

Chapter 4

REPORTS OF *SALMONELLA* IN ANIMAL FEEDINGSTUFFS

1) COMPOUND ANIMAL FEEDINGSTUFFS

In 1989, as part of its package of measures to control *Salmonella* in animals, particularly poultry, the Department, with the co-operation of the feedingstuffs industry, introduced a number of voluntary Codes of Practice for the hygienic production, storage, handling and transport of animal feedingstuffs (Defra 1989). The Codes contain measures for the testing of animal feedingstuffs for *Salmonella*, and the adoption of the Codes by all the major animal feedingstuff companies in Great Britain has resulted in a large volume of testing being undertaken each year. Laboratories which are authorised to test for *Salmonella* under the Poultry Breeding Flocks and Hatcheries Order, 1993, and the Animal By-products Regulation 2003, are required to report to Defra the number of tests done and the number positive for *Salmonella*. Under the Zoonoses Order 1989 all laboratories are required to report the isolation of *Salmonella* from feedingstuffs.

This chapter contains details on the results of that testing including the number of samples of various categories of feedingstuffs tested for *Salmonella*, the number of samples that proved positive and the contamination rate (Table 70). This table indicates no change in the overall contamination rate in animal feedingstuffs between 2003 and 2004. The number of tests carried out (36,770) was 9% lower compared with 2003, and 33% lower than the number carried out in 2001.

Tables 71 and 72 give results of *S. Typhimurium* and *S. Enteritidis* isolations from feedingstuffs. The number of isolations of *S. Enteritidis* remained low, but there was an increase in the number of reports of *S. Typhimurium* compared with 2003 (1 and 25 respectively out of 36,770 tests carried out – in 2003 the respective figures were 2 and 15 isolates).

Tables 73, 74 and 75 show the top serotypes isolated from compound ruminant, pig and poultry feed respectively. The most frequently isolated serotypes in 2004 were *S. Kedougou*, *S. Yoruba*, and *S. Mbandaka*. Previous problems with contamination of compound feeds by *S. Agona* appear to be reduced, although the organism was isolated from rape, soya and other feed materials (Table 76). As usual a wide range of other serovars were found in feed materials, reflecting their diversity of origin. *S. Rissen* was frequently isolated from rape in 2004 and was also found in soya, barley, wheat and compound poultry feed. This serovar was recovered from two turkey flocks in 2004 for the first time since recording began in 1995. It was not reported in any other species. The most frequently isolated serovar from compound poultry feed was

S. Typhimurium which was also isolated from a variety of feed ingredients including soya. Examples of the risk of introducing *Salmonella* serovars of potential public health significance in feed ingredients are provided by the isolation of *S. Typhimurium* in cocoa, soya, wheat and fishmeal.

A small number of feed isolates were not fully typed as reports rather than isolates were supplied by the testing laboratories.

2) PROCESSED ANIMAL PROTEIN

Processed animal protein is subject to statutory testing schemes at the point of production or importation and voluntary testing is also undertaken, mainly by feed mills receiving the material, where typically higher rates of contamination are found.

The feeding of mammalian meat and bone meal (MBM) to all farmed livestock was made illegal from 4 April 1996 and this resulted in much of it being disposed of by burial or incineration. As such, it no longer fell within the definition of “processed animal protein” as defined in the Processed Animal Protein Order 1989 (replaced by the Animal By-Products Order, 1999) and producers were no longer under a legal obligation to test products for *Salmonella* on each day they were consigned from their premises. However, official quarterly testing of products has continued under the Animal By-Products Order 1992, and since under the Animal By-Products Order 1999. The Animal By Products Regulations 2003 came into force in July 2003.

From 1 August 2001, under the Processed Animal Protein Regulations 2001, and now continued under the TSE Regulations 2002, the feeding of processed animal protein to animals kept, fattened or bred for the production of food is prohibited, with some exceptions including non-ruminant gelatin used for coating feed additives, animal-derived dicalcium phosphate and hydrolysed protein produced under certain conditions when fed to non-ruminants; fishmeal produced under certain conditions may be fed to farmed animals other than ruminants. Table 77 details the results obtained from the statutory official testing of domestic processed animal protein.

