

# Antimicrobial Resistance of the Salmonella's Strains. Twenty Years Review



## Biology

KEYWORDS :

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### ABSTRACT

*Today all over the world the most frequent causes of foodstuffs toxin infections are the Salmonellas. The study of antimicrobial resistance of the strains Salmonella made by microbiologists introduce a great theoretical and practical importance. It helps the physicians in using the indispensable antibiotic and replacing the resistant antibiotics with new antibiotics. Our study includes 3414 strains Salmonella met to persons with foodstuff's toxin infections and determines the prevalence of antimicrobial resistance of Salmonella isolates. All the strains of Salmonellas isolated in this period of time are made the tests based in the method of the saturated discs with nine antibiotics. Such a antimicrobial resistance of the Salmonella's strains detached in the district of Elbasan during 1985-2004 divided in two sub periods 1985-1994 and 1995-2004 has approximates and differences with that of some other authors from our country and abroad that has been taken to make the comparison.*

### I. INTRODUCTION

The genus *Salmonella* is a member of *Enterobacteriaceae* family. *Salmonella* strains are pathogenic and cause diseases in both humans and animals. These toxic infections are found world-wide, especially in developing countries (4,6,8,10) and are increased as a result of changes in the cultural way of living. (5,6) The development of antibiotic resistance in *Salmonella* over the last twenty years is caused by an extensive application of some antibiotics. (4,6). To know the resistance of the strains *Salmonella* against the antimicrobial preparations in a certain district helps the physicians to do a better treatment to the sicked persons with salmonellosis, as well as to the bearers even in case when they have not done the antibiograms. Furthermore, to know the resistance against an antibiotic, or some antibiotics contemporary help the physicians to make use of new antibiotics. Considering what we said above, we undertook such a study to demonstrate the antimicrobial resistance of the strains of *Salmonella* as a result of foodstuff toxin infection in Elbasan's district (Albania) during the years 1985-2004.

### II. MATERIALS AND METHODS

The strains *Salmonella* isolated in Petri's plates with D.C.A nutrition are identified in base of their cultural and biochemical qualities in the Enterotube II. For a complete identification of the strains *Salmonella* besides the above biochemical reactions is used even the serologic method of agglutination on glass with antystrains diagnostics serums. All the strains of *Salmonellas*

isolated in Elbasan's district during the period of time 1985 – 2004 are made the tests based in the method of the saturated discs with antibiotics: Ampicilin (AM), Streptomycin (S), Tetracycline (TE), Chloramphenicol (C), Kanamycin (K), Gentamicin (GM), Bactrim (SXT), Nalidixin (NA) dhe Ciprofloxacin (CIP). (4,6,10,13,14,15) As a condition for the resistance of these strains is considered the lack of their growth zone or the presence of it. (4,10 )

### III. RESULTS AND DISCUSSIONS

Antimicrobial resistance of the *Salmonella*'s strains consists a serious problem for the Authorities of Public Health all over the world and particularly in countries in way of development (where Albania is included), for the control of Salmonellosis.

Our study includes 3414 strains *Salmonella* met to persons with foodstuff's toxin infections during the period of time 1985-2004, to which are made the antibiograms and the antimicrobial resistance. For this study we have used the registers of National Microbiologic Laboratory of the district of Elbasan and we have worked in this Laboratory during the years 1999-2004.

Antimicrobial resistance of 3414 *Salmonella*'s strains isolated in the years 1985-2004, of 3244 strains isolated in the years 1985-1994, and of 170 strains isolated in the years 1995-2004 is demonstrated in the tables below.

**Table 1 The dynamics of the antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1985 - 2004. (In absolut number and in percentage)**

