0).

Except for Type Ib, figures for all types are at least as high in the present material as in the Zealand material. In both areas the Types III, Ia/III and X were found to be the ones most rapidly spreading within herds. Bearing in mind also that the prevalence of the other types seems rather unaffected by control measures (*Jensen* 1980 a) the above findings would seem to indicate that the Types III, Ia/III and X are especially adapted to the bovine udder. Consequently, in a program to eradicate B-str. efforts should be concentrated on these types. Measures against infections with other types, which appear sporadically

and tend to disappear spontaneously, need not be taken unless such infections are causing mastitis problems, i.e. giving rise to elevated numbers of somatic cells in bulk milk or to many cases of clinical mastitis.

If these lines are followed, the resources and capacity of the mastitis laboratories can be brought to bear exclusively on real mastitis problems.

A hygienic problem of unknown consequences, namely the occurrence of B-str. in the raw milk, still awaits a solution.

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SAMMENDRAG

Prævalensen blandt besætninger i fire danske mastitisbekæmpelsesområder og besætningstypens betydning for spredningstendensen i besætninger.

Ved hjælp af serologisk typebestemmelse af 336 kirtelprøveisolater hidrørende fra 159 besætninger fordelt i 3 jyske og det fynske mastitisbekæmpelsesområde kunne gruppe B-streptokok (B-str.) besætningstypefordelingen fastlægges med en acceptabel sikkerhed for et

samlet kontrolområde på ca. 25.000 besætninger (626 B-str. inficerede i oktober kvartal 1979, 408 B-str. nyinficerede i 1979).

I modsætning til hvad der var fundet for det sjællandske bekæmpelsesområde viste resultaterne ingen væsentlige forskelle i besætningstypefordelingen mellem nyinficerede besætninger og besætninger, hvor B-str. infektionen havde bestået en (kendt) periode. Besætningstype III var dog relativt underrepræsenteret, når nyinficerede besætninger sammenlignedes med besætninger med meget langvarige infektioner (Tabel 1).

Blandt køer inden for den enkelte smittede besætning udviste besætningstyperne III og X en signifikant højere spredningstendens end de øvrige typer (Tabel 2).

Det konkluderes under hensyntagen til resultaterne fra det sjællandske materiale, at infektioner forårsaget af besætningstyperne III, Ia/III og X kræver særlig opmærksomhed i et kontrolprogram, medens overvågning i de fleste tilfælde synes at være tilstrækkeligt for infektioner forårsaget af de øvrige typer.

Et bekæmpelsesprogram efter sådanne retningslinier vil imidlertid lade et hygiejnisk problem — B.str. forekomst i den rå mælk — være uløst.

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