The number of batches of domestically produced processed animal protein tested in 2004 (150) was similar to 2003 (152) (Table 77), although the overall contamination rate in 2004 was much lower compared with 2003 (0.67% and 5.90% respectively).

The contamination rate of 4.6% for imported animal proteins (Table 79) was lower than in 2003 (10.8%) and, in addition, the number of batches tested fell to 87 in 2004 compared with 130 in 2003.

Figures 43 and 44 show trends in contamination rates for domestically produced and imported animal protein.

Tables 78 and 80 show the serovars reported from testing of domestically produced and imported animal protein respectively. Neither *S. Enteritidis* or *S. Typhimurium* were isolated from animal protein in 2004.

**Table 70: Animal feedingstuffs and ingredients contamination rates
(Tests being performed under the Animal By-Products Order 1999 and
Defra Codes of Practice) 2003 - 2004**

Product	2003			2004		
	No of tests	No of tests positive	Percent positive	No of tests	No of tests positive	Percent positive
Processed animal protein at a GB protein processing premises	3752	21	0.6	3576	32	0.9
GB and imported processed animal protein arriving for feedingstuffs use	878	23	2.6	1153	36	3.1
Oilseed meals and products for feedingstuffs use	12475	376	3.0	10364	337	3.3
Non-oilseed meal vegetable products	9954	97	1.0	8845	35	0.4
Ruminant concentrates	1859	6	0.3	1982	5	0.3
Pig extrusions	1411	13	0.9	1591	9	0.6
Pig and poultry meals	4171	33	0.8	3069	25	0.8
Poultry extrusions	4346	21	0.5	5299	12	0.2
Protein concentrate	724	6	0.8	511	6	1.2
Minerals/other	643	1	0.2	380	0	0
Total	40213	597	1.5	36770	497	1.4

Table 71: *Salmonella* Enteritidis and *S. Typhimurium* in feedingstuff ingredients 2003 - 2004

Type of Material	2003		2004	
	S. Enteritidis	S. Typhimurium	S. Enteritidis	S. Typhimurium
Finished feeds	1	2	1	4
Animal protein	-	-	-	1
Vegetable material	-	3	-	5
Minerals	-	-	-	-
Miscellaneous	1	10	-	15
Total	2	15	1	25

Table 72: Isolations of *S. Enteritidis* and *S. Typhimurium* from products monitored under the Defra Codes of Practice, 2004

<i>Salmonella</i> serotype	Feedingstuff	Number
Enteritidis	compound feed	1
Typhimurium	pig compound feed	2
	poultry compound feed	1
	ruminant compound feed	1
	fishmeal	1
	cocoa	1
	soya	1
	wheat	3
	unspecified	15

Table 73: The top 3 serotypes of *Salmonella* isolated from compound ruminant feed in 2004, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2003	<i>Salmonella</i> serotype	Isolations 2004
Anatum	2	Kedougou	3
Livingstone	1	Lexington	2
Mbandaka	1	Agona	1
Meleagridis	1	Carno	1
Senftenberg	1	Cubana	1
		Livingstone	1
		Typhimurium	1
		Virchow	1
		6,7:rough:-	1

Table 74: The top 2 serotypes of *Salmonella* isolated from compound pig feed in 2004, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2003	<i>Salmonella</i> serotype	Isolations 2004
Mbandaka	4	Agona	3
Anatum	3	Kedougou	2
Agona	2	Mbandaka	2
4,12:b:-	2	Typhimurium	2

Table 75: The top 3 serotypes of *Salmonella* isolated from compound poultry feed in 2004, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2003	<i>Salmonella</i> serotype	Isolations 2004
Senftenberg	8	Yoruba	5
Agona	4	Kedougou	4
Kentucky	3	Mbandaka	4
Derby	3	Kentucky	3
3,10:y:-	3	Rissen	3
Ohio	2		

