

Salmonella serovars (others than Typhi and Paratyphi) from extra-intestinal sources. Israel, 1984–9

I. SECHTER, E. KATZENELSON AND A. REISFELD

*National Salmonella Center, Central Laboratories, Ministry of Health,
Jerusalem, Israel*

(Accepted 17 January 1991)

SUMMARY

The purpose of this study was to examine whether certain salmonella serovars, other than Typhi and Paratyphi, may have an increased ability to enter the human body fluids. The data are based on over 20 000 salmonella isolated from humans during 1984–9, among them 436 from extra-intestinal (EI) sources. The mean percentage of EI salmonella isolated in Israel (excluding Typhi and Paratyphi), was 2.1%. In three serovars: S. 9, 12:1, v:-, Virchow and Saintpaul, the percentage of blood isolations and of EI isolations in general, was high. Among the frequent serovars, ser. Infantis and Hadar had a much lower percentage of EI isolations.

INTRODUCTION

Salmonella serovars Typhi and Paratyphi (A, B and C) are known to penetrate the intestinal wall and entering the body fluids. Therefore they are commonly isolated from blood and other extra-intestinal (EI) sources.

The other serovars (non-Typhi or Paratyphi – NTP salmonella) mostly cause food poisoning and enteritis and are commonly isolated from stool samples. However, occasionally some of these NTP serovars invade the host and may be isolated from non-intestinal sources. This paper presents the NTP serovars of salmonella isolated from extra-intestinal sources, during a 6-year period, in hospitals and out-patient clinics in Israel.

MATERIALS

The study is based on 20 922 NTP salmonella isolated from humans, identified in the National Salmonella Center, Jerusalem, during the years 1984–9 [1]. Among these were 436 which originated from extra-intestinal (EI) sources. Most of the EI isolates were from infants and children and the common diagnosis was acute gastro-enteritis, neonatal fever or clinical dysentery with fever and mucus or blood in stool. The isolates from adults were from cases of diarrhoea with fever or from wound and pus and rarely from other sites.

RESULTS

The common sources of EI isolates of NTP salmonella were: blood (62.6%), urine (16.5%), bile (4.4%) and CSF (3.0%). Rare sources, representing each less than 1% of isolates, were: bone marrow, joints, ear, throat, tracheal suction,

Table 1. *NTP salmonella serovars from human extra-intestinal sources, Israel, 1984-9*

Serovar	No. of isolates	No. of E.I. isolates	Percent of E.I. isolates
S. 9, 12:1, v:-	2343	122	5.4
Virchow	350	17	4.9
Saintpaul	287	13	4.5
Enteritidis	984	30	3.0
Bredeney	1136	29	2.6
Newport	648	14	2.2
Typhimurium	3941	84	2.1
Eastbourne	682	13	1.9
Montevideo	358	5	1.4
Emek	521	5	1.0
Hadar	1192	11	0.9
Infantis	3136	25	0.8
Blockley	790	6	0.8
Agona	568	4	0.7
Other serovars*	3986	58	1.4
All NTP salmonella	20922	436	2.08

* Serovars rarely isolated from EI sources: Anatum, Choleraesuis, Concord, Edinburg, Give, Gnesta, Havana, Heidelberg, Java, Kentucky, Kottbus, Litchfield, Oranienburg, Manhattan, Muenchen, Newington, Sundsvall, Tennessee, Wagenia, Zanzibar, S. III 61:i:z53, S. 6, 7:b:-, S. 3, 10:-:-, S. T2:e, h:1, 5 and S. I Rough.

stomach fluid, abscess, fistula, cyst, burn, vagina, uterus, placenta, catheter and drain.

The EI isolates of salmonella belonged to 35 identified serovars; two isolates were not identified because of lack of a flagellar phase, one had a T₂ O-antigen and one was rough.

Table 1 shows the percentage of extra-intestinal isolates among the common serovars in humans.

Figure 1 illustrates the number of EI isolates in some of the main serovars during the 6-year period.

The serovars S. 9, 12:1, v:- and Typhimurium represent about half of all the EI isolates. The number of EI isolates of S. 9, 12:1, v:- increased during that period and it has become the most frequent EI serovar since 1987. On the contrary, the number of EI isolates of ser. Typhimurium has decreased since 1985.

DISCUSSION

The percentage of EI isolates among the NTP salmonella of human source in Israel, during the 6-year period 1984-9, was 2.08%. Isolates from blood culture only (273) represented 1.3%. A survey performed by Mandel and Brennan [2] in Manchester, UK, showed a percentage of blood isolates of 8.0%. From the data published by Blaser and Feldman [3] in the USA, we calculated a percentage of blood isolations of 2.2% among the NTP salmonella. These differences may reflect various politics of performing blood culture and various reporting procedures.