Years	Nr. Strains	ANTIBIOTICS																	
		AM		S		TE		C		K		GM		SXT		NA		CIP	
		Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%
1985	479	477	99.58	465	94.78	467	97.49	454	94.78	109	22.76	48	10.02	349	72.86	351	73.28	-	-
1986	511	509	99.61	493	96.48	484	94.72	467	91.39	222	43.44	52	10.18	494	96.67	399	78.08	-	-
1987	635	627	98.74	500	78.74	596	93.86	366	57.63	458	72.13	67	10.55	362	57.01	366	57.64	-	-
1988	753	746	99.07	380	50.46	634	84.20	216	28.69	259	34.40	82	10.89	325	43.16	312	41.43	-	-
1989	383	370	96.60	261	68.15	304	79.37	169	44.12	243	63.44	42	10.97	179	46.73	108	28.20	-	-
1990	165	160	96.96	87	52.72	148	89.69	40	24.24	31	18.78	20	12.12	79	47.87	84	40.60	-	-
1991	144	128	88.88	77	53.47	133	92.36	76	52.77	66	45.83	30	20.83	111	77.08	56	38.88	-	-
1992	75	73	97.33	55	73.33	70	93.33	63	84.00	69	92.00	22	29.33	64	85.33	41	54.66	-	-
1993	78	76	97.43	55	70.51	70	89.74	56	71.79	39	50.00	20	25.64	40	51.28	52	66.66	-	-
1994	21	19	90.47	12	57.14	18	85.71	14	66.67	8	38.09	5	23.80	13	61.90	12	57.14	-	-
1995	14	13	92.85	9	64.28	13	92.85	10	71.42	8	57.14	4	28.57	9	64.29	7	50.00	0	0.0
1996	27	21	77.77	20	74.07	22	81.48	16	59.25	11	40.74	10	37.03	24	88.89	18	66.66	1	3.70
1997	12	11	91.66	9	75.00	10	83.33	9	75.00	7	58.33	4	33.33	10	83.33	7	57.14	0	0.0

1998	68	65	95.58	57	83.82	58	85.29	63	92.64	42	61.76	20	29.41	60	88.23	52	76.47	2	2.94
1999	7	7	100.0	5	71.42	6	85.71	6	85.71	4	57.14	3	42.85	4	57.14	3	42.85	0	0.0
2000	8	8	100.0	6	75.00	7	87.50	5	62.50	3	37.50	3	37.50	3	75.00	2	25.00	0	0.0
2001	2	2	100.0	2	100.0	1	50.00	1	50.00	1	50.00	0	0.00	1	50.00	1	50.00	0	0.0
2002	25	25	100.0	24	96.00	18	72.00	16	64.00	16	64.00	9	36.00	14	56.00	10	40.00	4	16.00
2003	4	4	100.0	3	75.00	3	75.00	1	25.00	1	25.00	2	50.00	3	75.00	3	75.00	0	0.00
2004	3	3	100.0	3	100.0	3	100.0	1	33.33	1	33.33	0	0.00	3	100.0	3	100.0	0	0.00
1985 - 2004	3414	3344	97.95	2523	73.90	3065	89.78	2049	60.02	1598	46.81	443	12.98	2147	62.89	1887	55.27	7	4.12

Note: The mark minus ( - ) means that the antibiotic is not used.

**Table 2 The dynamics of the antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1985 - 1994. (In absolut number and in percentage)**

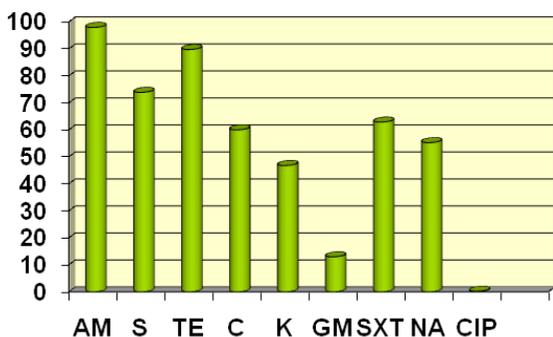
Years	Nr. Strains	ANTIBIOTICS																	
		AM		S		TE		C		K		GM		SXT		NA		CIP	
		Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%
1985 - 1994	3244	1185	98.18	2385	73.52	2924	90.14	1921	59.22	1504	46.36	388	10.42	2016	62.15	1781	54.90	-	-

**Table 3 The dynamics of antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1995 - 2004. (In absolut number and in percentage)**

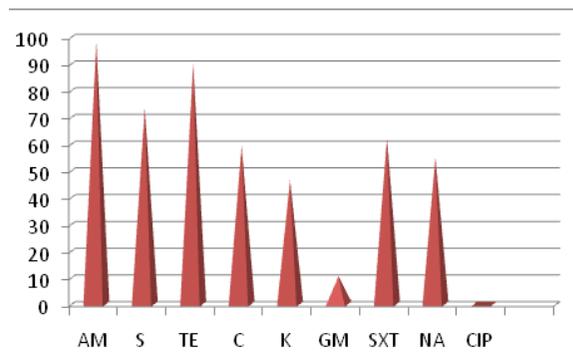
Years	Nr. Strains	ANTIBIOTICS																	
		AM		S		TE		C		K		GM		SXT		NA		CIP	
		Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%
1995 - 2004	170	159	93.52	138	81.18	141	82.94	128	75.29	94	55.29	55	32.35	131	77.05	106	62.35	7	4.12