Table 76: The major serotypes of *Salmonella* in feedingstuff ingredients 2004, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2003	Isolations 2004
Barley	Agama	1	0
	Mississippi	1	0
	Rissen	0	1
	Untyped	1	0
Cocoa	Ibadan	1	1
	Indiana	0	1
	Kuessel	1	0
	Mississippi	1	0
	Morningside	1	0
	Rubislaw	0	1
	Typhimurium	0	1
	Untyped	1	2
Linseed	Mbandaka	7	13
	Senftenberg	0	1
	Untyped	0	1
Maize	Agona	2	1
	Havana	1	0
	Infantis	1	0
	Kedougou	1	1
	Schwarzengrund	3	0
	Senftenberg	0	1
	Tennessee	1	0
	Typhimurium	1	0
	Untyped	0	1
Palm Kernel	Albany	2	0
	Amsterdam	1	0
	Cannstatt	1	2
	Carno	0	2
	Cotham	0	1
	Cubana	1	1
	Lexington	1	1
	Livingstone	0	1
	Mbandaka	0	1
	Molade	0	1
	Ruiru	0	1
	Rissen	1	0
	Senftenberg	0	7
	Tees	0	1
	Tennessee	0	1

Table 76 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2004, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2003	Isolations 2004
Rape	Agama	3	4
	Agona	55	3
	Binza	1	0
	Cubana	2	0
	Derby	3	2
	Idikan	1	0
	Kedougou	0	2
	Livingstone	1	0
	Mbandaka	26	17
	Rissen	0	168
	Senftenberg	2	3
	Tennessee	14	1
	4,12:b:-	1	0
	Untyped	0	2
Rice Bran	Typhimurium	1	0
Soya	Agona	26	6
	Anatum	4	1
	California	1	0
	Corvallis	0	1
	Cubana	2	3
	Derby	2	2
	Fresno	3	0
	Hadar	1	2
	Havana	4	0
	Ilugun	0	2
	Infantis	1	1
	Kedougou	0	2
	Kentucky	0	1
	Kingston	1	1
	Leiden	0	1
	Lexington	5	1
	Livingstone	5	3
	Mbandaka	24	28
	Meleagridis	1	3
	Minnesota	0	1
	Montevideo	1	1
	Oranienburg	1	0
	Ouakam	2	1
	Rissen	10	8
	Senftenberg	13	17
	Stanley	1	0
	Subdsvall	0	1
Tennessee	7	3	
Typhimurium	2	1	
Worthington	1	0	
Yoruba	4	5	

Table 76 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2004, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2003	Isolations 2004
	4,12:d:-	2	0
	6,7:-:-	1	3
	Rough	0	1
	Untyped	6	11
Sunflower	Agona	1	1
	Derby	0	1
	Emek	1	0
	Give	0	1
	Kedougou	1	0
	Livingstone	1	1
	Mbandaka	8	9
	Oranienburg	1	0
	Ouakam	1	0
	Senftenberg	3	1
	Tennessee	3	0
	Untyped	0	1
Wheat	Agona	1	0
	Kedougou	0	1
	Newport	1	1
	Rissen	0	1
	Senftenberg	0	1
	Stourbridge	1	1
	Taksony	0	1
	Typhimurium	0	3
	Yoruba	2	0
Fishmeal	Albany	1	0
	Anatum	1	1
	Corvallis	0	4
	Cubana	1	0
	Indiana	0	3
	Isangi	1	0
	Mbandaka	0	1
	Montevideo	1	0
	Oranienburg	3	0
	Ouakam	1	0
	Senftenberg	0	3
	Tennessee	2	1
	Typhimurium	0	1
Other	Adelaide	0	1
	Agama	1	1
	Agona	33	3
	Anatum	2	4
	Cerro	1	0
	Corvallis	0	1
	Cubana	1	1

