PREVALENCE OF *SALMONELLA ENTERICA* 61:K:1,5,(7) IN SELECTED NORWEGIAN SHEEP HERDS.

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The incidence of registered, verified cases of *Salmonella* infections in humans in Norway is very low, below 35 per 100.000 annually. Approximately 80 % of these cases are infected abroad (1). The prevalence of *Salmonella* infections in domestic cattle, swine and poultry in Norway is also very low compared to countries outside the Nordic area (2). However, in 1993, some sheep herds were found to be infected with a type of *Salmonella* infrequently isolated from man; *Salmonella enterica* subspecies *diarizonae* serovar 61:k:1,5,(7) (S.E.) (3). Re-sampling of these herds and of neighboring herds showed that the bacteria was widely spread. The same serovar has later been isolated sporadically from swabs taken from sheep carcasses in The National Surveillance and Control program for *Salmonella* (4).

In a nation wide study of the prevalence of S.E. in slaughtered lambs and adult sheep conducted in 1997, S.E. was isolated in 12.4 % of the herds. S.E. was isolated from the samples in the northern-, middle- and eastern part of Norway, while the samples from the western and southern part were negative. The level of infected herds varied from 11 % to 50 % in the different regions. Preliminary analyses of data indicated «increasing herd size» and «increased age» as the major risk factors for presence of infection.

The objective of the present study was to investigate the prevalence of S.E. in sheep in a Norwegian region and furthermore to follow the in-herd prevalence in the identified positive herds from December to May.

Materials & methods

Study design

Among herds with more than 50 ewes during the winter, 49 herds within a county were randomly selected and stratified in quartiles (Q) after herd size (Q_1=55 ewes/herd, Q_2=98 ewes/herd, Q_3=141 ewes/ herd, and Q_4=202 ewes/herd). As animal contact by sharing rams («ram circles») were assumed to be a major vehicle for infection into herds, the herds were further representatively categorized for this factor. Within selected herds, individual animals were sampled randomly from the age strata to create age representative groups. Additional samples were collected from the group of ewes younger than 2 years of age to ensure enough negative animals for the follow-up from January to May, where the same animals were re-sampled another five times.

Bacteriological analysis

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Animals were sampled by using rectal swabs (Copan, Cary Blair, 132 C , Brescia, Italy). The swabs were transferred to 10 ml Selenite Cysteine Broth
(SC; Difco, Detroit, MI) and incubated at 37 °C for 48 hours and then plated on Modified Brilliant Green Agar (BGA; Oxoid, Basingstoke, England). Presumptive *Salmonella* isolates were tested by agglutination with monovalent antiserum before being sent to the National Institute of Public Health for final verification**.**

Results

S.E was isolated from 10 animals in 7 out of 50 herds in December. As shown in Table 1, 6 of the 7 positive herds were from the upper quartiles (Q_3 and Q_4). Surprisingly, none of the positive herds participated in the «ram circle». Eight of the positive animals were older than 2 years of age, and only one was younger.

Quartiles	(RC+) or not (RC-)	No of herds sampled	Mean no of animals sampled/ herd	No. of positive herds	No. positive animals
1	RC+	1	22	0	0
	RC-	12		0	0
2	RC+	3	21	0	0
	RC-	10		1	1
3	RC+	2	24	0	0
	RC-	10		4	4
4	RC+	4	26	0	0
	RC-	8		2	5

Table 1. Results from sampling of 50 sheep herds in the selected county. Herds were stratified by herd size (1-4) and categorized as a member of the «ram circle» or not (RC+/RC-).

All the 7 positive herds were followed-up. There was a low in-herd prevalence at the beginning of the season, and a slight increase in the number of positive animals from December to May. Table 2 shows details of results from the re-sampling of the 7 positive herds.

Herd no.	Initial sampling December	January	February	March	April	May
1	1	0	0	0	0	-
2	1	0	0	4	2	-
3	1	2	4	1	1	-
4	2	2	1	0	1	-
5	3	0	0	0	1	-
6	1	0	2	0	0	-
7	1	0	0	0	1	-

Table 2. Results from re-sampling of individual animals in the 7 positive herds (Table 1).

14 of the animals sampled from January to April were older than 2 years of age, while 7 were younger.

DISCUSSION & CONCLUSION

The herd prevalence of S.E in the study region was in the same range as in previous studies conducted in the same geographical area. The consistently low in-herd prevalence was, however, somewhat surprising. The relatively low number of new positive animals within the herds during the follow-up sampling indicates that the infection does not spread rapidly.

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In the previous study fecal samples were analyzed. The use of rectal swabs might have decreased the sensitivity in this survey, but the fact that the same animals were positive several times indicates that the swab method did work well.

Different events, like mating, vaccination and late pregnancy, which are assumed to stress the sheep, did not seem to influence the prevalence dramatically.

In summary, this study indicated that S.E. infection was more prevalent in adult sheep than in lambs. The herd prevalence and the prevalence within a herd were both low, and no dramatic influence was observed due to participation in «ram circles» or seasonal events from December to May.

References

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