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## Serovars of *Salmonella* spp Isolated from Broiler Chickens and Commercial Breeders in Diverse Regions in Brazil from July 1997 to December 2004

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Poultry, *Salmonella*, serovars.

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### ABSTRACT

Avian salmonellosis is a worldwide problem to the poultry industry, from the point of view of animal health and public health as well. The aim of the present study was to survey the most common *Salmonella* serovars in commercial breeders or broiler flocks from several regions in Brazil. The results of the present study indicated a high incidence of *S. enterica* subspecies *enterica* serovar Enteritidis in breeders (57.5%) and broilers flocks (84.0%). The importance of these findings lies in the fact that *S. Enteritidis* has become the most frequent serovar responsible for foodborne outbreaks and sporadic cases of salmonellosis in humans.

### INTRODUCTION

Avian salmonella infections are distinguished between pullorum disease (*Salmonella enterica* subspecies *enterica* serovar *Pullorum* – *S. Pullorum*), fowl typhoid (*S. enterica* subspecies *enterica* serovar *Gallinarum*) and paratyphoid (other salmonellas) (Berchieri Jr, 2000). The intensive large scale production adopted by the poultry industry favors the introduction, establishment, maintenance and dissemination of paratyphoid salmonellas. Therefore, paratyphoid infections currently present a problem to poultry farmers (Berchieri Jr, 2000) and constitute a hindrance to the poultry industry worldwide from the point of view of animal health and also as a consequence of the involvement of poultry products in considerable problems to public health (Barrow, 1999). In Brazil, outbreaks caused by *S. Enteritidis* (SE) occurred after cases in Europe, United States of America and Japan (Tavechio *et al.*, 1996; Fernandes *et al.*, 2003), probably due to the importation of grandparents from these regions (Zancan *et al.*, 2000). Nevertheless, information on the actual condition of avian paratyphoid in Brazil is scarce. Many control measures have been established, from the elimination of infected flocks and vaccination to the extensive use of drugs in breeders and one-day-old progenies (Nepomuceno, 1997). This study presents a profile of the serovars of *Salmonella* spp most commonly isolated from flocks of commercial breeders and broilers in different regions in Brazil, from July 1997 to December 2004.

### MATERIAL AND METHODS

#### Samples

*Salmonella* spp was investigated in samples received from diverse poultry industries located in different regions in Brazil, between July 1997 and December 2004. The samples were collected in farms of broilers and commercial breeders in the following Brazilian States: Bahia, Ceará, Goiás, Paraná, Mato Grosso, Mato Grosso do Sul, Santa Catarina and São Paulo. Various sample types were submitted to analysis: cloacal



swabs, dragging swabs, swabs from chick boxes, pipped eggs, live or dead birds, feces and meconium.

### Bacteriology

Bacteriological procedures to isolate *Salmonella* spp were performed according to Brasil (1995). Samples of swabs, feces and meconium were incubated in buffered peptone water at 37°C for 18 to 24 hours and aliquots were transferred to tetrathionate and selenite enrichment broths. The samples from pipped eggs and birds (live or dead) were directly incubated in selective enrichment broths and also in Brain Heart Infusion broth. After incubation at 41°C for 24 hours in a shaking water bath, a loopful of each sample was streaked onto XLT-4 and MacConkey agar plates and incubated at 37°C for 24 hours. Suspected colonies were transferred to triple sugar iron (TSI), lysine iron agar (LIA), urea and SIM medium (sulphide, indole, motility). Suspected *Salmonella* spp colonies were serotyped at a reference centre (Fundação Instituto Oswaldo Cruz). All media used in the study were purchased from Difco Laboratories.

### RESULTS

Three hundred and ninety-one samples from breeders and 94 samples from broilers were positive for *Salmonella* spp. The eight most frequently isolated serovars and their respective sources are shown in Table 1. The results evidenced that SE is the most frequent serovar in breeders (57.5%) and broilers chickens (84%). The second most predominant serovar was *S. Heidelberg* (SH) in breeders (22.8%) and *S. I 9, 12: - - -* in broilers chickens (9.6%).

**Table 1** - Total values and percentages of *Salmonella* serovars isolated from breeders and broilers, from July 1997 to December 2004.