Table 76 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2004, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2003	Isolations 2004
	Derby	1	2
	Ealing	0	2
	Havana	5	1
	Heidelberg	0	1
	Indiana	0	2
	Infantis	1	4
	Kedougou	2	4
	Kentucky	0	1
	Kottbus	2	0
	Lexington	1	1
	London	0	2
	Mbandaka	3	6
	Meleagridis	0	1
	Montevideo	1	2
	Muenster	1	0
	Newport	2	0
	Ohio	1	0
	Ouakam	0	1
	Panama	1	0
	Poona	0	1
	Reading	0	1
	Rissen	3	0
	Senftenberg	3	4
	Stockholm	1	0
	Stourbridge	1	0
	Teltow	0	1
	Tennessee	0	1
	Typhimurium	4	12
	Westhampton	1	0
	Yoruba	0	2
	Rough	0	1
	Untyped	2	5
Mill environment	Agama	1	0
	Agona	2	0
	Binza	0	1
	Florida	0	1
	Mbandaka	0	5
	Senftenberg	0	3
Unspecified	Agama	4	2
	Agona	8	6
	Anatum	2	4
	Binza	0	1
	Cerro	1	0
	Cubana	2	1
	Derby	3	0
	Dublin	2	2
	Enteritidis	2	0

Table 76 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2004, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2003	Isolations 2004
	Give	0	1
	Good	0	1
	Havana	2	0
	Indiana	0	1
	Infantis	3	7
	Isangi	4	0
	Kedougou	2	5
	Kentucky	0	2
	Lexington	1	0
	Liverpool	1	0
	Livingstone	1	1
	Manhattan	1	0
	Mbandaka	4	2
	Ohio	1	0
	Oranienburg	1	0
	Oslo	0	2
	Ouakam	1	1
	Poona	1	1
	Rissen	3	1
	Schwarzengrund	0	5
	Senftenberg	6	7
	Taksony	3	0
	Tennessee	10	5
	Thompson	0	2
	Typhimurium	5	3
	Yoruba	0	1
	Untyped	0	4

Table 77: Animal By-Products Order 1999 - domestic protein official testing - contamination rates in 2004 compared with the previous year

Sample Type	Batches Tested in 2003			Batches Tested in 2004		
	No	+ve	% +ve	No	+ve	% +ve
Poultry Offal Meal	25	1	4.0	21	0	-
Meat & Bone Meal	30	6	20.0	10	0	-
Greaves	16	0	-	10	0	-
Herring Meal	4	0	-	4	0	-
Other Fish Meal	12	2	16.7	10	0	-
White Fish Meal	11	0	-	9	0	-
Others	54	0	-	86	1	1.2
Total	152	9	5.9	150	1	0.67

