TRENDS IN *SALMONELLA ENTERICA* SEROTYPES ISOLATED FROM SHELLFISH AND MARINE WATER IN FERRARA PROVINCE (NORTH-WESTERN ADRIATIC SEA. ITALY) FROM 1997 TO 2010

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INTRODUCTION

☆ The genus *Salmonella* includes more than 2400 different serotypes. Non-typhoidal Salmonella serotypes are increasing in importance. The WHO report that annually there are about 17 million cases of acute gastroenteritis or diarrhea due to non-typhoidal salmonellosis with 3 million deaths.

☆ According to the European legislation, the Health Authorities of the Member States must classify the areas of production and harvesting of bivalve molluscs. The criteria for the classification are laid down by the Regulations 853/2004, 854/2004, 2073/2005 and successive modifications.

☆ The harvesting areas are classified in three different types: Class A, Class B and Class C. The microbiological parameters include *Escherichia coli* and *Salmonella* spp. Live bivalve molluscs collected in a Class A area can be placed on the market for direct human consumption.

☆ The Health Authorities must establish official monitoring programs in the classified production areas to verify, besides, the microbiological quality of live bivalve molluscs.

☆ The Shellfish Monitoring Program has been carried out in the province of Ferrara since 1997. In this work we report the trends in *Salmonella enterica* serotypes isolated from shellfish and marine water from 1997 to 2010.

☆ The most important species harvested in the area are: mussels (*Mytilus galloprovincialis*), Manila clam (*Tapes philippinarum*) and striped Venus clam (*Chamelea gallina*). Oysters harvesting (*Crassostrea gigas* and *Ostrea edulis*) is currently of little economic importance.

MATERIALS AND METHODS

☆ From 1997 to 2002 a method including an enrichment broth and a semisolid medium (Rappaport Vassiliadis – MSRV – medium semisolid modified) has been used.

☆ Since 2003 the method of analysis for *Salmonella* detection was ISO 6579:2002 (Horizontal method for the detection of *Salmonella* spp.).

☆ Serotyping of *Salmonella* strains was performed according to the Kauffmann-White scheme.

☆ In the considered period the following number of samples were tested (Tab. 1):
  • 4066 water samples
  • 299 striped Venus clams samples
  • 1901 mussels samples
  • 410 oysters samples
  • 2132 Manila clams samples

RESULTS

☆ The isolation rate of *Salmonella* spp. In the different samples is reported in Tab. 1.

☆ The highest prevalence of *Salmonella* spp. was found in Manila clams.
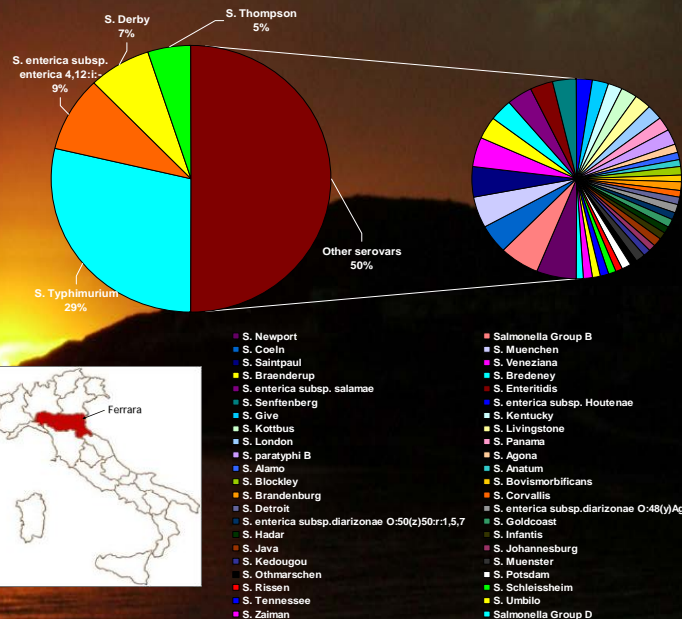
☆ As expected, the incidence of *Salmonella* spp. was higher in Class B than in Class A areas.

☆ In 14 years of analysis have been isolated 166 strains and 45 different serovars of *Salmonella enterica* subsp. *enterica* (Fig. 1).

Table 1. Results of *Salmonella* spp. testing in the Shellfish Monitoring Program of the Ferrara province (1997-2010)

Matrix	water		clams		mussels		oysters		manila clams		Tot
Area	A	B	A	B	A	B	A	B	A	B	
Samples tested	1040	3026	299	-	775	1126	31	379	-	2132	8808
Serovars											0
S. Typhimurium	1	15	1			2				20	39
S. enterica subsp. enterica 4.12:i:-	1	8		1						5	15
S. Derby		4	1		1					4	10
S. Thompson		2				1				3	6
Other serovars (44)	4	47			2	3		1		37	94
Total	6	76	2	-	4	6	-	1	-	69	164
Prevalence (%)	0.6%	2.5%	0.7%	-	0.5%	0.5%	-	0.3%	-	3.2%	1.9%

Figure 1. Serovars of *Salmonella* spp. isolated from 1997 to 2010

S. Derby 7%
S. Thompson 5%
S. enterica subsp. enterica 4,12:i:- 9%
Other serovars 50%
S. Typhimurium 29%

S. Newport — Salmonella Group B
S. Coeln — S. Muenchen
S. Saintpaul — S. Veneziana
S. Braenderup — S. Bredeney
S. enterica subsp. salamae — S. Enteritidis
S. Senftenberg — S. enterica subsp. Houtenae
S. Give — S. Kentucky
S. Kottbus — S. Livingstone
S. London — S. Panama
S. paratyphi B — S. Agona
S. Alamo — S. Anatum
S. Blockley — S. Bovismorbificans
S. Brandenburg — S. Corvallis
S. Detroit — S. enterica subsp.diarizonae O:48(y)AgH=z:1,5
S. enterica subsp.diarizonae O:50(z)50:r:1,5,7 — S. Goldcoast
S. Hadar — S. Infantis
S. Java — S. Johannesburg
S. Kedougou — S. Muenster
S. Othmarschen — S. Potsdam
S. Rissen — S. Schleissheim
S. Tennessee — S. Umbilo
S. Zaiman — Salmonella Group D

CONCLUSIONS

☆ Surveillance of *Salmonella* in all the different stages of feed-food chain constitutes an important element in the exploration of epidemiology of foodborne salmonellosis, and in the development and implementation of efficient Salmonella control strategies.

☆ The results of the Shellfish Monitoring Program in Ferrara province show a general low level of *Salmonella* contamination.

☆ Manila clams resulted the most frequently contaminated product. All Manila clams in Ferrara province are harvested in Class B areas so, before reaching the consumers, they must be depurate in a Purification Centre. The efficacy of purification has to be monitored and verified also in consideration of the pre-treatment level of contamination.

☆ As shown, some serovars of *Salmonella enterica* subsp. *enterica* were isolated sporadically while S. Typhimurium was the commonest isolated serovar .

☆ This observation is in contrast with a previous investigation from another Mediterranea country (Tunisia) where the most prevalent strain was Salmonella Enteritidis. These result suggest the hypothesis that the source of contamination could vary between different geographical areas.