On the contrary, the relative frequency of EI isolates in each serovar reflects its

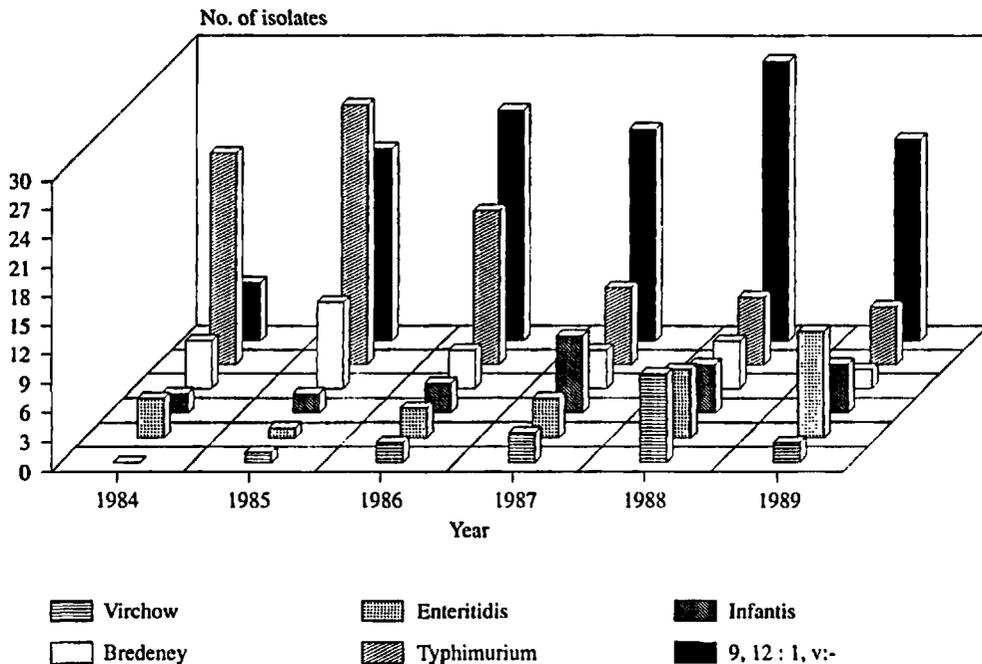


Fig. 1. Number of extra-intestinal isolates in six common salmonella serovars, Israel, 1984-9.

ability to enter the body fluids. In the data from Table 1, three serovars: S. 9, 12:1, v:-, Virchow and Saintpaul show a percentage of EI isolates more than twice the mean of EI isolates among all the salmonella serovars during the same period. On the contrary, five other serovars have a much lower percentage of EI isolates.

Serovar 9, 12:1, v:- has spread in Israel during the last years and its ratio of EI isolates was constantly high. This serovar seems to be more virulent than other common serovars in Israel but it is rarely isolated in other countries.

The highest ratio of EI isolates was not necessarily found in the serovars with the highest number of isolates. In serovar Virchow, with only 350 human isolates during 6 years, 17 were from EI source and the ratio of EI isolates was 4.9%. The high ability of this serovar to invade the organism was also reported by others [4, 5]. On the other hand, ser. Infantis with 3,136 isolates during the same period had a ratio of EI isolates of only 0.8%.

Differences in the ratio of EI isolates were observed not only between various serovars but also within the same serovar isolated in different countries. Serovars Infantis, Hadar and Agona show a high ratio of blood isolations in the report from the UK [2] but a low one in that from USA [3] and in Israel. The differences observed in the EI ratio of isolates between certain serovars and among various countries may reflect different invasive characters of these serovars, based on different plasmid contents [6].

In conclusions the ratio of EI isolates among the NTP salmonella from humans in Israel is 2.08%. However, some serovars, especially the frequent S. 9, 12:1, v:- and the two less common serovars - Virchow and Saintpaul - show a higher ratio of EI and blood isolates.

Striking differences were observed in the ratio of blood isolations of certain serovars, between our data and those from some other countries.

ACKNOWLEDGEMENT

The technical assistance of D. Aharon and M. Kigelman in identification of the various serovars is gratefully appreciated.

REFERENCES

1. Anonymous. Annual Reports 1984 to 1989. National Salmonella Center, Central Laboratories, Ministry of Health, Jerusalem.
2. Mandal BK, Brennand J. Bacteremia in salmonellosis: a 15 year retrospective study from a regional infectious disease unit. *Br Med J* 1988; **297**: 1242-3.
3. Blaser MJ, Feldman RA. Salmonella bacteraemia: Reports to the Centers for Disease Control, 1968-1979. *J Infect Dis* 1981; **143**: 734-6.
4. Mani V, Brennand J, Mandal BK. Invasive illness with *Salmonella virchow* infection. *Br Med J* 1974; **2**: 143-4.
5. Todd WT, Murdoch JM. *Salmonella virchow*: a cause of significant blood stream invasion. *Scott Med J* 1983; **28**: 176-8.
6. Helmuth R, Stephan R, Bunge B, Hoog B, Steinbeck A, Bulling E. Epidemiology of virulence-associated plasmids and outer membrane protein patterns, within seven common *Salmonella* serotypes. *Infect Immun* 1985; **48**: 175-82.