NB: This table excludes the results of private testing

**Fig 43: Contamination rate - domestic processed animal protein
(official and private testing - batches) 1995 - 2004**

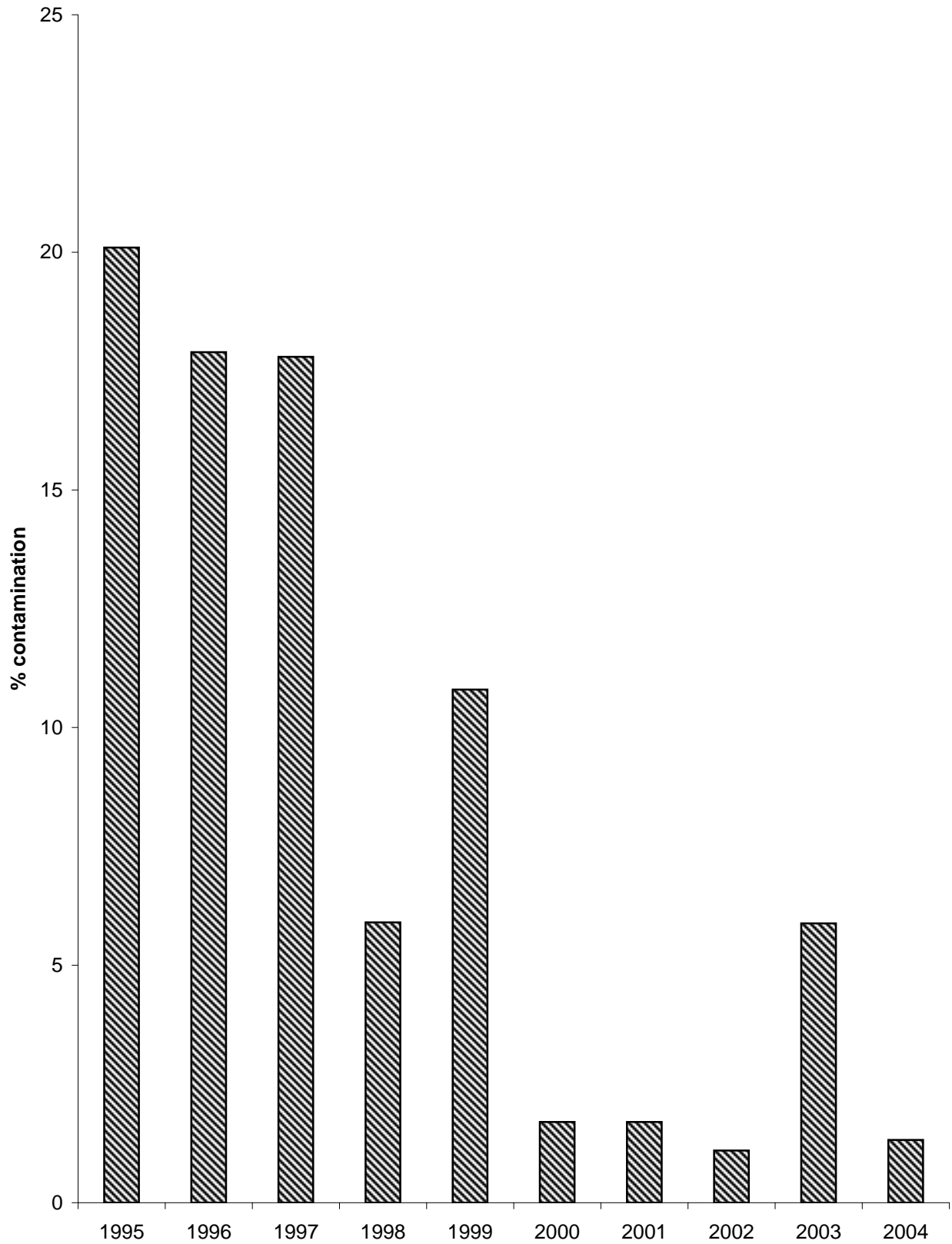


Table 78: Animal By-Products Order 1999 - serotypes isolated during 2004 from official and private testing of domestic protein, compared with previous year

<i>Salmonella</i> serotype	Isolations 2003	<i>Salmonella</i> serotype	Isolations 2004
Tennessee	5	Schwarzengrund	2
Montevideo	1	Saint Paul	1
6,7:-:-	1		
Group B	1		
Untyped	3		
Total isolations	11	Total isolations	3
No. of positive batches	9	No. of positive batches	2

Table 79: The Importation of Processed Animal Protein Order, 1981 - imported protein contamination rates in 2004, compared with the previous year

Sample Type	Batches Tested in 2003			Batches Tested in 2004		
	No	+ve	% +ve	No	+ve	% +ve
Bone Meal	-	-		1	1	100.0
Meat & Bone Meal	23	7	30.4	19	2	10.5
Fish Meal	102	7	6.9	62	1	1.6
Others	5	0	-	5	0	-
Total	130	14	10.8	87	4	4.6