Serovars	Source			
	Breeders		Broilers	
	N*	%	N	%
<i>S. Enteritidis</i>	225	57.5	79	84.0
<i>S. Heidelberg</i>	89	22.8	0	0
<i>S. Kentucky</i>	17	4.3	0	0
<i>S. I 9,12: - - -</i>	10	2.6	9	9.6
<i>S. Infantis</i>	8	2.1	0	0
<i>S. Mbandaka</i>	7	1.8	0	0
<i>S. Typhimurium</i>	5	1.3	2	2.1
<i>S. Senftenberg</i>	6	1.5	1	1.1
Others	24	6.1	3	3.2
Total	391	100.0	94	100.0

\*number of samples.

### DISCUSSION

The present study showed that SE was the serovar most frequently isolated from breeders and broiler chickens. Tavechio *et al.* (1996) reported an increase in SE isolation from non-human sources in the State of São Paulo, from 1.2% in 1991 to 64.9% in 1995. Such increase has been noticed in eggshells, birds and environment samples. Tavechio *et al.* (2002) reported that SE comprised 32.7% of 4581 samples of *Salmonella* isolated from non-human sources between 1996 and 2000. From all samples, 21.7% had been isolated from commercial birds. SE has also been identified as the most frequently isolated serovar from birds by Van Duikeren *et al.* (2002) and Ferris *et al.* (2004). On the other hand, conflicting results have been reported. FSIS (2004) showed that among the serovars isolated from broiler carcasses between 1998 and 1999, SE was the ninth most common serovar. Previous studies reported SE isolation from 5.15% of bird samples, derived products and poultry environment (Roy *et al.*, 2002), from 2.7% of commercial laying hen flocks (Poppe *et al.*, 1991a) and from 3.1% of commercial broiler flocks (Poppe *et al.*, 1991b). In Brazil, SE outbreaks were reported after cases in Europe, United States and Japan (Tavechio *et al.*, 1996, Fernandes *et al.*, 2003), probably because grandparent birds have been imported from these countries (Zancan *et al.*, 2000). The importance of the high frequency of SE lies in the fact that salmonellosis is one of the most problematic zoonosis to public health worldwide (Hofer *et al.*, 1997). Since 1994, this serovar has been implicated most frequently in outbreaks and sporadic cases of foodborne diseases in humans (Berchieri Júnior, 2000; Fernandes *et al.*, 2003). It is also one of the serovars included in the control regulations established by the Brazilian National Program for Poultry Health (Plano Nacional de Sanidade Avícola, Brasil, 1995). SH was the second most frequent serovar in the breeder flocks examined in the present study. According to CCDDR (1998), SH was the serovar most frequently isolated from non-human sources in 1995, which were almost exclusively bird samples. Studies carried out in the USA during 1999 and 2000 by Ferris *et al.* (2004) showed that 22% of salmonellas isolated from animal sources were originated from birds. These authors reported an increase of 58% in SH isolation, so that 67% of these samples were of poultry origin. The identification of this serovar in the present study (22.8%) was similar to the occurrence of 25.8% reported by Roy *et al.* (2002). SH was one of the most



frequent serovars in broiler carcasses (FSIS, 2004). Nevertheless, no SH was recovered from broiler chicken samples in the present study. Hofer *et al.* (1997) ranked the serovars of *Salmonella* isolated from birds between 1962 and 1991 according to the occurrence. The "most frequent" category included SE, SH, *S. Typhimurium* (STM) and *S. Infantis*. The "common" but not "frequent" serovars were *S. Mbandaka* and *S. Kentucky*, whereas *S. I 9,12:-:-* was considered "accidental" or "rare". It is worth noting that the latter was the second most frequent serovar isolated from broilers (10.2%) and the fourth in breeders in the present study. STM was a predominant serovar in bird flocks from diverse regions in Brazil from 1962 to 1991 (Hofer *et al.*, 1997). High STM frequency has also been reported by CCDD (1998), Ferris *et al.* (2000), Van Duinkerken *et al.* (2002) and FSIS (2004). Nevertheless, the findings in the present study showed STM positivity only in 1.3% and 2.1% of breeders and broilers, respectively. The findings presented herein must be carefully interpreted. Although flocks from different regions in Brazil have been sampled, the present data do not represent nationwide data on poultry salmonellosis, but could be seen as an estimate of the Brazilian scenario. Therefore, information about different *Salmonella* serovars on an incidence/prevalence basis have been provided, which makes it possible to compare their frequencies among regions and track the predominant isolates in order to implement preventive or control measures (Hofer, 1985).

## CONCLUSION

In conclusion, considering the sampling performed in the present study, *S. Enteritidis* was the serovar with the greatest occurrence among breeders and broiler chickens, predominating in percentages as high as 57.5% and 84.0%, respectively.

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