

The Enter-Vet Italian surveillance network: data on samples of pig origin from 2002 to 2005

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Summary

The Enter-Vet net was established in 2002 in Italy, with the aim of collecting data at national level on *Salmonella* isolation from samples of animal origin. The Enter-Vet net consists of the laboratories of Istituti Zooprofilattici Sperimentali with the supervision of the National Reference Laboratory for *Salmonella* (NRL). The laboratories send to the NRL data on salmonella strains typed, together with Enteritidis and Typhimurium strains for phage typing. Data collected are sent to the Italian partner of Enter-Net (the European network for surveillance of human enteric infection) on a regular basis. A national database has been set up with the aim of collecting and organizing data and a report summarising the results is published annually (reports can be downloaded from the web site www.izsvenezie.it).

The data collected during these years allow to evaluate trends in serovars distribution and also trends in antimicrobial sensitivity as required also by the new UE legislation on zoonoses (Directive 99/2003/EC and Regulation 2160/2003/EC).

On average annually (considering the period from 2002 to 2005) the NRL has collected from the Enter-Vet laboratories data on 4572 strains isolated from samples of animal origin collected from animals, food and environment.

In this paper data on *Salmonella* surveillance in pigs and pork products from 2002 to 2005 are presented. Particularly the results of bacteriological investigation, serotyping, phage typing and antimicrobial susceptibility testing, performed on isolates of pig origin, are described and commented.

Introduction

This paper gives details on *Salmonella* strains isolated along the pig production chain by all the Enter-Vet network participants since 2002 to 2005. In these four years data regarding 18,304 swine *Salmonella* isolates were incorporated in the central database (4,550 isolates in 2002, 4,379 in 2003, 4,591 in 2004, 4,784 in 2005). These strains represent the 30% of the total amount of *Salmonella* strains collected by the participants of the network.

Methods

The *Salmonella* isolates identified by the Enter-vet laboratories were serotyped according to the Kauffman-White scheme and the *S. Enteritidis* or *S. Typhimurium* strains were sent to the National Reference Laboratory for Salmonellosis, where these isolates were phagetyped following the method provided by Health Protection Agency, Colindale, London.

Enter-vet participants tested the isolates for antimicrobial susceptibility against a panel of 16 antimicrobials (Na: Nalidixic acid; Am: Ampicillin; Ctx: Cefotaxime; Cip: Ciprofloxacin; C:

Chloramphenicol; Gm: Gentamicin; N: Neomycin; CL: Colistin; K: Kanamycin; S: Streptomycin; S3: Sulfonamides; Te: Tetracycline; Sxt: Trimethoprim-Sulfamethoxazole; Amc: Amoxicillin-clavulanic acid, Enr: Enrofloxacin, Cf: Cephalothin).

The data collected by the laboratories involved in the network were incorporated into a central database, periodically pooled and processed by the National Reference Laboratory for Salmonella in order to monitor trends of *Salmonella* and recognise unusual episodes.

The quality of the data is guaranteed by regular interlaboratory comparison studies within Enter-Vet participants.

Results

In figure 1 the distribution of swine samples considered in this paper is presented. The great majority of *Salmonella* strains were collected from foodstuffs (various types of fresh pig meat and pork products) and from animals (mainly samples of faeces, organs and tissues).

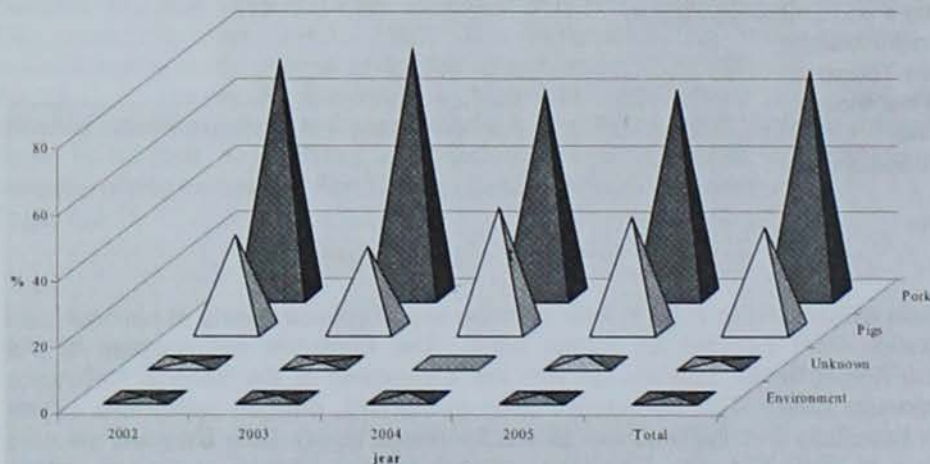


Figure 1 Distribution of samples of swine origin collected for the detection of *Salmonella* spp. by the Enter-Vet network from 2002 to 2005.