From the tables above results that the antimicrobial resistance of the *Salmonella's* strains isolated in the years 1985-2004 and during the two sub periods is increased to: Ampicilin, Streptomycin, Kanamycin, Bactrim, Gentamicin, Ciprofloxacin, but to Tetracycline, Chloramphenicol, Nalidixin is reduced. But all the *Salmonella's* strains have been more resistant to Ampicilin (97.95),Tetracycline (89.78), Streptomycin (73.90 %), Bactrim (62.83 %), Chloramphenicol (60.02 %), Nalidixin ( 55.27 %), Kanamycin, (46.81%), and less to Ciprofloxacin (4.12 %), Gentamicin (12.98 %).

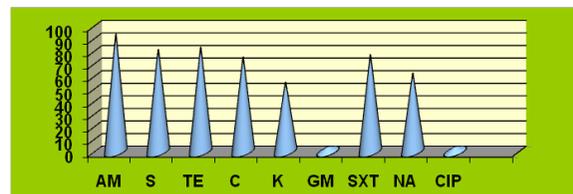
**Fig. 1 Antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1985 - 2004. (In percentage)**



**Fig. 2 Antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1985 - 1994. (In percentage)**



**Fig. 3 Antimicrobial resistance of the Salmonella's strains isolated in Elbasan's district during the years 1995 - 2004. (In percentage)**



Such a antimicrobial resistance of *Salmonella's* strains detached in the district of Elbasan during 1985-2004 divided in two sub periods 1985-1994 and 1995-2004 has approximates and differences with that of some other authors from our country and abroad just to do the comparison.

**Table 4 Antimicrobial resistance of the Salmonella's strains in Albania and in some other countries. (In percentage)**

Author	Country	Year	ANTIMICROBIAL RESISTANCE								
			AM	S	TE	C	K	GM	SXT	NA	CIP
Hizmo F.	Tirana	1990	82.2	50.3	63.3	78.8	40.7	22.3	52.3	12.2	-
Abazi E.	Fier	2001	19.9	95.5	82.7	87.7	18.4	-	94.6	-	-
Kryemadhi A.	Durres	2001	72.0	44.4	69.1	62.8	40.2	55.8	51.5	17.8	-
Hila N.	Elbasan	2004	97.9	73.9	89.7	60.0	46.8	12.9	62.9	55.3	4.12
Trikka G.E.	Greece	2000	78.0	-	-	98.2	-	-	96.1	-	0.0
Abayrak F.	Turkey	2000	88.6	-	-	81.8	-	-	90.9	-	0.0
Florescu S.	Romania	2000	37.8	-	-	-	-	-	31.9	47.2	0.0
Lukas D.	Croatia	1999	35.3	-	-	15.4	-	-	3.6	-	-
Guide B.	Italy	1985	63.3	-	58.5	42.0	-	32.0	53.2	-	-
Prats G.	Spain	1998	44.0	-	42.0	26.0	-	3.0	11.0	11.0	0.2
Ahmetova L.S.	Russia	2000	16.7	-	13.8	-	-	-	6.1	-	0.0
Hakanen A.	Finland	2000	11.5	16.9	18.1	8.8	-	-	17.7	-	0.4
Wasfy M.O.	Egypt	1999	-	-	-	65.6	-	-	-	-	-
Mwanso J.	Zambia	2001	-	-	77.0	77.0	-	25.0	84.0	32.0	-
Jamal W.Y.	Kuwait	1998	39.0	-	-	13.0	-	1.0	17.0	-	0.0
Isenbarger D.W	Thailand	1999	28.0	-	59.0	26.0	-	-	37.0	0.9	0.9
Davis M.A.	U.S.A	1997	65.9	69.9	63.5	46.6	18.9	0.8	2.0	-	-

**IV. CONCLUSIONS**

From the data mentioned above result that *Salmonella's* strains have been more resistant to Ampicilin, Tetracycline, Streptomycin, Bactrim.

**We can say that the reasons of passivity of such antibiotics against salmonellas are:**

- their use in most cases, without doing the antibiograms in each case;
- physicians have used very often the above antibiotics against salmonellas, bringing about the intensification of bacteria's resistance towards them;
- another problem must be the bearers that use antibiotics without consulting the physician.

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