**Fig 44: Contamination rate: imported processed animal protein
(batches tested) 1995 - 2004**

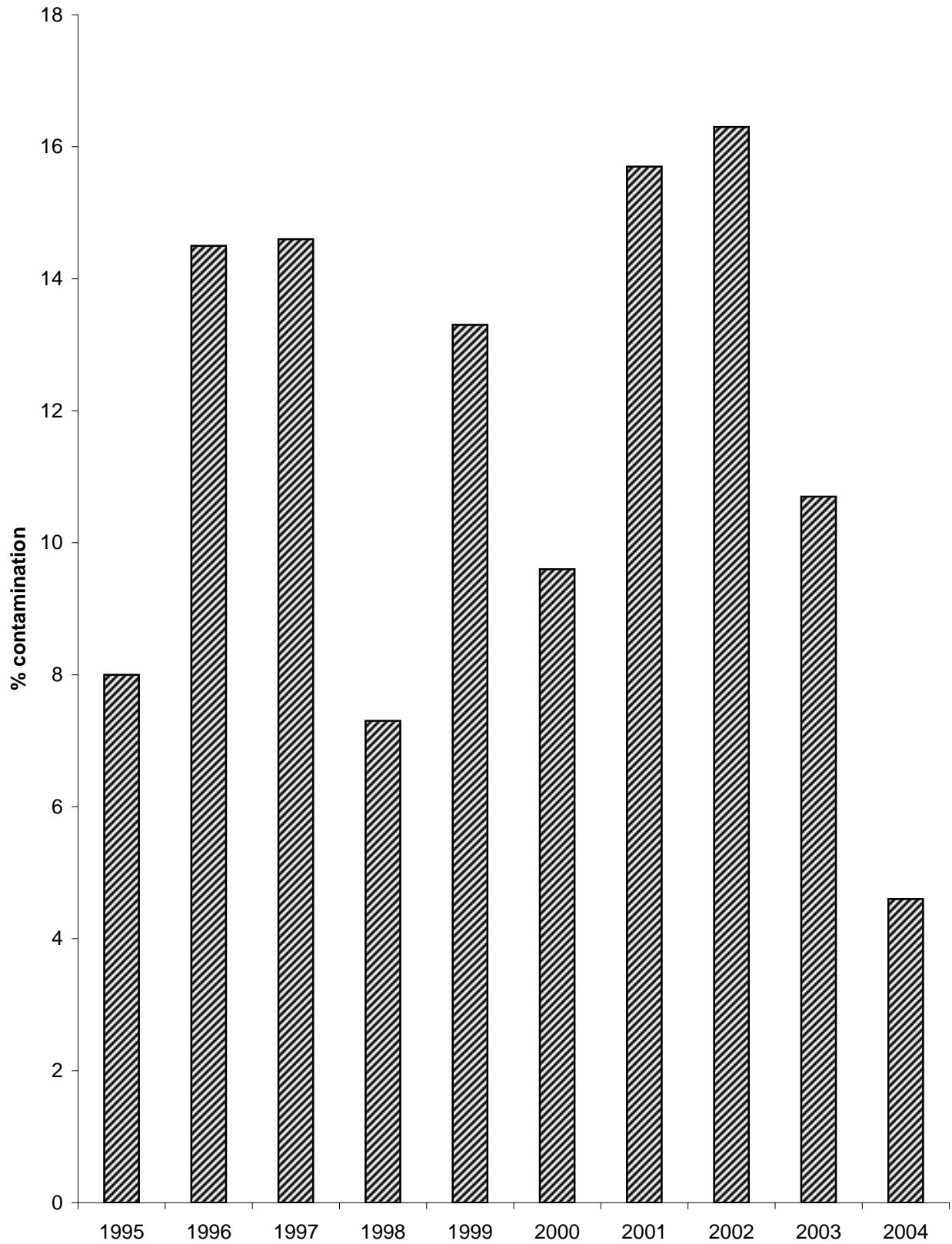


Table 80: The Importation of Processed Animal Protein Order, 1981 - serotypes isolated during 2004 from imported protein, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2003	<i>Salmonella</i> serotype	Isolations 2004
Enteritidis	6	Thompson	5
Isangi	4	Infantis	2
Anatum	2	Poona	1
Cerro	1	Senftenberg	1
Dublin	2		
Infantis	1	Group C	5
Livingstone	1	Group G	1
Manhattan	1		
Senftenberg	1		
Group B	1		
Group C	1		
Total isolations	26	Total isolations	21
No. of positive batches	24	No. of positive batches	24