Serotyping

S. Typhimurium has been the predominant serovar isolated in pigs and pork products since 2002, followed by *S. Derby* and the monophasic strain 4,5:1:-. A clear tendency was not discernable in the trend of serotypes, except for the last year (2005) in which we noted a clear fall in the isolates of *S. Typhimurium* and an increase of the monophasic strains 4,5:1:- (figure 2).

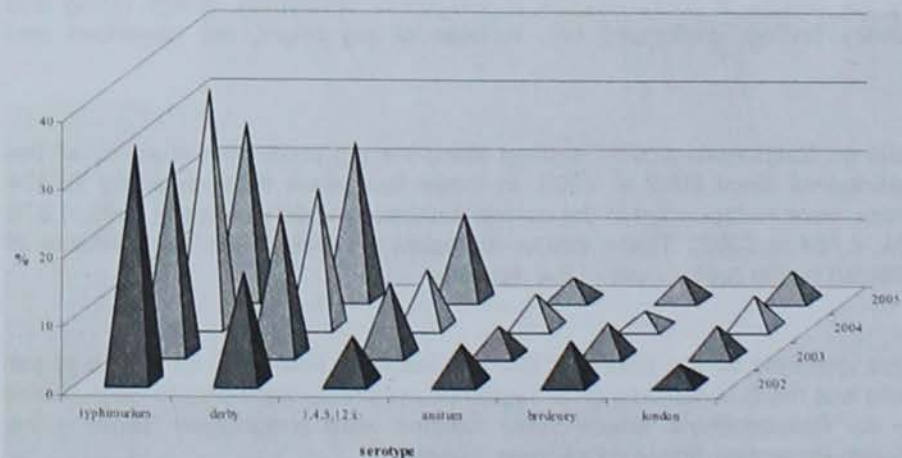


Figure 2 Distribution of *Salmonella* serovars of swine origin collected by the Enter-Vet network from 2002 to 2005.

Phage typing

Excluding nontypeable (NT) and RDNC isolates, the most frequent *S. Typhimurium* phage types in pigs and pork products were DT104, DT208, DT12 (figure 3). DT104 remained the dominating phagetype for the entire monitored period, even if its trend has not been constant (DT104 represented respectively 17.98%, 13.31%, 17.62%, 10.61% and 14.85% of *S. Typhimurium* strains collected in 2002, 2003, 2004 and 2005). As regards DT208, a high prevalence was detected in 2002, but a steady decrease of this phage type has been detected in the following years. In the first year of the monitored period DT208 represented the 12.72% of the *S. Typhimurium* isolates while in the subsequent years the prevalence of this phagetype dropped (3.24% -2003-; 3.47% -2004-; 5.76% -2005-).

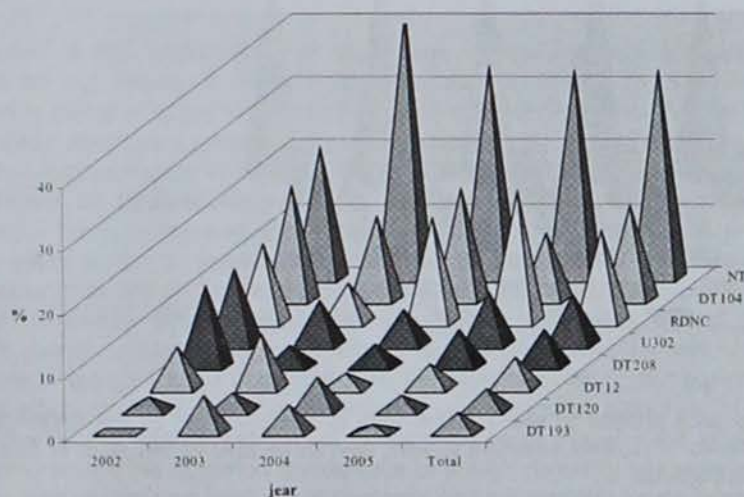


Figure 3 Distribution of phage types of *S. Typhimurium* of swine origin collected by the Enter-Vet network from 2002 to 2005.

Antimicrobial susceptibility tests

Data on the occurrence of antimicrobial resistance in swine *Salmonella* strains isolated by the Enter-Vet laboratories are given in table 1.

Year	Na	Am	Ctx	Cip	C	Gm	N	Col	K	S	S3	Te	Sxt	Amc	Enr	Cf
2002	6.49	42.74	0.40	0.27	18.75	1.86	7.85	0.70	8.28	51.00	67.68	71.13	18.06	4.52	0.56	2.95
2003	7.45	36.75	0.76	0.00	13.46	2.43	7.77	1.31	11.07	43.66	54.27	58.43	16.95	2.62	0.19	1.33
2004	7.65	36.32	0.29	0.15	13.84	2.50	7.82	6.47	7.06	50.00	67.50	64.06	18.14	4.78	0.00	2.72
2005	11.21	32.45	3.24	0.15	15.58	4.27	13.49	4.19	8.70	44.33	51.11	62.39	23.86	6.06	0.30	3.41

Table 1 Antimicrobial resistance profiles of swine *Salmonella* strains collected by the Enter-Vet network from 2002 to 2005.

Resistance was widespread but a clear trend was not completely described. However, a continuous increase in the level of resistance to Nalidixic acid, Cefotaxime, Gentamicin, Neomycin and Trimethoprim-Sulfamethoxazole has been reported, whereas for Ampicillin, Streptomycin, Sulfonamides and Tetracycline prevalence of resistant isolates decreased progressively.

The most common pattern of antibiotic resistance was AmSS3Te -Ampicillin-Streptomycin-Sulfonamides- Tetracycline- (that accounted respectively for the 25% of *Salmonella* strains collected in 2002 and for the 16% of isolates tested in 2005), followed by the pattern AmCSS3Te (Ampicillin- Chloramphenicol- Streptomycin- Sulfonamides- Tetracycline, characterizing multidrug resistant strains of DT 104).

As showed in figure 4, the great majority of the multiresistant strains collected showed resistance to four or five antimicrobials. Considering the trend of antimicrobial resistance in swine isolates, during the 4-years monitored, a decrease in the prevalence of multiresistant strains has been

reported. The prevalence of isolates resistant to four or more antimicrobials was 47.9%, 40.8%, 41.1%, 39.7% and 42.4% respectively in 2002, 2003, 2004 and 2005. In addition to the increase of strains resistant to less than 4 agents (52% in 2002, 60% in 2005), also the growth of the number of isolates sensible to all antimicrobial agents has been reported in the four years (18% in 2002, 27% in 2005). However, even if the number of multiresistant strains collected has reduced steadily, an increase of isolates resistant to 6, 7 and also 8 different agents has been noted in the four years of the monitoring.

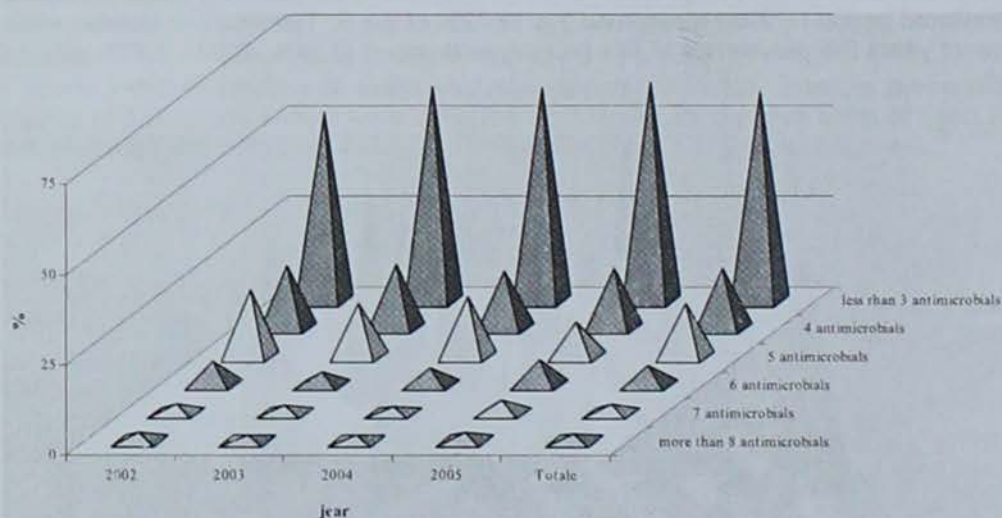


Figure 4 Antimicrobial resistance profiles of swine *Salmonella* strains collected by the Enter-Vet network from 2002 to 2005. Proportions of isolates resistant to less than three agents, resistant to four, five, six, seven or more than 8 different agents.

Conclusion

Salmonella strains of swine origin collected by Enter-Vet laboratories since 2002 to 2005 were represented mainly by foodstuffs (raw meat and pork products). During the 4 years considered in the paper, the most prevalent serotype identified in the samples of swine origin was *S. Typhimurium* followed by *S. Derby*. A great number of *S. Typhimurium* strains were DT104 presenting the characteristic profile of pentaresistance (AmCSS3Te). Multi-drug resistance was observed in a high percentage of the isolates and the dominant profile of resistance resulted to be AmSS3Te.